

4 Forest Restoration Initiative Soil and Water Specialist Report



United States
Department of
Agriculture

Forest
Service

October, 2014



Soil Resources Specialist's Report

4 Forest Restoration Initiative

**Flagstaff and Mogollon Rim Ranger Districts, Coconino National
Forest**

**Williams and Tusayan Ranger Districts, Kaibab National Forest
Coconino County, Arizona.**

Prepared by Rory Steinke, CPSSc

Coconino National Forest Watershed Program Manager

Revised 7/18/2012, 11/28/2012, 1/2/2013, 1/8/2013, 3/24/2014,

7/15/2014, 9/5/2014, 10/17/2014

Table of Contents

Introduction.....	6
Purpose and Need	6
Desired Conditions for Soil and Watersheds	7
Methodology and Analysis Process	12
Comparison of Alternatives and Summary of Environmental Effects.....	24
Comparison of Effects to Soil Productivity and Watershed Function	27
Coconino and Kaibab National Forest Land Management Plan Direction.....	33
Summary of Response to Key Soil & Water DEIS Comments.....	50
Affected Environment.....	53
TES, Accuracy of Data and Quality Assurance.....	55
Accuracy of Data and Quality Assurance.....	56
Soil Stratification and Classification	56
Soil Classification.....	57
Use of Internal Soil Study (Steinke 2007).....	58
Conclusions of Study:.....	58
Environmental Consequences.....	66
Forest Erosion Processes	66
Current Soil Erosion	67
Summary of Soil Disturbance for All Alternatives	69
Summary of Soil Condition, Productivity and Watershed Function by Alternative	71
Executive Summary of Environmental Effects All Alternatives	75
Cumulative Effects Summary Including the Proposed Action (Alternative B).....	78
Alternative A (No Action) - Direct and Indirect Effects-Soils	78
Cumulative Effects	82
Alternative B (Proposed Action) - Direct and Indirect Effects.....	84
Treatment Area and 6 th HUC Area-Wide Soil Disturbance.....	104
Cumulative Effects	106
Alternative C - Direct and Indirect Effects	112
Reduced Mechanical Treatment Intensity Effects on Soil Productivity, Water Quality and Watershed Function - Alternatives C and E.....	116
Paired Watershed Study Effects Alternative C and E.....	117
Summary of Effects to Soil Resources - Alternative C	119
Cumulative Effects	121
Alternative D - Direct and Indirect Effects.....	123
Summary of Effects to Soil Resources - Alternative D	125
Cumulative Effects Alternative D	127
Alternative E - Direct and Indirect Effects	130
Summary of Effects to Soil Resources - Alternative E.....	132
Cumulative Effects Alternative E	134
Cumulative Effects Slide Fire	136
Executive Summary of Treatment and Cumulative Effects for all Alternatives: ..	137
Summary of Effects to Soils and Watershed Function for all Alternatives.....	138
4-FRI Forest Plan Amendment Analysis for Soil Productivity and Watershed Function	141
Executive Summary of Effects to Soil Productivity and Watershed Function for all Alternatives.....	144
Short-term Uses and Long-term Productivity.....	146
Unavoidable Adverse Effects	146

Irreversible and Irretrievable Commitments of Resources	146
Monitoring Requirements.....	147
Literature Cited and References.....	149
Attachment 1. Soil Disturbance by Treatment Area, 6th HUC Watershed by Alternative for EIS and Cumulative Effects.....	190
Attachment 2. Disturbed WEPP Interface for 4-FRI Project	216
Attachment 3. Soil Interpretations by Watershed, Strata and TESU.....	233
Attachment 4. Paired Watershed Study Locations and Soil Disturbance Details	414
Attachment 5. Soil and Water Responses to Public Comments.....	8

List of Tables

Table 1. Summary of Alternative Treatment Outputs Analyzed in Detail	11
Table 2. Resource Protection Measures Required for All Action Alternatives	15
Table 3. Comparison of Alternatives and Soil Disturbance Effects to Soil and Water Resources, Proposed Treatment Areas, 4-FRI	24
Table 4. Range in Percent of Mechanical and High Severity Fire Disturbance by Treatment Area and 6th HUC Watershed.....	25
Table 5. Treatment Area Potential Percent Soil Erosion Above Tolerable Soil Loss Threshold	26
Table 6. Comparison of Effects to Soil Productivity by Alternative.....	27
Table 7. Comparison of Effects to Watershed Function by Alternative	28
Table 8. Summary of Management Areas in the project area from the 1987 Coconino National Forest Plan as amended.....	33
Table 9. Summary of Coconino NF Forest Plan Standards and Guidelines for the project area	36
Table 10. Summary of Management Areas, Description, Plan Emphasis, Acres Proposed For Treatments in Kaibab NF Revised Plan	42
Table 13. List of 6 th code watersheds as defined by the Watershed Condition Framework....	63
Table 14. 10-Year Return Period Predicted Soil Erosion (All Alternatives).....	68
Table 15. Alternative A Summary of Direct Soil Effects (acres are approximate)	80
Table 16. Alternative A (No Treatment) 10-Year Return Period Predicted Soil Erosion	80
Table 17. 5th HUC Watersheds, Acres and Percent Proposed for Treatment by Alternative..	84
Table 18. Acres of Low-Intensity Treatments with Severe Erosion Hazard Soils	89
Table 19. Acres of High-Intensity Treatments with Severe Erosion Hazard Soils	92
Table 20. Acres of Savanna Treatment with Severe Erosion Hazard Soils.....	94
Table 21. Acres of Aspen Treatment with Severe Erosion Hazard Soils	96
Table 22. Alternative B Summary of Direct Effects	104
Table 23. Summary of cumulative effects – Alternative B	110
Table 24. Alternative C Acres of Severe Erosion with Low-& High Intensity Treatments & Aspen & Savanna.....	112
Table 25. Alternative C. Acres of Severe Erosion Hazard with Grassland Treatments	113
Table 26. Alternative C - Summary of Direct Soil Effects.....	115
Table 27. Alternative C - Summary of Cumulative Effects	123
Table 28. Alternative D - Summary of Direct Soil Effects	124
Table 29. Alternative D - Summary of Cumulative Effects	129
Table 30. Alt E - Acres of Severe Erosion Hazard, Low, High, Aspen, Grassland & Savanna Treatments.....	131
Table 31. Alt. E - Summary of Direct Soil Effects (acres and percents are approximate)	132
Table 32. Alt E - Summary of Cumulative effects	136

Table 33. Strata TES Units, Approximate Acreage, Soil Interpretations and Strata-Specific BMP Acres	152
Table 34. Proposed Action Taxonomic Classifications and Potential Plant Community by Strata and TES Map Units	162
Table 35. Alternative B, C, D, E 5 th and 6 th HUC Watersheds, Condition and Treatment Acres	185
Table 36. Alternative B Soil Disturbance Calculation by Treatment Area, 6th HUC Watershed and Cumulative Effects.....	190
Table 37. Alternative C Soil Disturbance Calculation by Treatment Area, 6th HUC Watershed and Cumulative Effects.....	197
Table 38. Alternative D. Soil Disturbance Calculation by Treatment Area, 6th HUC Watershed and Cumulative Effects	203
Table 39. Alt. B. Soil Interpretations by Watershed, Strata and TESU.....	233
Table 40. Cumulative Effects Baseline Data.....	400
Table 41. Current Projects Total Acres and Expected Ground Disturbance Acres	404
Table 42. Current and ongoing project acres by 6 th code watershed and treatment type	405
Table 43. Future Foreseeable Projects	411

List of Figures

Figure 1. 0-15 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests.....	216
Figure 2. 0-15 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests.....	216
Figure 3. 15-40 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests.....	217
Figure 4. 15-40 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests.....	217
Figure 5. 40-120 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests.....	218
Figure 6. 40-120 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests.....	218
Figure 7. 0-15 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires).....	219
Figure 8. 0-15 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires).....	220
Figure 9. 15-40 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires).....	220
Figure 10. 15-40 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires).....	221
Figure 11. 40-120 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires).....	222
Figure 12. 40-120 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires).....	222
Figure 13. 0-15 percent slopes, loam soils on ponderosa pine mature forests.....	223
Figure 14. 0-15 percent slopes, loam soils on ponderosa pine mature forests.....	223
Figure 15. 15 to 40 percent slopes, loam soils on ponderosa pine mature forests.....	224
Figure 16. 15 to 40 percent slopes, loam soils on ponderosa pine mature forests.....	225
Figure 17. 40-120 percent slopes, loam soils on ponderosa pine mature forests.....	225
Figure 18. 40-120 percent slopes, loam soils on ponderosa pine mature forests.....	226
Figure 19. 0-15 percent slopes, loam soils on ponderosa pine thinned, young forests.....	227
Figure 20. 0-15 percent slopes, loam soils on ponderosa pine thinned, young forests.....	227
Figure 21. 15-40 percent slopes, loam soils on ponderosa pine thinned, young forests.....	228
Figure 22. 15-40 percent slopes, loam soils on ponderosa pine thinned, young forests.....	229
Figure 23. 40-120 percent slopes, loam soils on ponderosa pine thinned, young forests.....	230
Figure 24. 40-120 percent slopes, loam soils on ponderosa pine thinned, young forests.....	231
Figure 25. 15-40 percent slopes, loam soils on ponderosa pine thinned, young forests.....	231
Figure 26. 15-40 percent slopes, loam soils on ponderosa pine thinned, young forests.....	232

Introduction

This report is the specialist report for soil resources relevant to the proposed 4 Forest Restoration Initiative Fuels Reduction Project. The report contains the current conditions of soil and water resources within the project area, and the effects of proposed alternatives on soil resources. This report will be used for the analysis of soil resources within the 4 Forest Restoration Initiative Fuels Reduction Project Environmental Assessment.

The Four-Forest Restoration Initiative (4FRI) is a planning effort designed to restore forest resiliency and function across four National Forests in Arizona including the Coconino, Kaibab, Apache-Sitgreaves and Tonto. This environmental analysis focuses on the Coconino National Forest (hereafter referred to as Coconino NF) and the Kaibab National Forest (hereafter referred to as Kaibab NF) with a project area totaling approximately 988,764 acres. Alternatives B–E would mechanically treat up to 431,049 acres of vegetation and treat up to 586,110 acres with prescribed fire.

This analysis focuses on soil resources, on the Coconino NF and Kaibab NF. It also contains information on effects to water quality. It discloses the affected environment and predicted environmental effects on soil resources from implementation of each alternative.

Structure of Report:

This Soil Specialist report analysis follows the table of contents and includes a description of the affected environment which describes the current condition of soil resources but also has information describing effects to water resources in the project area. Water resources are analyzed in detailed in another report (MacDonald, 2014). Following the description of the affected environment, a section describing the predicted environmental consequences (effects) of implementing the no action and all action alternatives to soil resources is described. Due to the scope and complexity of the project, there are numerous lengthy tables and appendixes included interpreting soil conditions and characteristics and two attachments.

Attachment #1 displays soil disturbance by treatment type, treatment area and 6th Hydrologic Unit Code (HUC) watershed including cumulative effects by alternative. Attachment #2 displays Disturbed Water Erosion Prediction Project (WEPP) soil erosion modeling runs and Attachment #3 displays soil interpretations by 6th HUC watershed, strata and Terrestrial Ecosystem Survey (TES) map unit. Attachment #4 lists soil disturbance by 6th HUC watershed and analyzes cumulative effects soil disturbances.). Appendix A displays soil interpretations and Best Management Practices (BMPs) by aggregated terrestrial ecological unit type (strata). Table 2 displays resource protection measures including soil and water BMPs. Additional maps detailing treatment areas and photos can be found in the fire, vegetation and forestry specialist reports.

Purpose and Need

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

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

Desired Conditions for Soil and Watersheds

- Long-term soil productivity is protected by maintaining or improving soil condition and function.
- Soil condition and function is maintained or improved toward satisfactory.
- The vegetative ground cover is adequate to protect against accelerated erosion resulting in maintained soil stability, soil and vegetative productivity. Soil loss is below tolerance, and no visible signs of excessive erosion are present.
- Adequate vegetative ground cover is present to reduce the threat to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows).
- Surface soil hydrologic soil function is in satisfactory condition with well aggregated, granular surface soil structure and tubular pores with sufficient porosity to effectively infiltrate water.

- Soil nutrient cycling is in satisfactory condition. Vegetative ground cover, plant basal area, species composition and forage productivity and herbaceous understory approaches natural conditions in PPC.
- Forests are restored at the landscape-scale that will provide for sustainable, forest health, wildlife and plant diversity while at the same time maintain and improve long-term soil productivity. The resultant forests are fire-adapted with the majority of fires occurring as ground fires at low fire severity to watershed.
 - Watershed function is maintained or improved towards functioning properly and exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Fire regime condition class and tree density is reduced and moves towards FRCC 1 (historical range), unneeded roads are decommissioned or restored to natural condition, soil and riparian condition and function is improved and moving towards satisfactory and properly functioning.

Relevant Laws, Regulations and Policy

All alternatives are designed to guide the Coconino NF's management activities in meeting all applicable Federal and State laws, regulations, and policies.

Clean Water Act (see Federal Water Pollution Control Act)

Emergency Flood Prevention (Agricultural Credit Act) Act of August 4, 1978 - Authorizes the Secretary of Agriculture to undertake emergency measures for runoff retardation and soil-erosion prevention, in cooperation with land owners and users, as the Secretary deems necessary to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood, or other natural occurrence is causing or has caused a sudden impairment of that watershed.

Federal Land Policy and Management Act of October 21, 1976 - Requires that public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use. Also states that the United States shall receive fair market value of the use of the public lands and their resources unless otherwise provided for by law.

Federal Water Pollution Control Act and Amendments of 1972 (Clean Water Act) - Enacted to restore and maintain the chemical, physical, and ecological integrity of the Nation's waters. Provides for measures to prevent, reduce, and eliminate water pollution; recognizes, preserves, and protects the responsibilities and rights of States to prevent, reduce, and eliminate pollution, and to plan the development and use (including restoration, preservation, and enhancement) of land and water resources; and provides for Federal support and aid of research relating to the prevention, reduction, and elimination of pollution, and Federal technical services and financial aid to state and interstate agencies and municipalities for the prevention, reduction, and elimination of pollution.

Established goals for the elimination of water pollution; required all municipal and industrial wastewater to be treated before being discharged into waterways; increased Federal assistance for municipal treatment plant construction; strengthened and streamlined enforcement policies; and

expanded the Federal role while retaining the responsibility of States for day-to-day implementation of the law.

Federal Water Project Recreation Act of July 9, 1965 - Requires that recreation and fish and wildlife enhancement opportunities be considered in the planning and development of Federal water development.

Forest and Rangeland Renewable Resources Planning Act of August 17, 1974 - Directs the Secretary of Agriculture to prepare a Renewable Resource Assessment every ten years; to transmit a recommended Renewable Resources Program to the President every five years; to develop, maintain, and, as appropriate, revise land and resource management plans for units of the National Forest System; and to ensure that the development and administration of the resources of the National Forest System are in full accord with the concepts of multiple use and sustained yield.

Organic Administration Act of June 4, 1897 - Authorizes the President to modify or revoke any instrument creating a national forest; states that no national forest may be established except to improve and protect the forest within its boundaries, for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States. Authorizes the Secretary of Agriculture to promulgate rules and regulations to regulate the use and occupancy of the national forests.

Multiple-Use Sustained-Yield Act of June 12, 1960 - States that it is the policy of Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes, and authorizes and directs the Secretary of Agriculture to develop and administer the renewable surface resources of the national forests for the multiple use and sustained yield of products and services.

National Environmental Policy Act of January 1, 1970 - Directs all Federal agencies to consider and report the potential environmental impacts of proposed Federal actions, and established the Council on Environmental Quality.

National Forest Management Act of October 22, 1976 - The National Forest Management Act reorganized, expanded, and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on National Forest System lands. The National Forest Management Act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. It is the primary statute governing the administration of National Forests.

Safe Drinking Water Amendments of November 18, 1977 - Amended the Safe Drinking Water Act to authorize appropriations for research conducted by the Environmental Protection Agency relating to safe drinking water; Federal grants to states for public water system supervision programs and underground water source protection programs; and grants to assist special studies relating to the provision of a safe supply of drinking water.

Soil and Water Resources Conservation Act of November 18, 1977 - Provides for a continuing appraisal of the United States' soil, water and related resources, including fish and wildlife habitats, and a soil and water conservation program to assist landowners and land users in furthering soil and water conservation.

Surface Mining Control and Reclamation Act of August 3, 1977 - Authorizes the Secretary of Agriculture to enter into agreements with landowners, providing for land stabilization, erosion, and sediment control, and reclamation through conservation treatment, including measures for the conservation and development of soil, water, woodland, wildlife, and recreation resources, and agricultural productivity of such lands.

Travel Management Rule - On December 9, 2005, the Forest Service published the TMR. The agency rewrote direction for motor vehicle use on National Forest Service (NFS) lands under 36 CFR, Parts 212, 251, and 261, and eliminated 36 CFR 295. The rule was written to address at least in part the issue of unmanaged recreation. The rule provides guidance to the Forest Service on how to designate and manage motorized recreation on the Forests. The rule requires each National Forest and Grassland to designate those roads, motorized trails, and Areas that are open to motor vehicle use.

Water Quality Improvement Act of April 3, 1970 - Amends the prohibitions of oil discharges, authorizes the President to determine quantities of oil which would be harmful to the public health or welfare of the United States; to publish a National Contingency Plan to provide for coordinated action to minimize damage from oil discharges. Requires performance standards for marine sanitation device and authorizes demonstration projects to control acid or other mine pollution, and to control water pollution within the watersheds of the Great Lakes. Requires that applicants for Federal permits for activities involving discharges into navigable waters provide state certification that they will not violate applicable water quality standards.

At this time, there is uncertainty whether a National Pollution Discharge Elimination System (NPDES) permit under Section 402 of the Act would be required for stormwater discharges from logging roads associated with this project. Although the Environmental Protection Agency has published a final rule exempting logging road stormwater discharge from NPDES permitting requirements, the United States Supreme Court is currently reviewing the matter. Until the Supreme Court rules, it will be uncertain whether a NPDES permit is required for this project.

Watershed Protection and Flood Prevention Act of August 4, 1954 - Establishes policy that the Federal government should cooperate with states and their political subdivisions, soil or water conservation districts, flood prevention or control districts, and other local public agencies for the purposes of preventing erosion, floodwater, and sediment damages in the watersheds of the rivers and streams of the United States; furthering the conservation, development, utilization, and disposal of water, and the conservation and utilization of land; and thereby preserving, protecting, and improving the Nation's land and water resources and the quality of the environment.

Alternatives

The following table summarizes the alternatives and their outputs within this analysis:

Table 1. Summary of Alternative Treatment Outputs Analyzed in Detail

Proposed Activity	Alt. A (No Action) acres	Alt.B (Proposed Action) a	Alt.C	Alt.D	Alt.E
Vegetation mechanical treatment (acres)	0 proposed but on-going would treat about 166,897 acres	384,966	431,049	384,966	403,218
Prescribed Fire (acres)	0 proposed but 195,076 on-going	583,330	586,110	178,441	581,019
Mexican spotted owl protected activity center (PAC) habitat treatments	N/A	Mechanically treat up to 16-inch d.b.h. in 18 PACs (excluding core areas). Utilize prescribed fire in 70 MSO PACs (excluding core areas).	Mechanically treat up to 17.9-inch d.b.h. in 18 PACs. Utilize prescribed fire in 54 MSO PACs (including core areas). Utilize prescribed fire in 16 MSO PACs (excluding core areas).	Mechanically treat up to 16-inch d.b.h. in 18 PACs (excluding core areas).	Mechanically treat up to 9-inch d.b.h. in 18 PACs (excluding core areas). Utilize prescribed fire in 70 MSO PACs (excluding core areas).
Springs/Seeps Restored (number)	0	74	Same as alternative B		
Springs protective fence construction (miles)	0	4	Same as alternative B		
Aspen protective fencing (miles)	0	Up to 82	Same as alternative B		
Ephemeral stream restoration (miles)	0	39	Same as alternative B		
Existing & unauthorized road decommission (miles)	0	Up to 726 on Coconino NF. Up to 40 reconstructed or relocated	Same as alternative B		
Unauthorized route decom	0	134 on KNF	Same as alternative B		
Temporary road construction	0	520	Same as alternative B		

and decom.			
Road Reconstruction-Improvement (miles)	0	Up to 30	Same as alternative B
Road recon/reloc. (miles)	0	Up to 10	Same as alternative B

Methodology and Analysis Process

- The Terrestrial Ecosystem Survey (TES) of the Coconino (USDA, 1995) and Kaibab (USDA, 1989) national forests were used for soil and potential plant community (PPC) (ecological unit) interpretations. Terrestrial ecological units or TES map units were aggregated into strata for landscape level analysis that have similar soils and PPCs. Strata aggregation stems from a collaborative effort between Coconino and Kaibab National Forest soil scientists and the Ecological Restoration Initiative Soil Scientist Dave Brewer. Aggregations were reviewed by the R3soil scientists and adjusted to the current strata.
- The project lies within 82, 6th code watersheds, (see Appendix C). The Watershed Condition Framework (WCF) protocol (USDA, 2010a, 2010b) was used to classify watershed conditions at the 6th HUC level in spring, 2011 including 12 watershed indicators. The interactive website link can be found here, <http://apps.fs.usda.gov/WCFmapviewer/>
- The strata were used to identify soil types, suitabilities, hazards and limitations and PPC potentials to design 4-FRI silvicultural treatments and identify necessary BMPs to implement.
- Limitations and accuracy of data including their use to determine soil suitability, hazards and limitation for timber harvest and other management actions are described in the Soils Affected Environment chapter.
- Analysis is by treatment type, strata and 6th hydrologic unit code (HUC) watershed.
- Analysis by restoration unit or restoration subunit (RSU) was considered but not used because effects to soil and water resources (especially water flow) is better expressed at the watershed level rather than artificial boundaries used in the RSU.
- Water Erosion Prediction Project (WEPP) erosion models were used with accuracy plus or minus 50 percent. Although the accuracy seems high, the values generated from the model are believed to be consistent across alternatives and useful in comparing alternatives. The disturbed WEPP interface was used because it can model differences in vegetative ground cover predicted from timber harvest activities and low, moderate and high burn severity soils across watersheds. Disturbed WEPP is designed to predict runoff and sediment yield from undisturbed and harvested forests and prescribed and wildfires. The WEPP (USDA 2006) model can be found online at <http://forest.moscowfsl.wsu.edu/fswcpp/>.
- Assumptions made for mechanical and fire disturbance, erosion modeling. The analysis

of environmental effects compares soil disturbance and soil erosion above tolerable soil loss amongst each alternative.

- Proposed mechanical treatments were aggregated into 5 major treatments types with corresponding soil disturbances assigned based on past observations, aerial photo interpretive estimates and monitoring data from similar harvesting techniques. Acres and percent of soil disturbance by treatment type, 6th HUC watershed and treatment area wide and acres of soil condition and productivity improved, maintained and protected and relative change in watershed function are the units of measure used to compare each alternative in this analysis. The treatment types and corresponding averages of soil disturbance carried forward in this analysis are the following:
 1. **Grassland Restoration:** Disturbance is predicted at about 1-5 percent and 3 percent used in calculation of soil disturbance except in Alternative C where 10% is used since some grasslands are encroached with more pine (Garland Prarie) and require more mechanical maneuvering resulting in more soil disturbance
 2. **Ponderosa Pine Restoration Higher Intensity Mechanical:** Includes all WUI and 40-55 cover value treatments. Disturbance is predicted at 10-20 percent and the midpoint of 15 percent is used.
 3. **Ponderosa Pine Restoration Lower Intensity Mechanical:** Includes all treatments less than 40-55 cover value and pine sage treatments and owl or goshawk sensitive treatment sites where thinning is proposed. Disturbance is predicted at 10-15 percent and 12 percent is used.
 4. **Savanna:** Disturbance is predicted at 10-20 percent and the midpoint of 15 percent is used.
 5. **Aspen:** Disturbance is predicted at 10-20 percent and the midpoint of 15 percent is used.

Fire types analyzed include prescribed fire and wildfire. Acres of potential high severity burns by treatment type, 6th HUC watershed and treatment area wide are compared by alternative. Assumptions made to predict acres that would be burned in the high severity class include the following:

1. Prescribed and managed fire would result in 1-3 percent burning in high severity. This is based on recent managed fire data averages from Coconino national forest BAER assessments (2009-2011 in office files) and (Lata, 2014 and per. com. Mary Lata, 2/2012).
 2. Wildfires managed primarily for suppression would result in about 33 percent high burn severity. This is based on (Lata, Fire Specialist Report, 2014) and recent BAER assessments on the Coconino National Forest
- Proposed road treatments and channel restoration acres were calculated by treatment type and 6th HUC watershed and included in overall determination of soil disturbance.

- Data is typically reported to the nearest acre, mile, or percentage. Most values have been rounded from their actual decimal values. Totals were calculated before any values were rounded in order to give the most accurate sum. Any apparent inconsistency between the total values reported in a table and a sum resulting from adding up individual values in a table typically accounts for a discrepancy of about 1% in the case of rounding percentages or miles, and <2 acres in the case of acres.
- In an attempt to avoid confusion over these kinds of inconsistencies, minor adjustments to the numbers in the EIS document were made to allow for numbers in tables to add up correctly as displayed. As a result, some numbers may not be exactly the same in the EIS document as compared to this report. The numbers in this report are the most accurate and any differences do not alter any determination of effects.

Units of Measure

The units of measure for soil resources will be displayed for the treatment area (about 595,000) and for the entire 6th HUC watershed and by alternative for soil productivity and watershed function. The units of measure are:

- Acres and percent of treatment area and 6th HUC watershed with soil disturbance from mechanical activities and equipment use.
- Acres and percent of treatment area and 6th HUC watershed with soil disturbance from potential high severity burns.
- Total soil disturbance in acres and percent of treatment area and 6th HUC watershed from both mechanical activities and potential high burn severity. With that being said, adverse effects to soil and water resources are expected to be mitigated and reduced through the use of resource protection measures (BMP's) and through sequencing treatments and prescribed fires temporally (at different times).
- Percent of treatment area with mechanical and fire treatments resulting in soil erosion above soil tolerable levels (threshold). For fire treatments, two scenarios are analyzed.
 1. 100 percent acres burned in high severity and
 2. 33 percent acres burned in high severity. 33 percent is a more realistic number of acres (33 percent) calculated by fire modeling (Lata 2014), and recent data from several resource benefit fires show less than 5% burn in high severity on the Coconino NF).
- Acres of soil condition and productivity improved, maintained and protected.
- Relative change in watershed function (improved and maintained).

The No Action (Alt A) assumes potential disturbance resulting from high severity fires. Alt A does not directly cause soil disturbance because no ground disturbance would occur.

For water quality measures, no physical stream measurements will be taken to determine water quality. A narrative description will describe the effects to water quality by Alternative identifying the most current water quality status of perennial waters including streams and lakes

as identified by ADEQ.

Resource Protection Measures

Resource protection measures listed below include references to the standard contract clauses (BT and CT) Forest Service Timber Sale Contract (TSC) and to Best Management Practices (BMP's) the Soil and Watershed Conservation Practices Handbook (USDA 1991a). Resource protection measures are put in place to minimize nonpoint source pollution as outlined in the intergovernmental agreement between the Arizona Department of Environmental Quality and the Southwestern Region of the Forest Service (ADEQ 2010). Note that no resource protection measures are needed for the No Action Alternative since no ground disturbance would occur.

Table 2. Resource Protection Measures Required for All Action Alternatives

BMP #	Mitigation	Objective
BMP's Common To All Activities		
BMP #1	Implement Best Management Practices prior to project implementation.	To minimize impacts to soil and water resources from project implementation, to minimize non-point source pollution, to adhere to the Clean Water Act, and to adhere to the intergovernmental agreement between Region 3 of the Forest Service and the Arizona Department of Environmental Quality.
BMP #2	Minimize mechanical operations when ground conditions are such that soil compaction can occur. All activities should be limited/restricted to when soils are dry or frozen. If compaction occurs, mitigate through ripping, seeding and covering compacted areas with slash.	To minimize soil compaction, soil detachment and sediment transport. To maintain long-term soil productivity.
BMP #3	All fueling of vehicles will be done on a designated protected, upland site. If more than 1320 of gallons of petroleum products are to be stored on site above ground or if a single container exceeds 660 gallons, then a spill prevention control and countermeasures plan (SPCC) will be prepared as per 40 CFR 112).	To prevent contamination of waters from accidental spills.
BMP #4	The following applies to any personnel implementing ground-disturbing actions: Prior to moving off-road equipment onto a project area, contractor shall identify the location of the equipment's most recent operation. Contractor shall not move any off-road equipment that last operated in an area infested with one or more invasive species of concern onto sale area without having cleaned such equipment of seeds, soil, vegetative matter, and other debris that could contain or hold seeds, and having notified Forest Service, as provided in (iii). If the location of prior operation cannot be identified, then contractor shall assume that the location is infested with invasive species of concern. If the contractor has	To minimize the spread of non-native species

BMP #	Mitigation	Objective
	worked in areas where potential chytrid fungus could occur, contractor shall assume chytrid fungus is present and must disinfect equipment prior to work adjacent to water bodies. (i – intentionally omitted) (ii) Prior to moving Off-road equipment from a cutting unit or cutting area that is shown on contract area or sale area map to be infested with invasive species of concern to, or through any other area that is shown as being free of invasive species of concern, or infested with a different invasive species, contractor shall clean such equipment of seeds, soil, vegetative matter, and other debris that could contain or hold seeds and/or disinfect as necessary, and shall notify the Forest Service, as provided in (iii). (iii) Prior to moving any off-road equipment subject to the cleaning and disinfecting requirements set forth above, contractor, shall advise Forest Service of its cleaning measures and make the equipment available for inspection. Forest Service shall have 2 days, excluding weekends and Federal holidays, to inspect equipment after it has been made available. After satisfactory inspection or after such 2 day period, contractor may move the equipment as planned. Equipment shall be considered clean when a visual inspection does not disclose seeds, soil, vegetative matter, and other debris that could contain or hold seeds. Contractor shall not be required to disassemble equipment unless so directed by the Forest Service after inspection. (iv) If contractor desires to clean off-road equipment on National Forest land, such as at the end of a project or prior to moving to, or through an area that is free of invasive species of concern, contractor shall obtain prior approval from contracting officer as to the location for such cleaning and measures, if any, for controlling impacts.	
BMP #5	If construction crews are to live on-site, then an approved camp and suitable sanitation facilities must be provided.	To protect surface and subsurface water from unacceptable levels of bacteria, nutrients and chemical pollutants.
Prescribed burning		
BMP #6	On areas to be prescribed burned, fire prescriptions should be designed to minimize soil temperatures over the entire area. High severity fire should occur on 10 percent or less of the entire area. Fire prescriptions should be designed so that soil and fuel moisture temperatures are such that fire severity is minimized and soil health and productivity are maintained. If containment lines are put in place, rehabilitate lines after use by either rolling berm back over the entire fireline, spreading slash across the fireline or waterbar the fireline. If line is only to be waterbarred, disguise the first 400 feet of line to discourage use as a trail.	To maintain long-term soil productivity and minimize sediment delivery from containment lines.

BMP #	Mitigation	Objective
BMP #7	On areas to be prescribed burned, manage for 5-7 tons/acre of coarse woody debris in ponderosa pine be left on-site after the prescribed burns to maintain long-term soil productivity on areas to be burned except in areas of identified WUI treatments. Within the pinyon-juniper cover type, snags would be managed for 1 per acre over 75 percent of the area and coarse woody debris (CWD) would be managed for an after treatment average of 1 to 3 tons per acre. Where available, a portion of the CWD would include two logs ≥ 10 inches and ≥ 10 feet in length.	To maintain long-term soil productivity.
BMP #8	On areas to be prescribed burned, establish filter strips (also known as streamside management zones. These stream reaches will be designated as protected streamcourse The following are recommendations to protect streamcourses. Riparian streamcourse: Severe erosion hazard: 120 feet on each side of streamcourse. Moderate erosion hazard: 100 feet on each side of streamcourse. Slight erosion hazard: 70 feet on each side of streamcourse. Non-riparian streamcourse: Severe erosion hazard: 100 feet on each side of streamcourse. Moderate erosion hazard: 70 feet on each side of streamcourse. Slight erosion hazard: 35 feet on each side of streamcourse. Do not ignite fuels within this buffer area. Some creep may occur into the buffer.	To minimize sediment and/or ash delivery into drainages and maintain water quality.
BMP #9	Intentionally left blank.	
BMP #10	All burning will be coordinated daily with the Arizona Department of Environmental Quality (ADEQ). Burning will not take place on any portion of the project without prior approval from ADEQ. Coordination with ADEQ will take place through the Kaibab and Coconino National Forest Zone Dispatch Center and the Prescribed Burning Boss.	To ensure that smoke management objectives are met.
Road Reconstruction and Channel Restoration		
BMP #11	Complete all required permitting (404 permits) and Water Quality Certification (if necessary), prior to project implementation.	To comply with Clean Water Act provisions.
BMP #12	Site rehabilitation on upland sites for stream channel and road reconstruction projects where ground disturbance occurs: Seed at 5	To minimize soil erosion and minimize noxious weed spread and

BMP #	Mitigation	Objective
	pounds/acre with native, certified weed free seed mix. Potential vegetation for individual sites should utilize the Kaibab and Coconino National Forest Terrestrial Ecosystem Survey to identify species to be utilized. Where feasible, protect site with slash spread across the disturbed area to create microclimates and protect from grazing ungulates.	mitigate severe erosion hazard.
BMP #13	Site rehabilitation on riparian sites for stream channel and road reconstruction projects where ground disturbance occurs: Seed at 5 pounds/acre with certified weed free native seed mix to rehabilitate the site and minimize impacts of noxious weeds. Potential vegetation for individual sites should utilize the Kaibab and Coconino National Forest Terrestrial Ecosystem Survey to identify species to be utilized. Where feasible, protect site with a variety of methods (e.g., ungulate proof fence, spreading slash etc.).	To comply with State and Federal water quality standards by minimizing soil erosion through the stabilizing influence of vegetation ground cover. Minimize noxious weed spread.
BMP #14	Install silt fences and/or wattles downstream from ground-disturbing activities in stream channels to minimize the chance of sediment being lost downstream during construction and until revegetation is completed.	To comply with State and Federal water quality standards by minimizing sediment delivery to drainages.
BMP #15	Provide site protection on newly disturbed soils (e.g. hydromulch, erosion mat, spread slash etc.) in channel restoration and road reconstruction sites on all sites as needed and where feasible.	To comply with State and Federal water quality standards by minimizing sediment delivery to drainages, minimize impacts on severe erosion hazard soils, and to create microclimate for regeneration of grass/forb community and minimize noxious weed spread.
BMP #16	Bring rock material from a local upland site to any headcut drop structures that may be installed in channel restoration projects.	To minimize disturbance in drainage systems and minimize sediment production within channel.
BMP #17	Site rehabilitation on disturbed sites at and stream channel shaping on previously obliterated roads: Site rehabilitation consists of several revegetation methods, such as, but not limited to: 1) Store sod removed from the initial ground disturbance and replace the sod from the top of the bank on the disturbed site; 2) Seed with a native seed mix (see BMP's above) 3) Protect site with slash spread across the disturbed area to create microclimates and protect from grazing ungulates. Slash placement will be limited to the upper 2/3 of the bank to limit transport downstream of woody material; 4) Fence out ungulates for 1 to 2 years (or until the site has re-established); 5) consider mycorrhizal inoculum on severely disturbed sites where no topsoil is left, and, 6) install erosion mat.	To comply with State and Federal water quality standards by minimizing soil erosion through the stabilizing influence of vegetation ground cover. Minimize noxious weed spread.

BMP #	Mitigation	Objective
BMP #18	Do not borrow road fill or embankment materials from the stream channel or meadow surface on road maintenance projects. End-load all material hauled on-site and compact fill.	To minimize disturbance in drainage systems and minimize sediment production within channel.
BMP #19	Where feasible, relocate roads out of filter strips into an upland position. If this is not feasible, use riprap or velocity checks to stabilize or disperse outfall on road maintenance projects when roads are located within filter strips.	To minimize sediment delivery into drainage and to minimize disturbance in drainage systems and minimize sediment production within channel.
BMP #20	At riparian stream reach restoration sites, restore riparian dependent grasses through 1) seeding of native species, 2) planting plugs of rushes, sedges, and spike rushes to improve success of regeneration efforts. Fence with ungulate proof fencing for 1 to 2 years (or until plants are established) if grazing is inhibiting regeneration efforts.	To comply with State and Federal water quality standards by minimizing soil erosion through stabilization of ground cover. Minimize noxious weed spread.
BMP #21	On areas that have had roads previously obliterated and the remaining roadbed will be removed, add slash/or erosion mat and seed to the disturbed areas.	To add surface roughness and to comply with State and Federal water quality standards by minimizing soil erosion through stabilization of ground cover and to diminish the impact of the first rain event and to speed recovery of the site.
Springs and seeps		
BMP #22	At spring restoration sites, restore riparian dependent species through 1) seeding of native species, 2) planting plugs/cuttings of native plants to improve success of regeneration efforts. Fence with ungulate proof fencing for 1 to 2 years (or until plants are established) if grazing is inhibiting regeneration efforts.	To comply with State and Federal water quality standards by minimizing soil erosion through stabilization of ground cover. Minimize noxious weed spread.
Harvesting operations		
BMP #23	Do not blade roads when the road surface is too dry. If the road surface is too dry, a water truck can apply water, or the project can be scheduled for when adequate moisture occurs to complete the project.	To minimize sediment detachment and to minimize impacts on severe erosion soils
BMP #24	In grassland restoration sites, limit skidding and designate skid trails if wood is to be removed. Where material is not to be removed, do not skid logs in meadows and lop and scatter is the preferred method of treating slash. Do not machine pile within meadows. If skidding has to occur across a riparian or non-riparian streamcourse, designate any crossing prior to skidding.	To minimize impacts to streams and soils in meadows from tree harvesting operations.

BMP #	Mitigation	Objective
BMP #25	Skid trails and obliterated roads will have slash placed on the trail or cross-ditched (waterbarred) to break the energy flow of water. Placing slash on skid trails is the preferred method to dissipate the energy flow of water. Waterbars are only to be implemented with equipment with an articulating blade (no skidders) or by hand.	To minimize soil erosion and maintain soil productivity. and to minimize impacts on .severe erosion soils
BMP #26	Landing locations will be in upland positions and out of meadows, riparian and non-riparian filter strips.	To minimize sediment delivery into drainage. and to minimize impacts on .severe erosion soils
BMP #27	Mechanical harvest or mechanical fuel treatment are only allowed on Cinder Cones greater than 25 percent slope with designated skid trails and slash mats placed on the skid trails. On other sites, mechanized harvesting can occur up to 40 percent slopes.	To maintain long-term soil productivity on slopes with severe erosion hazard potential
BMP #28	Designated skid trails and log landings will be required within the Integrated Resource Service Contract (BMP 24.18 in FSH 2509.22) on all cutting units. Skid trail design should not have long, straight skid trails that would direct water flow. Skid trails should also be located out of filter strips (exceptions are at approved crossings).	To minimize the number of acres disturbed and to minimize impacts on .severe erosion soils.
BMP #29	Felling to the lead will be required within the Integrated Resource Service Contract (IRSC) to minimize ground disturbance from skidding operations (BMP 24.18) .	Felling of timber should be done to minimize ground disturbance from skidding operations and to minimize impacts on .severe erosion soils.
BMP #30	The IRSC outlines the timing and application of erosion control methods to minimize soil loss and sedimentation of streamcourses. Seed mix can include any of the following certified weed free native species at a minimum of 5 lbs./acre pure live seed: Potential vegetation for individual sites should utilize the Kaibab and Coconino National Forest Terrestrial Ecosystem Survey to identify species to be utilized. Corresponding BMP's from FSH 2509.22 to minimize soil loss and sedimentation of include 24.13, 24.21, 24.22, 24.23, 24.24, and 24.25. The preferred erosion control method on the skid trails in the harvest areas will be by spreading slash. Other acceptable erosion control measures include, but are not limited to, waterbarring (waterbars should not be more than two feet deep and need at least a ten foot leadout. Waterbars are only to be implemented with equipment with an articulating blade (no skidders) or by hand.), removing berms, seeding, mulching and cross-ripping. Erosion control after skidding operations must be timely to minimize the effects of log skidding.	Minimize soil loss and sedimentation of streamcourses from skidding operations and to minimize noxious weed spread and re-establish native vegetation and to minimize impacts on .severe erosion soils
BMP #31	Road drainage is controlled by a variety of methods (BMP 41.14), including rolling the grade, insloping outsloping, crowning, water spreading ditches, and contour trenching. Sediment loads at drainage	To minimize soil movement and maintain water quality and to minimize impacts on .severe

BMP #	Mitigation	Objective
	structures can be reduced by installing sediment filters, rock and vegetative energy dissipaters, and settling ponds. Design of roads is included in the transportation plan of the IRSC and T-specs.	erosion soils.
BMP #32	Road maintenance (BMP 41.25) through the IRSC should require prehaul and post haul maintenance on all roads to be used for haul.	To minimize soil movement and maintain water quality. and to minimize impacts on severe erosion soils.
BMP #33	The designation of filter strips (also known as streamside management zones) minimizes on-site soil movement from timber harvest activities along streamcourses (BMP 24.16). These stream reaches will be designated as protected streamcourses. Locations of protected streamcourses are included in the individual Task Order Maps and will be designated with a protected streamcourse designation. The following are recommendations to protect streamcourses within the proposed tree harvest units in relation to riparian and non-riparian streamcourses. The guidelines for filter strip designation are as follows: Riparian streamcourse: Severe erosion hazard: 120 feet on each side of streamcourse. Moderate erosion hazard: 100 feet on each side of streamcourse. Slight erosion hazard: 70 feet on each side of streamcourse. Non-riparian streamcourse: Severe erosion hazard: 100 feet on each side of streamcourse. Moderate erosion hazard: 70 feet on each side of streamcourse. Slight erosion hazard: 35 feet on each side of streamcourse. Accepted harvest activities within riparian and non-riparian filter strips include mechanical and conventional tree felling and limited skidding on designated skid trails and not across streamcourses. Landings, decking areas, machine piles, and roads (except at designated crossings) are planned outside of riparian and non-riparian filter strips.	Filtering sediment and/or providing bank stability on all streamcourses and to minimize impacts on severe erosion soils To implement the Oak Creek E. Coli TMDL and Lake Mary Region Mercury TMDL and to filter sediment and/or provide bank stability.
BMP #34	Intentionally left blank.	
BMP #35	Manage for 5 to 7 tons (forest plan consistency) per acre of coarse woody debris in ponderosa pine sites that will be left on-site on all cutting unit sites except in areas of identified WUI treatments. Within the pinyon-juniper cover type maintain the following where possible: 1 snag per acre and 1 to 3 tons of coarse woody debris (CWD) per acre (specialist recommendation). Where available, a portion of the CWD would include two logs ≥ 10 inches and ≥ 10 feet in length (specialist recommendation).	To promote long-term soil productivity.
BMP #36	Mechanical crushing of lopped slash can only occur on 0-25 percent slopes.	To incorporate slash into the soil to promote long-term soil productivity.

BMP #	Mitigation	Objective
BMP #38	Identify landings, staging area for heavy equipment and sites for any in woods processing sites outside of filter strips and meadows. Sites will be rehabilitated after use by methods such as, but not limited to: 1) ripping to remove compaction, 2) seeding with certified weed free native seed to 5 lbs per acre. Potential vegetation for individual sites should utilize the Kaibab and Coconino National Forest Terrestrial Ecosystem Survey to identify species to be utilized; and, 3) spreading of slash to disguise the site and provide for a mulch for seeds.	To minimize and mitigate impacts from activities that compact sites and to restore long-term soil productivity and to minimize impacts on severe erosion soils.
BMP #39	Within the pinyon-juniper cover type, snags would be managed for 1 per acre over 75 percent of the area and coarse woody debris (CWD) would be managed for an after treatment average of 1 to 3 tons per acre. Where available, a portion of the CWD would include two logs ≥ 10 inches and ≥ 10 feet in length (Huffman per. Com from Brewer, 2008).	To promote long-term soil productivity.
BMP #40	Provide soil and site protection on newly disturbed soils located on temporary roads on soils with severe erosion hazard as needed. Avoid locating temporary roads on soils with severe erosion hazard. Where unavoidable, provide soil protection through implementation of any of the following methods to control sediment and protect water quality. Methods may include, but are not limited to: wattling, hydromulching, straw or woodshred mulching, spread slash, erosion mats, terraces, blankets, mats, silt fences, riprapping, tackifiers, soil seals, seeding and side drains, and appropriately spaced water bars or water spreading drainage features. Temporary roads will be decommissioned and footprint obliterated and protected with any of the above methods after treatments are finished.	To protect long-term soil productivity and water quality
BMP #	Mitigation	Why
BMP's Common To Slide Fire Area		
BMP #XX	Defer mechanical thinning and prescribed fire activities within the Slide Fire perimeter until 5 years after the signed decision, at the earliest.	To minimize impacts to the water quality of West Fork of Oak Creek and Oak Creek (Arizona Unique Water) from sediment. The BMP will allow for adequate post-fire recovery of soil and vegetation resources and minimize the cumulative effects from the fire.
BMP #xx	Defer mechanical thinning and prescribed fire activities within the Slide Fire perimeter until adequate vegetative ground cover (plant litter, duff and basal area) is present (minimum of about 60% in ponderosa pine vegetation types) to filter and reduce sediment delivery into streamcourse.	To minimize impacts to the water quality of West Fork of Oak Creek and Oak Creek (Arizona Unique Water) from sediment. The BMP will assure streamside management zone is capable of filtering into

BMP #	Mitigation	Objective
		connected perennial waters downstream.

Desired Conditions

- Long-term soil productivity is protected by maintaining or improving soil condition and function.
- Soil condition and function is maintained or improved toward satisfactory.
- The vegetative ground cover is adequate to protect against accelerated erosion resulting in maintained soil stability, soil and vegetative productivity. Soil loss is below tolerance, and no visible signs of excessive erosion are present.
 - Surface soil hydrologic soil function is in satisfactory condition with well aggregated, granular surface soil structure and tubular pores with sufficient porosity to effectively infiltrate water.
- Soil nutrient cycling is in satisfactory condition. Vegetative ground cover, plant basal area, species composition and forage productivity and herbaceous understory approaches natural conditions in PPC.
- Forests are restored at the landscape-scale that will provide for sustainable, forest health, wildlife and plant diversity while at the same time maintain and improve long-term soil productivity. The resultant forests are fire-adapted with the majority of fires occurring as surface fires at low fire severity to watershed.

Comparison of Alternatives and Summary of Environmental Effects

This section provides a tabular and narrative summary and comparison of the predicted environmental effects to soils (soil disturbance and erosion above tolerable soil loss) of implementing each alternative in the treatment area (approximately 585,000 acres depending on alternative). All treatment acres are approximate. Total treatment acres in other specialist reports may be slightly different depending on GIS processing but are within about 200 acres or .03 percent. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Past direction from FSM 2509.18-91-1 (now superceeded by FSM 2550) suggested 15% as a threshold where soil productivity may be appreciably reduced. Current direction (FSM 2550) recommends the soil quality standard or threshold be set by the Interdisciplinary Team and the technical reference Soil Disturbance Field Guide (August, 2009) recognizes the importance the extent of soil disturbance has on soil productivity.

Based on past and current FSM direction, Elliot, personal communication 2014) and (Bolton and Ward, 1991) as well as the Soil Disturbance Protocol technical reference and observations made in recent hazardous fuel reduction projects, the 4-FRI IDT determined that the 15% guideline is an appropriate threshold where soil disturbance at or below will likely maintain soil productivity. Previous observations and BMP monitoring indicate that the extent of soil disturbance less than about 15% adequately protects soil productivity. Evidence of onsite accelerated erosion has not been observed to be present in the form of rills and gullies and any soil compaction did not contribute to accelerated erosion when minor in extent (less than about 15%). (Elliot, personal communication 2014) and (Bolton and Ward, 1991) states that as long as vegetative ground cover is greater than about 60%, erosion is minimized, accelerated erosion does not occur and soil productivity is maintained. Therefore, soil disturbance less than about 40% and 4FRI conservative threshold of about 15% should adequately protect soil from accelerated erosion and soil loss. In addition, within about 2 years following treatment, areas of soil disturbance routinely appear to be newly covered with pine leaf duff preventing accelerated erosion and runoff in the short-term. Also, implementation of soil and water BMPs adequately protected the soil from accelerated erosion and runoff that could affect water quality. Total treatment acres are about 583,000 acres for Alt. B, 586,000 for Alt. C and 563,000 for Alt. D and 581,000 for Alt. E.

Soil Disturbance by Alternative

Table 3. Comparison of Alternatives and Soil Disturbance Effects to Soil and Water Resources, Proposed Treatment Areas, 4-FRI

	Alt. A Acres	Alt. A % of Trt Area	Alt. A % of Wshd	Alt. B Acres	Alt. B % of Trt Area	Alt. B % of Wshd	Alt. C Acres	Alt. C % of Trt Area	Alt. C % of Wshd	Alt. D Acres	Alt. D % of Trt Area	Alt. D % of Wshd	Alt. E Acres	Alt. E % of Trt Area	Alt. E % of Wshd
Soil Disturbance from Mechanical Activities (Average)	0 acres proposed	0	0	54,488	9.3	2.7	59,647	10.2	2.9	54,368	9.6	2.7	52,361	9.1	2.6
Soil Disturbance form Potential High Severity Burns	0 acres proposed	0 but potentially 33% w/o treatment	0%	11,667	2.0	.6	11,724	2.0	.6	3,569	.6	.2	11,620	2.0	.6
TOTAL Average SOIL DISTURBANCE (High severity burns and mechanical).	0 acres proposed	0 %	0	66,155	11.3	3.3	71,371	12.2	3.5	57,937	10.3	2.9	64,252	11.1	3.2

Table 4. Range in Percent of Mechanical and High Severity Fire Disturbance by Treatment Area and 6th HUC Watershed

	Alt. A % of Trt Area	Alt. A % of Wshd	Alt. B % of Trt Area	Alt. B % of Wshd	Alt. C % of Trt Area	Alt. C % of Wshd	Alt. D % of Trt Area	Alt. D % of Wshd	Alt. E % of Trt Area	Alt. E % of Wshd
Soil Disturbance from Mechanical Activities & High Severity Fire	0 but potentially 33%	0 but potentially .1-31.2%	2.1-18.3%	0.1-11.3%	2.5-19.2%	.1-11.5%	2.1-16.3%	0.1-9.7%	2.3-18.4%	.1-10.8%

Note: Percents are approximate

Table 3 shows average total maximum soil disturbance within 6th HUC watersheds ranges from 2.9% to 3.5% and 10.3% to 11.3% within treatments areas. Based on averages within all connected watersheds and treatment areas, soil disturbance is minimal, less than 15%, short-term (less than about 2 years) and expected to maintain long-term soil productivity.

Average soil disturbance from mechanical and prescribed fire treatments at the watershed level would be less than 4% and less than 12.5 % at the treatment level which is much less than the established soil productivity threshold of 15% .Therefore, implementation of alternatives B through E should maintain long-term soil productivity.

Across all action alternatives, total maximum soil disturbance at the 6th HUC watershed scale range from .1% to 11.5% and within treatment areas range from 2.1% to 19.2% (table 4). Total maximum soil disturbance by any individual treatment type within treatment areas across all action alternatives ranges from less than .1% to 9.7 % with high intensity thinning causing the highest soil disturbance (Attachment #1 and calculations of soil disturbance and end note).

All predicted soil disturbance is less than 20%. The amount that is greater than 15% is minor in extent. All remaining soil disturbance is predicted to be well below the 15% soil disturbance threshold. Furthermore, soil disturbance would be short term (less than bout 2 years) since pine needle duff is expected to fall and remaining vegetative ground cover woody is expected to adequately cover the bare soil and prevent accelerated erosion thereby maintaining soil productivity.

Alternative A proposes no 4FRI treatments but on-going treatments (per implementation of forest plans) would continue. Mechanical and prescribed fire treatment acreage would be much less than all other alternatives so soil disturbance would be less than all other alternatives.

However, treating far fewer acres (table 6 and 7) compared to all other alternatives would result in much more detrimental soil disturbance (up to 33% of untreated acres) from effects of uncharacteristic wildfire previously described. Where ongoing acres are treated, soil condition, soil productivity, soil and watershed function would improve but acres treated would be far less than all other alternatives so landscape-wide, implementation of Alternative A is the least effective alternative at improving and protecting soil productivity and watershed function within the 4FRI project area.

No watersheds would have soil disturbance above 11.5 percent which is 3.5 percent below the 15 percent threshold and therefore, soil productivity should be maintained at the watershed level.

Alternatives B, C, D and E (attachment #1) have a few treatment areas in watersheds where soil disturbance would be above 15 percent but less than 20 percent located in some of the following watersheds (depending on alternative), Government Canyon, Juan Tank Canyon, Curley Wallace Tank, Sinclair Wash, Yeager Draw, Big Springs, Fry Canyon, Volunteer Wash, Walnut Creek-Upper or Lower Lake Mary, Government Prairie, Sawmill tank, and Telephone Tank. Most of these watersheds have few acres proposed for treatment and therefore are not expected to pose a risk to overall soil productivity at the treatment level. Implementation of identified soil and water resource mitigation measures and BMPs are expected to minimize soil erosion and maintain soil productivity and water quality.

Potential Soil Erosion by Alternative

Another unit of measure is percent of treatment area with potential soil erosion above threshold or tolerable levels.

Table 5. Treatment Area Potential Percent Soil Erosion Above Tolerable Soil Loss Threshold

Indicator	Alternative A Percent of Treatment Area	Alternatives B-E Percent of Treatment Area
Potential soil erosion above tolerable levels when 33 percent of soils is severely burned	9	Up to 2 (post-treatment)
Potential soil erosion above tolerable levels when all (100 percent) of soils are severely burned	24	Up to 2 (post-treatment)
Soil erosion above tolerable levels from mechanical activities	0	0

Table 5 shows left untreated (alternative A), about 9% of the treatment area would erode above tolerable soil loss thresholds at 33% high severity or 24% at 100% high severity posing substantial risk to soil productivity. Proposed treatments (B-E) would result in only about 2% soil loss above soil loss tolerance thresholds protecting soil productivity and water quality. See attachment #2 for calculations.

A detailed effects analysis is found and summarized by alternative in this report and also found in the section entitled comparison of alternatives at the end of the effects analysis. Below is a summary of key findings of environmental effects to soils.

Comparison of Effects to Soil Productivity and Watershed Function

Table 6. Comparison of Effects to Soil Productivity by Alternative

Soil Condition and Productivity	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres Treated for Improvement, Maintenance and Protection of Soil Condition and Productivity (Mechanical and Prescribed Fire)	0 acres from 4FRI proposals. On-going treatments would continue. About 166,897 mechanical and about 195,076 prescribed fire (from ongoing treatments)	583,330 (fire) 384,966 (mechanical)	586,110 (fire) 431,049 (mechanical)	178,441 (fire) 384,996 (mechanical)	581,020 (fire) 403,218 (mechanical)
Overall change (Improvement, Maintenance and Protection) of Soil Condition, Function and Productivity	No improvement from 4FRI proposals. On-going treatments would continue and would improve or protect soil productivity in those areas treated but less than all other action	Would improve, maintain and protect soil productivity better than D, a little better than E but not as well as C respectively. Thinning stands combined with prescribed and maintenance burning would increase herbaceous understory productivity and improve soil productivity on about 385,000 acres. Burn only on about 198,330 acres would decrease wildfire threat and improve soil	Would improve, maintain and protect much better than D and slightly better than B and E because it restores more grasslands and savannas. Thinning stands combined with prescribed and maintenance burning would increase herbaceous understory and improve soil productivity on about 431,049 acres. Burn only on about 155,100 acres would decrease wildfire	Less than B, C and E. Thinning stands would increase herbaceous understory and improve soil productivity on about 385,000 acres. However, not prescribed or maintenance burning would put soil productivity at risk of possible high burn severity on about 25% of those treated acres or 97,125 acres (Lata, 2014) on acres subject to high severity surface fire effects Burn only with maintenance burning on about 178,441 acres with the thinning acres not subject to high severity wildfire would	Would improve, maintain and protect soil productivity better than D but a little less than B and C. Thinning stands combined with prescribed and maintenance burning would increase herbaceous understory and improve soil productivity on about 403,200 acres. Burn only on about 177,800 acres would decrease wildfire threat and improve soil condition and protect productivity in the long-term. However, not treating diameters in the 9-16 inch class would not allow for improved soil nutrient cycling and may put those areas at higher risk of uncharacteristic wildfire posing risk to soil condition and productivity. Overall, soil productivity

	alternatives.	condition and protect productivity on about 583,330 acres in the long term.	threat and improve soil condition and protect productivity on about 586,110 acres in the long-term.	decrease wildfire threat and improve soil condition and protect soil productivity.	would improve better than D but not as much as B and C respectively.

Summary Finding: Overall implementation of Alternative C would protect and improve soil productivity much better than Alternative D and a little better than Alternatives E, B. Implementation of Alternative A would not improve or maintain soil productivity except in those minimal acres from on-going treatments.

Table 7. Comparison of Effects to Watershed Function by Alternative

Watershed Condition Indicator and Treatment Improving and Maintaining Watershed Function	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Restoration treatment acres resulting in improvement, protection and maintenance of soil condition and productivity	0 acres from 4FRI proposals About 166,897 (mechanical) and 195,076 (prescribed fire) from ongoing treatments	583,330 (fire) 384,966 (mechanical)	586,110 (fire) 431,049 (mechanical)	178,441 (fire) 384,996 (mechanical)	581,020 (fire) 403,218 (mechanical)
Potential for High Severity Burns	200,000 acres or 34%	23,000-41,000 acres or 4-7%	Same as B	23,000-41,000 acres or 4-7% in crown fire in short-term with surface fire intensity similar to A on about 25% of mechanical treatment acres and 50% in VCC 3 in long-term (2050). .50% revert to	Same as B

				FRCC 3 in long-term (2050)	
Ephemeral Stream Restoration (miles)	0	39 miles. Of which 19 miles are in functioning at risk watersheds, 11 miles are in functioning proper watersheds and 9 miles are in impaired function watersheds	Same as B	Same as B	Same as B
Existing & unauthorized road and route decommission and road reconstruction or relocation (miles)	0	About 860 miles plus 40 miles for reconstruction or relocation of which about 500 miles are in functioning at risk watersheds, 180 miles are in functioning proper watersheds and 220 miles are in impaired function watersheds.	Same as B	Same as B	
Springs and Seeps Restored (Number)	0	74	Same as B	Same as B	Same as B
Overall Change (Improvement & Maintenance) in Watershed Function	None from proposal but some improvement in ongoing areas treated but much less than all other alternatives. Continue to have	Would greatly improve and maintain watershed function. Moves toward improved watershed function through a positive change in fuels reduction and improved soil productivity on 23% of the functioning at risk (or about ¼ of the 58% that are currently functioning at risk) and 42% (i.e., almost half) of impaired watersheds would improve.	Same as Alternative B. Roads, springs and stream channels are the same as Alt B.	Would improve in short-term but not be maintained in long-term. Moves toward improved watershed function through a positive change in fuels reduction and improved soil productivity on 18% of the functioning at risk and 34% of the impaired	Same as B.

	high amounts of and the most functioning at risk and impaired watersheds compared to all other alternatives	Reduces open road density by about 500 miles are in functioning at risk watersheds, and 220 miles are in impaired function watersheds. Stream channel treatments improve water flow regime on 19 miles of functioning at risk and 9 miles in impaired watersheds.		watersheds. Overall watershed improvement not as extensive as B and C. Roads, springs and stream channels are the same as Alt B.	

Summary Finding:

Overall, implementation of the proposed action is expected to maintain, improve and protect long-term soil productivity, and watershed function much better than Alternatives A and D, a little better than E but not as well as C. Implementation of Alternative C would probably better restore grasslands than other action alternatives and still has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level. Implementation of Alternatives B, C and E would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.

Overall Alternative C, B and E would improve and maintain watershed condition and function a little better than Alternative D and much better than Alternative A. Implementation of Alternative A would not improve or maintain soil productivity except in those minimal acres from on-going treatments not proposed in 4FRI but implemented through the forest plans.

Overall Comparison Summary

- Short-term impacts from soil disturbances would range from 2.9 percent (lowest in alternative D) to 3.5 percent (highest in alternative C). All action alternatives provide long term soil improvement and protection of soil productivity and watershed function to varying degrees. Overall, implementation of the proposed action (alternative B) is expected to maintain, improve and protect long-term soil productivity and watershed function much better than alternative A, a little better than D and about the same as alternative C. Implementation of Alternatives B and C is expected to maintain, improve and protect long-term soil productivity and watershed function better than D because the vast majority of D does not follow mechanical treatments with prescribed fire necessary to maintain soil productivity and watershed function processes. The absence of prescribed fire following mechanical treatments increases the risk of uncharacteristic fire that could result in areas of high burn severity which leads to accelerated erosion, runoff and sediment delivery into connected streamcourses following storm events. Implementation of alternative C is likely to better restore grasslands than alternative B. Implementation of alternatives B and C would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.
- In alternatives B-E no watershed would have soil disturbance above 11.5 percent (3.5 percent below the 15 percent threshold). Soil productivity and watershed function should be maintained. In alternative A, soil disturbance could range from 0 to 33 percent due to unmitigated fire risk.
- With implementation of identified soil and water BMPs, ADEQ water quality standards would be met.
- Slopes over 15 percent subject to high burn severity could result in accelerated soil loss where erosion rates are higher than tolerable soil loss posing risk to soil productivity. Erosion exceeds tolerable soil loss rates where soils have been exposed to high burn severity predominantly in wildfires on slopes greater than 15 percent posing risk to soil productivity and sediment delivery to connected streamcourses. The highest amounts of high burn severity (predicted up to 33%) are more likely to occur where forests are untreated (Alternative A) than all action alternatives. There would be potential for high burn severity across more acres in alternative D than the other action alternatives because of the continuing accumulation of surface fuels (Lata, 2014).

Key Finding

Implementation of 4FRI Alternative A would not meet the projects purpose and need to improve and protect soil condition, productivity and watershed function nor move towards the desired condition of having a resilient forest by reducing the potential for undesirable fire behavior and its effects and maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire except in those minimal acres treated (tables 6 and 7) from on-going projects, Alternative A would not increase forest resiliency to natural disturbances and would not improve or protect soil condition and soil productivity or watershed function as well as all other action alternatives. Implementation of Alternative A would put soils and watersheds at risk of continued uncharacteristic wildfires that

could result in loss of soil productivity and sediment delivery to connected streamcourses.

Alternative A proposes no 4FRI treatments but on-going treatments (per implementation of forest plans) would continue. Mechanical and prescribed fire treatment acreage would be less than all other alternatives so soil disturbance would be less than all other alternatives.

However, treating far fewer acres (table 6 and 7) compared to all other alternatives would result in much more detrimental soil disturbance (up to 33% of untreated acres) from effects of uncharacteristic wildfire previously described. Where ongoing acres are treated, soil condition, soil productivity, soil and watershed function would improve but acres treated would be far less than all other alternatives so landscape-wide, implementation of Alternative A is the least effective alternative at improving and protecting soil productivity and watershed function within the 4FRI project area.

Key Finding

Implementation of Alternative D does not fully meet the projects purpose and need as well as other action alternatives but would come closer than Alternative A.

Key Finding

Implementation of Alternatives B, C and E meet the projects purpose and need and meet the Kaibab and Coconino national forest plan standards and guidelines. Implementation of Alternative D would meet the forest plans standards and guidelines but not fully meet the purpose and need of this project.

Overall, implementation of the proposed action is expected to maintain, improve and protect long-term soil productivity, and watershed function much better than Alternatives A and D, a little better than E but not as well as C. Implementation of Alternative C would probably better restore grasslands than other action alternatives and still has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level. Implementation of Alternatives B, C and E would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.

Coconino and Kaibab National Forest Land Management Plan Direction

Tables 8 through 12 summarize the management direction and the standards and guidelines for soil and water resources in the Coconino (USDA 1987) and Kaibab (USDA 2014) National Forest Plan. Acres are approximate.

Table 8. Summary of Management Areas in the project area from the 1987 Coconino National Forest Plan as amended

Management Area (MA)	Coconino NF Forest Plan (FP) Management Emphasis
3	Emphasize a combination of multiple-uses including a sustained-yield of timber and firewood production, wildlife habitat, livestock grazing, high quality water, and dispersed recreation. FP amendment 11, replacement p. 117
4	Emphasize wildlife habitat, watershed condition, and dispersed recreation. Management intensity is low. FP Errata #1 1/2008, replacement p. 139
6	Emphasize a combination of wildlife habitat, watershed condition, and livestock grazing. Other resources are managed in harmony with the emphasized resources. FP amendment 12, replacement p. 145
7	Emphasize firewood production, watershed condition, wildlife habitat, and livestock grazing. FP, Errata #1 1/2008, replacement p. 156
8	Emphasize wildlife habitat, watershed condition, and dispersed recreation. FP, Errata #1 1/2008, replacement p. 148
9	Emphasize livestock grazing, visual quality, and wildlife habitat. Other resources are managed in harmony with emphasized resources. The smaller mountain meadows in remote areas are managed mostly for wildlife habitat, especially for elk summer range. FP, Errata #1 1/2008, replacement p. 158
10	Emphasize range management, watershed condition, and wildlife habitat. Other resources are managed to improve outputs and quality. Emphasis is on prescribed burning to achieve management objectives. Walnut Canyon National Monument entrance road is within this MA. The management and use of the 1000 foot right-of-way along the entrance road is directed toward the protection and maintenance of the cultural and natural resources of the area. FP, Errata #1 1/2008, replacement p. 162
12	Emphasize wildlife habitat, visual quality, fish habitat, and watershed condition on the wetlands, riparian forest, and riparian scrub. Emphasize dispersed recreation, including wildlife and fish recreation, on the open water portion. FP, Errata #1 1/2008, replacement p. 172
35	Focus on maintenance and/or improvement of soil condition and watershed function. Degraded meadows and stream channels will be improved through a variety of management activities designed to increase herbaceous ground cover and litter and reduce soil erosion. System roads and trails will receive adequate maintenance so that accelerated soil erosion is minimal. Non-system roads will be rehabilitated and some poorly located roads will be re-located.

Management Area (MA)	Coconino NF Forest Plan (FP) Management Emphasis
	The northwestern portion of this MA is within the Urban/Rural Influence Zone. Reduce the risk of catastrophic wildfire, especially within the Urban/Rural Influence Zone. Reduce instances of illegal activities and trash dumping. Maintain scenic quality. Opportunities for firewood or other forest products are rare in the northwest portion; however, firewood sales may be used as a tool for management. In the entire MA, re-introduce fire's natural role as much as possible, and ponderosa pine lands progress towards desired forest structure, including northern goshawk and Mexican spotted owl habitats. In the lakes, maintain the variety of waterfowl, raptors, amphibians, and many different kinds of plants adapted to lake shore environments. Emphasize healthy shorelines adjacent to the water with ample ground cover, and less erosion or compaction. Turbidity is natural to these lakes. Minimize human disturbance to wildlife, where needed, during the critical times. Continue to provide general dispersed and water-based recreation opportunities. Improve wildlife viewing opportunities where wildlife viewing is compatible with wildlife habitat. FP Errata #1 – 1/2008 Replacement Page 206-97and 206-98
37	Provide Recreational Opportunities. Maintain the quality of the recreational experience throughout this MA. North and west of Walnut Canyon emphasize daytime recreation activities, primarily non-motorized. South and east of Walnut Canyon emphasize remote dispersed recreation (day and overnight) with motorized and non-motorized opportunities. Balance recreation demands with protection of the soils, water, vegetation, and sensitive species. Manage to protect the values of Walnut Canyon National Monument and complement National Park Service goals for the Monument as described in the National Park Service's General Management Plan. Maintain scenic quality. Protect the community - A small portion of this MA is within the Urban/Rural Influence Zone. Reduce the risk of catastrophic wildfire, especially within the Urban/Rural Influence Zone. Reintroduce fire's natural role as much as possible. Opportunities for firewood or other forest products are rare north and west of the Canyon, however, firewood sales may be used as a tool for management. Protect Walnut Canyon environs. Focus on maintenance and/or improvement of soil condition and watershed function. Degraded meadows and stream channels will be improved through a variety of management activities designed to increase herbaceous ground cover and litter and reduce soil erosion. System roads and trails should receive adequate maintenance so that accelerated soil erosion is minimal. Nonsystem roads

Management Area (MA)	Coconino NF Forest Plan (FP) Management Emphasis
	will be rehabilitated and some poorly located roads will be re-located. Maintain sensitive species habitat. Ponderosa pine lands progress towards desired forest structure, including Mexican spotted owl and northern goshawk habitats. Reduce instances of illegal activities and trash dumping. Emphasize the social values compatible with an urban interface that includes recognition of the area's opportunity for wildlife, recreational, and scenic values. Provide forage and security for a variety of game and non-game species of wildlife, provide conservation and environmental education opportunities, provide an area for recreational uses for the Flagstaff public, and manage a portion of the area to give a quiet, almost primitive recreation experience. FP Errata #1 – 1/2008 Replacement Page 206-107

Table 9. Summary of Coconino NF Forest Plan Standards and Guidelines for the project area

Management Area (MA)	Description	Standards and Guidelines	Forest Plan Reference Page
Forest-wide	Forest-wide	Use Best Management Practices to reduce nonpoint source pollution	Amendment 3, replacement page 71
Forest-wide	Forest-wide	Plan for appropriate filter strips adjacent to streamcourses and/or riparian areas	Amendment 3, replacement page 71
Forest-wide	Forest-wide	Designate streamcourses and riparian areas to receive protection during projects	Amendment 3, replacement page 72
Forest-wide	Forest-wide	Maintain current satisfactory watershed conditions and improve unsatisfactory conditions to satisfactory by the year 2020.	Page 74
Forest-wide	Forest-wide	Plan projects, parts of projects, and/or management practices for soil and water resources improvement where watershed condition is unsatisfactory. Incorporate plans for soil and water improvements into project planning for other resources	Amendment 3, replacement page 72
Forest-wide	Forest-wide	Inventory riparian communities and areas capable of supporting riparian species by the end of the first decade. Channel condition and aquatic habitat condition will be included in the survey. Plan and design projects in areas of unsatisfactory or degraded condition to promote channel and streambank stability and to improve flow and timing of water. Meet or exceed eighty percent of Regional requirements above the Rim and ninety percent below the Rim by 2030. Manage to achieve at least 25 percent of the currently unsatisfactory riparian areas will be in satisfactory condition by 2000.	
3	Ponderosa Pine and Mixed Conifer less than 40% slopes	Identify each terrestrial ecosystem and assess soil properties to determine:	Amendment 17, replacement page 120
6	Unproductive Timber Land	Soil limitations for soil scarification purposes. The method of soil scarification best	Forest Plan p 146

Management Area (MA)	Description	Standards and Guidelines	Forest Plan Reference Page
9	Mountain Grassland	suited for the soils of the project area. Soil potential for revegetation - Identify soils that are suitable or unsuitable for successful revegetation. Erosion hazard and on-site soil loss - Soils with a potential erosion hazard rating of severe will require specific resource management activities in order to avoid severe impairment of soil productivity.	Forest Plan p 160
3	Ponderosa Pine and Mixed Conifer less than 40% slopes	For each timber sale area, identify each terrestrial ecosystem and assess soil properties to determine: Soils with severe potential for sheet and gully erosion, such as steep slopes, cinder cones, alluvial bottoms, and swales, that require specific resource management activities in order to avoid severe impairment of soil productivity. Soil limitations for site preparation - Identify soils that present severe limitations for successful site preparation such as soils with severe erosion hazard and shallow soils. Require specific resource management activities where successful site preparation is limited by environmental factors in the terrestrial ecosystem. Soil potential for reforestation - Identify soils that are suitable or unsuitable for successful reforestation. Adjust stocking levels and require specific resource management activities where successful reforestation is limited by environmental factors in the terrestrial ecosystem. Whether soils are suitable, unsuitable, or unproductive for timber management. Soil limitations for timber harvest activities. Soils with high potential to convert to another vegetative type such as oak, locust, or juniper as a result of timber management	Amendment 1, replacement page 136

Management Area (MA)	Description	Standards and Guidelines	Forest Plan Reference Page
		activities. Modify timber management activities in these terrestrial ecosystems conversion by approved chemical or mechanical means or by prescribed fire.	
3	Ponderosa Pine and Mixed Conifer less than 40% slopes	Where open meadows in the pine/mixed conifer type are to be maintained, eliminate invading overstory vegetation, stabilize gullies to raise the water table, scarify the soil, and seed with appropriate grass and forage species. Control livestock grazing through management and/or fencing to establish the revegetation.	Amendment 17, replacement page 120
3	Ponderosa Pine and Mixed Conifer less than 40% slopes	Construct landings and decking areas outside of riparian areas.	Amendment 1, replacement page 136
3	Ponderosa Pine and Mixed Conifer less than 40% slopes	Locate or relocate roads out of riparian areas, except at designated crossings. Obliterate unnecessary roads in riparian areas.	Amendment 1, replacement page 136
e	Ponderosa Pine and Mixed Conifer less than 40% slopes	Avoid or designate stream course crossings for skid trails. Limit to the minimum needed. Choose crossings with stable conditions or stable bed and bank material such as cobble or rock.	Amendment 1, replacement page 136
3	Ponderosa Pine and Mixed Conifer less than 40% slopes	Restrict skidding and hauling to soil moisture conditions that do not cause excessive soil compaction, displacement, or puddling. Restrict timber sale activities to slopes of 25 percent or less on cinder cones under conventional skidding.	Amendment 1, replacement page 136
6	Unproductive Timber Land	During the first decade, identify each terrestrial ecosystem and assess soil properties to determine: Whether soils are suitable, unsuitable, or unproductive for timber management. Provide detailed soils input to administrative study plans for reforestation.	Forest Plan, page 146
9	Mountain Grassland	Manage mountain grasslands to achieve 90 percent of potential ground cover to prevent accelerated	Forest Plan, page 160

Management Area (MA)	Description	Standards and Guidelines	Forest Plan Reference Page
		surface erosion and gully formation. Areas that presently do not meet these standards are scarified and seeded to bring ground cover to the desired level by the second decade. Restricting livestock may be necessary until revegetation. In areas capable of supporting woody riparian species, maintain and/or improve these species to standards in the Regional Guide, August 1983. Plan and implement cost effective stream channel restoration projects to raise the water table in meadow areas where channel erosion has resulted in a lowering of the water table.	
12	Riparian and Open Water	Through coordination with other disciplines, maintain or improve, where necessary, riparian vegetation along streams for moderating water temperature and protecting bank stability. Accomplish promptly after the inventory phase is completed. Investigate and implement where necessary, cost effective structural measures to control channel erosion.	Forest Plan, page 177
12	Riparian and Open Water	Plan for suitable filter strips between streamcourses and disturbed areas and/or road locations. See Filter Strip Table in Forest-wide Standards and Guidelines under Watershed/Soil/Air, F2. Plan for suitable filter strips between stream courses and ground disturbing activities including roads.	Amendment 1, replacement page 176
12	Riparian and Open Water	No precommercial thinning or piling slash in riparian areas or areas that have riparian characteristics.	Amendment 1, replacement page 176
35	Lake Mary Watershed	This area is a high priority for fixing drainage culverts, relocating roads from meadows, and obliterating unnecessary roads so that erosion does not degrade water quality in Lake Mary.	Errata #1 – 1/2008 replacement page 206-100 and 206-101

Management Area (MA)	Description	Standards and Guidelines	Forest Plan Reference Page
		Roads, trails, camping, and grazing will be managed to improve watershed condition particularly within mountain meadows, springs, and drainages. Improve watershed conditions in Priest Draw. Cooperate with the City of Flagstaff and National Park Service to develop study proposals and projects designed to evaluate best management practices, reservoir modifications, and/or operational criteria to address the objectives of maintaining the quality of the municipal water supply and increasing the likelihood of flood flows and improvement of the inner-canyon environment in Walnut Canyon National Monument (per the Stipulation Between The City of Flagstaff and the United States on Behalf of the National Park Service and the Forest Service).	
37	Walnut Canyon	Cooperate with the City of Flagstaff and National Park Service to develop study proposals and projects designed to evaluate best management practices, reservoir modifications, and/or operational criteria to address the objectives of maintaining the quality of the municipal water supply and increasing the likelihood of flood flows and improvement of the inner-canyon environment in Walnut Canyon National Monument (per the Stipulation Between The City of Flagstaff and the United States on Behalf of the National Park Service and the Forest Service).	Errata #1 – 1/2008 replacement page 206-111

Evaluation: All action alternatives are consistent with Coconino LRMP plan components for soils and watershed management since they include treatments aimed at maintaining soils in satisfactory condition or improving soils in unsatisfactory condition. In addition,

implementation of site-specific BMPs and SWCPs, see FEIS, Appendix C, SW 1 to SW39 would maintain or improve soil condition, long term soil productivity and watershed function. Alternative A would also be consistent with the water quality related guidelines for soils and watershed management since future projects would incorporate site-specific BMPs and SWCPs in accordance with the national best management practices for water quality management.

All action alternatives would be consistent with desired conditions for soils within the CNF portion of the project area to varying degrees. Reduced stand densities and fuel loads would decrease the risk of uncharacteristic fire which typically results in increased soil erosion and long-term loss of soil productivity. Uncharacteristic fire also typically increases soil hydrophobicity, which affects the ability of soils to infiltrate, transmit and store water. Spring and ephemeral channel restoration has the potential to restore hydric (wetland) soil conditions where the frequency or duration of surface inundation or saturation is increased. Improved vegetative ground cover in treated areas would also contribute to improved soil porosity, aggregate stability, organic matter content, nutrient cycling, and carbon sequestration. Decommissioning of roads within the project area would improve soils on these sites. Installation of protective aspen fences would exclude domestic livestock and wildlife ungulates from aspen stands, thereby improving soil conditions in protected areas. Implementation of BMPs and SWCPs as described in Table 2 would minimize or mitigate potential adverse effects of treatment activities on soil productivity.

While alternative A and D would generally be consistent with desired conditions for soils as described above, as previously noted, risk of uncharacteristic high-severity wildfire would remain in many areas since forest restoration treatments would not be implemented at the same scale as proposed under the action alternatives (B and C). In the absence of restoration treatments (A) vegetative ground cover in dense ponderosa stands would not improve, but remain static. Additionally, soils conditions would not be improved in areas where springs restoration, ephemeral channel restoration, road decommissioning, and aspen fencing are proposed. Soils conditions would likely remain static or could trend downward over time. Where soil erosion is not minimized (e.g., ephemeral channels that exhibit downcutting, incision, or aggradation), Alternative A would not be consistent with desired conditions for soils. The absence of prescribed fire in most portions of Alternative D would elevate the risk of uncharacteristic wildfire that could lead to large areas of high burn severity.

Management direction in the Revised Kaibab National Forest Plan (USDA, 2014) that affect soils and watershed resources are located below in table 10 and narrative.

Table 10. Summary of Management Areas, Description, Plan Emphasis, Acres Proposed For Treatments in Kaibab NF Revised Plan

Forest Plan Management Areas (MA) within the Project Area*	Description	Forest Plan Emphasis	Forestwide MA Acres	MA Acres within Project Area	Acres/Percent (%) of Forestwide MA Proposed for Treatment*
Kaibab National Forest					
Kendrick Mountain Wilderness	Designated Wilderness	Manage for natural processes	6,660	6,660	0/0
Arizona Bugbane Botanical Area	Designated Area	AZ bugbane habitat protection	490	490	0/0
Wildland Urban Interface (WUI)	Areas surrounding human development	Wildland fires are low intensity surface fires	389,720	117,272	60,273/51
Grand Canyon Game Preserve	Game preserve	Range of habitats and desired nonnative wildlife species, including predators	612,736	2,395	2,395/<1
Developed Recreation Sites	Recreation sites, trailheads,	Developed Recreation	1,556	1,556	1,556/100
Bill Williams Mountain	Multiple uses	High natural, cultural and economic value	17,745	17,745	20/<1
Garland Prairie	Former proposed research natural area	serves as reference for study of ecological changes	340	340	340/100
Arizona National Scenic Trail	Non-motorized scenic trail		90 Miles	19 miles	19 miles/21

***Acres are approximate**

Summary of the Management Direction (Desired Conditions, Standards, Guidelines and Objectives and Approaches) and Consistency with Forest Plan for Soil and Water Resources from the Kaibab National Forest Revised Plan for the Project Area

The Revised Kaibab National Forest Land and Resource Management Plan became effective on April 6, 2014 (USDA 2014). It is therefore necessary to ensure that the proposed project is consistent with and conforms to the requirements of the Revised Plan, which includes desired conditions and management approaches for soils and watersheds including riparian areas. This section therefore addresses consistency with the Revised Kaibab National Forest Land and Resource Management Plan.

Soils and Watershed

Desired Conditions for Soils (LRMP For the Kaibab NF, pp. 43-45)

- Soils provide for diverse native plant species. Vegetative ground cover is well distributed across the soil surface to promote nutrient cycling and water infiltration.
- Accelerated soil loss is minimal, especially on sensitive or highly erodible sites.
- Soils can readily absorb, store, and transmit water vertically and horizontally; accept, hold, and release nutrients; and resist erosion.
- Infiltration rates are good in TES soil units that are described as well drained and moderately well drained.
- Logs and other woody materials are distributed across the surface to maintain soil productivity.
- Biological soil crusts (mosses, lichens, algae, liverworts) are stable or increasing in semi-desert grasslands, desert, pinyon-juniper, and sagebrush communities.
- Soils are free from anthropogenic contaminants that could alter ecosystem integrity or affect public health

DC for Ponderosa Pine (Fine-scale)

- Organic ground cover and herbaceous vegetation provide protection for soil and moisture infiltration, and contribute to plant and animal diversity and ecosystem function. Herbaceous vegetation reflects the site potential.

DC for Frequent Fire Mixed Conifer (Fine-scale)

- Organic ground cover and herbaceous vegetation provide protection for soil and moisture infiltration, and contribute to plant and animal diversity and ecosystem function. Herbaceous vegetation reflects the site potential.

Soil Specific Desired Conditions for Wetlands/Cienegas and Springs

Soil Specific Desired Conditions for Cottonwood-Willow Riparian Forest

- Water flow regime approximates reference conditions (i.e., perennial flows) and flows freely. Sedimentation is minimized. Springtime flooding contributes to ecosystem sustainability by optimizing germination conditions for seedlings and/or suckering opportunities from the parent plant.
- Native vegetation dominates, but when nonnative vegetation is present, the spatial and structural

- composition contributes to overall faunal diversity.
- Grazing from domestic ungulates is minimal or absent.
- Soil is free from compaction and includes sand and gravelly reaches and provides suitable germination sites for desirable plant species.
- Sandy and vegetated terraces provide habitat for reptiles and amphibians.
- Fire is limited or absent in this system.

Guidelines For Soils and Watershed Management

- Projects should incorporate the national best management practices for water quality management and include design features to protect and improve watershed condition.
- In disturbed areas, erosion control measures should be implemented to improve soil conditions.

Objectives –Major Vegetation Community Types, Nonnative Invasive Species

Major Vegetation Community Types:

- Pinyon-Juniper Grasslands – no objectives exist
- Ponderosa Pine: (1) Mechanically thin 11,000 to 19,000 acres annually, (2) Treat an average of 13,00 to 55,000 acres annually, using a combination of prescribed fire and naturally ignited wildfires.
- Aspen (component of other forested communities): On Williams and Tusayan District: (1) Fence 200 acres of aspen within 10 years of Plan approval to exclude ungulates; (2) Reduce conifer encroachment on 800 acres of aspen within 10 years of Plan approval
- Grassland Communities: (1) Reduce tree density to less than 10 percent on 5,000 to 10,000 acres of historic grasslands annually, (2) Modify fences and/or install crossings to facilitate pronghorn movement on 50 miles of fence within 10 years of plan approval.
- Montane/Subalpine Grasslands – no objectives exist
- Colorado Plateau/Great Basin Grasslands – no objectives exist

Non Native Invasive Species – (1) Treat 2,000 to 3,000 acres invaded by nonnative invasive plants annually

Non Native Invasive Species – (1) Treat 2,000 to 3,000 acres invaded by nonnative invasive plants annually - see botany evaluation

Consistency with Management Approach: The project would reduce stand densities and fuel loads and decrease the risk of uncharacteristic fire which typically results in increased soil erosion and long-term loss of soil productivity. The project occurs within two of the six priority watersheds identified for restoration on the Kaibab NF: Cataract Creek Headwaters, Upper Hell Canyon (MacDonald? 2014, table 3).

Evaluation:

Under the revised Kaibab National Forest plan, all Action Alternatives would be consistent with desired conditions for soils and watershed management within the KNF portion of the project area. All action alternatives are consistent with revised LRMP guidelines for soils since they include implementation of site-specific BMPs and SWCPs, see FEIS, Appendix C, SW 1 to SW39. Alternative A would also be consistent with the guidelines for soils and watershed

management since future projects would incorporate site-specific BMPs and SWCPs in accordance with the national best management practices for water quality management.

Proposed treatments would reduce tree stand densities and fuel loads would decrease the risk of uncharacteristic fire which typically results in large areas of high burn severity, increased soil erosion, short and long-term loss of soil productivity, and high amounts of sediment delivery into connected streamcourses. Uncharacteristic fire also typically increases soil hydrophobicity, which affects the ability of soils to infiltrate, transmit and store water. Spring and ephemeral channel restoration has the potential to restore hydric (wetland) soil conditions where the frequency or duration of surface inundation or saturation is increased. Improved vegetative ground cover in treated areas would also contribute to improved soil porosity, aggregate stability, organic matter content, nutrient cycling, carbon sequestration and organic ground cover and herbaceous vegetation important for soil protection. Decommissioning including temporary roads and relocation of roads within the project area would improve and protect soils and soil productivity on these sites. Installation of protective aspen fences would exclude domestic livestock and wildlife ungulates from aspen stands, thereby improving soil conditions in protected areas. Implementation of BMPs and SWCPs as described in Table 1 would minimize or mitigate potential adverse effects of treatment activities on soil productivity.

While Alternative A would generally be consistent with desired conditions for soils as described above, as previously noted, risk of uncharacteristic high-severity wildfire would remain in many areas since forest restoration treatments would not be implemented at the same scale as proposed under the Action Alternatives with consequences described above. In the absence of restoration treatments, herbaceous vegetation composition and productivity in dense ponderosa stands would not improve, but remain static and soil nutrient cycling function would continue to decline. Additionally, soil conditions would not be improved in areas where springs restoration, ephemeral channel restoration, road decommissioning, and aspen fencing are proposed. Soil conditions and productivity would likely remain static or could trend downward over time. Where soil erosion is not minimized (e.g., ephemeral channels that exhibit downcutting, incision, or aggradation), Alternative A would not be consistent with desired conditions for soils. All Action Alternatives include restoration of 74 springs and up to 39 miles of ephemeral channels within the project area, which is consistent with desired conditions for soils and wetlands as outlined in the Revised LRMP. Exclosure fences, where warranted, would prevent adverse effects of human activities and vertebrate herbivores (including domestic livestock); such adverse effects include soil disturbance and compaction, riparian vegetation trampling and removal, and defecation near spring sources, etc.). Implementation of BMPs and SWCPs as outlined would minimize and mitigate potential adverse effects to soil productivity and water quality from proposed restoration activities.

Alternative A would also be consistent with desired conditions for cottonwood-willow riparian forests on the KNF.

All Action Alternatives include restoration activities designed to achieve desired conditions for cottonwood-willow riparian forest. However, in the absence of fuels reduction treatments and reintroduction of low- to moderate-severity prescribed fire (A and D), there is an increased risk of uncharacteristic fire behavior in upland areas adjacent to this forest vegetation type. If a high-severity wildfire were to occur in areas adjacent to cottonwood-willow riparian forests, accelerated erosion, loss of soil productivity and high amounts of sediment delivery to connected waters could occur. There would also be increased risk of uncharacteristic fire entering

cottonwood-willow riparian areas, which could cause considerable damage to this ecologically important vegetation type.

In addition to spring and ephemeral channel restoration, relocation of approximately 10 miles of roads out of stream bottoms would have potential to improve cottonwood-willow riparian forest conditions by eliminating soil compaction resulting from road use in stream bottoms. Thinning of adjacent stands of dense ponderosa pine would reduce high fuel loads and would protect cottonwood-willow riparian forests from uncharacteristic fire behavior that could lead to high burn severity, accelerated erosion and loss of soil productivity.

Additionally, proposed watershed research included in Alternative C and E would inform future management toward achieving desired conditions for soils and wetlands within the KNF portion of the project area.

Alternative A would not contribute to desired conditions for soils, wetlands and springs within the KNF portion of the project area as it does not include restoration of native vegetation and natural water flow patterns on at least 6 acres of wetlands within 5 years of plan approval as outlined in the objectives for wetlands/cienegas.

Desired Conditions for Watershed (LRMP For the Kaibab NF, pp. 43-45)

- Vegetation conditions within watersheds contribute to downstream water quality and quantity. Surface runoff, sheet, rill, and gully erosion, and subsequent sedimentation into connecting waters downstream is minimal.
- Flooding maintains normal stream characteristics (e.g., water transport, sediment, woody material) and dimensions (e.g., bankfull width, depth, slope, and sinuosity). Vertical down cutting and embeddedness are absent in drainages.
- Flood plains are functioning and lessen the impacts of floods on human safety, health, and welfare.
- The fuels composition within watersheds does not put the watersheds at risk for uncharacteristic disturbance.
- Water quality meets or surpasses State of Arizona or Environmental Protection Agency water quality standards for designated uses. Water quality meets critical needs of aquatic species.

All action alternatives are consistent with revised LRMP guidelines for watershed management since they include implementation of site-specific BMPs and SWCPs, see FEIS, Appendix C, SW 1 to SW39. Alternative A would also be consistent with the guidelines for soils and watershed management since future projects would incorporate site-specific BMPs and SWCPs in accordance with the national best management practices for water quality management.

Wetlands/Cienegas

Land and Resource Management Plan for the Kaibab National Forest (USDA 2014):

Desired Conditions for Wetlands/Cienegas (LRMP for the Kaibab NF, p. 41)

- Wetland conditions are consistent with their flood regime and flood potential.
- Native plant and animal species that require wetland habitats have healthy populations within

the natural constraints of the particular wetland community.

- Wetlands infiltrate water, recycle nutrients, resist erosion, and function properly.

Objectives for Wetlands/Cienegas (LRMP for the Kaibab NF, p. 41)

- Restore native vegetation and natural water flow patterns on at least 6 acres of wetlands within 5 years of plan approval.
- Note: There are no standards and guidelines for Wetlands/Cienegas

Evaluation: All Action Alternatives (B-E) include restoration of 74 springs and up to 39 miles of ephemeral channels within the project area, which is consistent with desired conditions for soils and wetlands as outlined in the Revised LRMP. Springs restoration treatments have potential to improve springs discharges and seasonal wetland distribution and extent. At a minimum, removal of dysfunctional spring infrastructure would naturalize spring conditions. Thinning of dense forest vegetation and reintroduction of low- to moderate-intensity fire has the potential to increase snowpack retention, runoff, surface water storage, and groundwater recharge rates, assuming adequate precipitation and infiltration. Exclosure fences, where warranted, would prevent adverse effects of human activities and vertebrate herbivores (including domestic livestock); such adverse effects include soil disturbance and compaction, riparian vegetation trampling and removal, and defecation near spring sources, etc.). Implementation of BMPs and SWCPs as outlined in Table 1 of the water specialist report and table 2 of the soil specialist report would minimize and mitigate potential adverse effects to water quality and riparian area from proposed restoration activities. Additionally, proposed watershed research included in Alternative C would inform future management toward achieving desired conditions for wetlands within the KNF portion of the project area.

Alternative A would not contribute to desired conditions for wetlands within the KNF portion of the project area as it does not include restoration of native vegetation and natural water flow patterns on at least 6 acres of wetlands within 5 years of plan approval as outlined in the objectives for wetlands/cienegas.

Natural Waters

Desired Conditions

- Springs, streams, and ponds have appropriate plant cover to protect banks and shorelines from excessive erosion.
- Stream channel stability and aquatic habitats retain their inherent resilience to disturbances and climate fluctuations. Stream channel morphology reflects changes in the hydrological balance, runoff, and sediment supply appropriate to the landscape setting.
- Springs and ponds have the necessary soil, water, and vegetation attributes to be healthy and functioning. Water levels, flow patterns, groundwater recharge rates, and geochemistry are similar to reference conditions. Springs, streams, and ponds have appropriate plant cover to protect banks and shorelines from excessive erosion.
- Hydrophytes and emergent vegetation exist in patterns of natural abundance in wetlands and springs in levels that reflect climatic conditions. Overhanging vegetation and floating plants such as water lilies exist where they naturally occur.
- The necessary physical and biological components, including cover, forage, water, microclimate, and nesting/breeding habitat, provide habitat for a diverse community of

plant and wildlife species.

- Riparian dependent plant and animal species are self-sustaining and occur in natural patterns of abundance and distribution. Within its capability, stream flow and water quality are adequate to maintain aquatic habitat and water sources for native and desired nonnative species.⁷ Native macroinvertebrates are appropriately abundant and diverse.
- Native amphibians are free from or minimally impacted by nonnative predation and diseases.
- Unwanted nonnative species do not exert a detectable impact on aquatic and wetland ecosystems
- Where springs or other natural waters have been modified for livestock and/or human consumption, developments are operational.
- The location and status of springs and water resources are known, organized, and available.

Evaluation: All action alternatives (B-E) are consistent with desired conditions for natural waters. Springs and ephemeral channel restoration would improve soil, water and vegetation attributes in these areas. Relocation of roads that are currently in stream channels would improve the condition of stream courses. Alternative A would not be consistent with desired conditions for natural waters as ephemeral stream channels proposed for restoration would not be meeting the desired condition of stream channel stability. Springs proposed for restoration would not receive restoration treatments under this alternative. Desired conditions for springs would therefore not be achieved.

Objectives

Protect and restore at least 10 individual springs within 5 years of Plan approval.

Evaluation: All action alternatives (B-E) would be consistent with objectives for natural waters described above since all action alternatives include springs restoration. Approximately X springs would be restored on the Kaibab NF. Alternative A would not be consistent with objectives for natural waters as no springs restoration would occur under this alternative.

Guidelines for Activities In and Around Natural Waters

Access to natural waters should be restricted to designated trails and points of entry to mediate erosion and prevent trampling and inadvertent introduction of nonnative and undesirable biota and disease.

Activities in and around waters should use decontamination procedures to prevent the spread of chytrid fungus.

Fences constructed around natural waters should allow bats and other desirable wildlife to pass through unharmed.

Evaluation: All Action Alternatives would be consistent with guidelines for activities in and around natural waters. Springs restoration includes protective fencing where appropriate to control human ingress and egress and to minimize adverse effects of vertebrate herbivores. Protective exclosures around spring sources would be installed in a manner that prevents large herbivores (domestic livestock and elk) from accessing spring sources, while allowing smaller mammals and other wildlife to access spring sources unharmed (see wildlife mitigation W46 and W 47 in appendix C of the FEIS). Mitigation designed to reduce the potential for chytrid fungus applies to all action alternatives, see page X of the FEIS (need this). Alternative A would not be consistent with guidelines for activities in and around natural waters. Springs sources that are not

currently protected from human impacts and vertebrate herbivores would continue to exhibit adverse effects such as indiscriminate trampling of vegetation, soil compaction, and browsing of riparian vegetation at spring sources.

Summary of Response to Key Soil & Water DEIS Comments

Numerous 4FRI DEIS comments were received (fall, 2013) related to concerns that the proposed action might negatively affect soil productivity or water quality. A total of 8 comment letters were received including from the 4FRI Stakeholder group, Jay Lininger of the Center of Biological Diversity (CBD) (including attachment references), Gatewood Wildwood Consulting, the Grand Canyon Trust, NAU, Arizona State Forestry, Dick Artley (including opposing views) and a combined response from 5 Conservation Organizations including the CBD, Sierra Club, Grand Canyon Wildlands Council, Great Old Broads for Wilderness, and the White Mountain Conservation League.

Overall substantive and key comments can be categorized into 3 comment groups. Detailed responses can be found in the project record and cara database. Comments not considered key are responded to in the project record are not summarized below.

The first is from the Stakeholder Group and NAU proponents commenting on specifics of the Paired Watershed Study. The Stakeholder Group would like treatments to be designed for snowpack accumulation and water retention. The forest response is that snowpack and water retention are outside the scope of the project and do not meet the purpose and need but the FEIS Alternatives C and the new E proposes a study to evaluate the effects of vegetative treatments on water yield.

NAU prefers no treatment in the control watersheds to better study the effects of water yield by treatment type. Following their recommendation, the FEIS will now incorporate no treatments in the control watersheds. NAU also prefers to use the term Water Balance Study instead of Water Yield Research. The FEIS will use the term Paired Watershed Study since it is the name of NAU's final proposal and better describes the scale involved. Furthermore, the FEIS has provided additional analysis of all instruments proposed with new information recently provided by NAU. NAU would like treatments to be "evidence based". The FEIS will use treatments described in the proposed action in the paired watersheds selected for study since it fits in the purpose to reestablish and restore forest structure and pattern, forest health, and vegetation composition and diversity.

The second comment group (CBD, 5 Groups, Dick Artley) is centered around the perception that the proposed action is constructing new roads and these roads and timber harvest activities may or do cause high levels of soil erosion that can negatively affect water quality and soil productivity including on soils with severe erosion hazard. Many opposing views and literature cited suggests that roads can cause soil erosion that may lead to degradation of water quality in perennial streams especially in the absence of appropriate mitigation measures or BMPs to protect soil productivity and water quality. The Forest response points out that we do not disagree that there is increased risk of runoff and erosion from forest treatments and (new or temporary road construction) if protective design features and best management practices are not made part of the action. However, proven effective soil and water BMPs (DEIS, Appendix C) have been identified and will be implemented during timber harvest activities that are expected to protect soil productivity and water quality. The responses point out that no new road construction is proposed and temporary roads construction will have design features, mitigation measures and some of the 38 soil and water BMPs (DEIS Appendix C) that have been proven effective at protecting soil productivity and water quality and will be implemented during harvest activities.

In addition, temporary roads will be fully decommissioned, obliterated and footprint obliterated

immediately following treatments with any of the soil protective measures now identified in SW BMP #38 and adaptive management identified in table 19 of FEIS. The response goes on to state that the FEIS will include an additional soil and water BMP for the concern about Temporary roads that may be constructed on soils with severe erosion hazard. BMP-#38 provides direction and additional soil and water protective measures that are expected to protect soil productivity and water quality. Furthermore, the response points out the DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road thus actually decreasing the effects of roads that are currently located within the analysis area.

The third comment groups are opposing views and literature provided by Dick Artley. These comments center around the same concerns listed in the second comment group above (i.e., timber harvest activities and roads effects on soil productivity and water quality). Many of the opposing views are not substantive because they are categorized as popular press or come from parts of the United States with very different environments where erosional processes and fisheries are not comparable to SW forest environments. Substantive opposing views fall into gray literature and some in popular science. Most of these views again come from research or studies conducted in parts of the US with very different forest environments and coldwater fisheries and suggest construction of roads and timber harvest activities has been shown to increase soil erosion and may degrade water quality without appropriate mitigation and soil and water BMPs.

Some opposing views included literature from other geographic locations including Michigan and the northwest (CARA #8). Soil and site productivity can be negatively affected if protective design features and best management practices are not made part of the action. The 4FRI project minimizes vegetation treatment impacts to soil and site productivity through implementation of design features, mitigation measures and the following Soil and Water BMP's listed and located in Appendix C, page 567 of DEIS. They have been developed and will be implemented (for timber harvest and fuels operations and retention of coarse woody debris) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality. The Chapter 3 soil and water analysis (DEIS table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance (average at the watershed level) would occur (including temporary road construction) under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity.

Some comments (CARA #8) included (popular not peer reviewed) science that suggested the project (timber harvest and road actions) would result in high soil erosion due to debris slides. 4FRI does not propose any ground disturbance treatments or roads construction on slopes greater than 40% and consequently, have very low risk of debris slides and associated erosion than on the Klamath (NF). The effects disclosed in chapter 3 of the DEIS are site-specific to this project. The potential for soil disturbance and soil erosion is disclosed in the DEIS on page 109 to page 113 (affected environment), and on page 113 to page 118 (environmental consequences) and pages 118-126 (Water) and in the soil specialist report from page 60 to page 120. Additionally, design features, mitigation measures and Soil and Water BMP's located in Appendix C, page 567 of DEIS have been developed and will be implemented (for timber harvest operations) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality. Other articles reviewed were considered to be outside the scope of the analysis or not applicable to this site-specific analysis. See the soil and water specialist report for the complete response to comments document.

The Forest response points out that while we do not disagree that there is increased risk of runoff and erosion from forest treatments, maintenance of permanent roads, and temporary road construction if protective design features and best management practices are not made part of the action. The 4FRI project minimizes vegetation treatment impacts to soil and site productivity through implementation of design features, mitigation measures and the following Soil and Water BMP's listed and located in Appendix C, page 567 of DEIS.

No new permanent roads would be constructed for this project. Temporary roads would be constructed to provide necessary access for forest treatments and decommissioned after use with identified BMPs.

Affected Environment

This section details the affected environment for the soil resources within the analysis or treatment area (431,049 acres of mechanical and treat up to 586,110 acres with prescribed fire). It establishes the baseline against which the decision maker and the public can compare the effects of all action alternatives.

Affected Environment

The resource areas to be affected by the proposals within this analysis are Forest soils, riparian areas, ephemeral, intermittent and perennial streamcourses and water quality. Affected environment of riparian resources and water quality is analyzed in the water resources specialist report (MacDonald 2014). This report analyzes soil resources and water quality that may be affected by the alternatives.

Summary of Affected Environment

Some 94 TES map units were aggregated into 17 strata (Appendix B). All acres approximate. These strata have similar soils and vegetation types with similar limitations, hazards and production potentials to management activities. The strata were used in part to design treatments, analyze effects and are based on the potential plant community and capability of the soils.

Within the analysis area, the following strata (Appendix A) are dominated by soils with severe erosion hazard, 16, 17, 19, 20, 32, 35, 38, 41, 42, 43, 44, 45, and portions of 47, 48, and 49. Strata 18, 22, 31, 33, 34, 36, 50 (a total of about 133,850 acres or about 13 percent of the analysis area), and portions of 21, 47, and 48 have soils dominated with moderate erosion hazard (about 52, 750 acres, or about 5 percent of the area). The remaining strata including, 1 – 15, 23, 24, 25, 26, 27, 28, 29, 30, 37, 39, 40, and most of 46 have soils with slight erosion hazard (about 805,700 acres, or about 81percent of the analysis area). Identified resource protection measures are required to assure accelerated soil erosion does not occur that would impair soil productivity.

Almost all strata within ponderosa pine PPC's have moderate or severe timber harvest limitations except most of strata 21. Identified resource protection measures are required to assure accelerated soil erosion and compaction do not impair soil productivity.

Most strata in the ponderosa pine type currently have closed stand structure (Steinke 2007, McCusker et al. 2014, Lata 2014) and appear to have high canopy covers and densities that have reduced the understory forage productivity although there is generally sufficient vegetative ground cover to reduce accelerated erosion. Due to the closed stand structure, most strata have relatively high risk of crown fire that also pose a high risk of moderate or high burn severity to the watershed under normal or extreme fire behavior conditions Lata, 2014 and (USDA, 2010a).

Most soils and strata in ponderosa pine PPC's on slopes less than about 40 percent are in satisfactory soil condition (about 841,500 acres or about 85 percent of the analysis area) and have the ability to resist accelerated erosion because they have high amounts of protective vegetative ground cover due to the presence of high and adequate amounts of vegetative ground cover that protects the soil against accelerated erosion and compaction. Although most soils rate out as satisfactory, nutrient cycling is reduced in dense stands and is nearly impaired soil condition overall. The amount of coarse woody material has been modeled and quantified but maintenance of 5-7 tons/acre of coarse woody material in ponderosa pine and 1-3 tons/acre in pinyon-juniper

types will improve soil nutrient cycling (USDA 1994a) and listed as BMP in table 3.

On strata where slopes are greater than about 40 percent (strata 42, 43, 47 and portions of 44 and 45) soil condition is unsuited or also known as inherently unstable where natural erosion exceeds tolerable erosion (about 30,000 acres). These soils and strata are not suitable for mechanical timber harvesting and identified BMP's should be used to protect soil resource when prescribed burning.

Soil condition on some montane meadows (strata 1, 4, and 6) are impaired on the Coconino National Forest and listed as satisfactory on the Kaibab National Forest (about 25,400 acres). However, it is probable that soil condition is impaired on Kaibab national forest soils located in montane meadows (strata 1-8) also. Refined soil condition assessments including all three soil functions was not made on the Kaibab forest and based solely on the ability of the soil to resist erosion. Since these strata are located on flat slopes, it is improbable for the soils to erode faster than renew themselves but most often; these soils have reduced hydrologic and nutrient cycling functions.

Strata 9 are wetlands where soil condition is rated as unsatisfactory on the Coconino forest and satisfactory on the Kaibab forest but similar to the discussion above, soils on the Kaibab forest are likely to be in unsatisfactory condition (about 4,400 acres).

Some Montane Meadows (strata 2 and 3) have either impaired or unsatisfactory soil condition (see Appendix B) due to low vegetative ground cover or compacted soil conditions resulting in hydrologic dysfunction (about 48,900 acres). These strata have reduced ability to effectively infiltrate water and have relatively low vegetative productivity compared to conditions under the PPC. Other similar strata located on the Kaibab National Forest may be in similar condition but no soil condition is available to document condition.

According the WEPP erosion modeling, predicted soil loss rates on undisturbed soils are below tolerable soil loss rates on slopes less than about 80 percent.

Soil condition on pinyon juniper vegetation types on slopes less than 40 percent (strata 46) is variable and has areas of satisfactory, impaired and a few areas have unsatisfactory soil condition (about 1,000 acres). The amount of coarse woody material has been modeled and quantified but maintenance of coarse woody material identified in table 3, BMPs will improve soil nutrient cycling and soil condition (Huffman 2010).

Overall, ponderosa pine vegetation types are dominated by functional at risk 6th HUC watersheds (about 451,500 acres, or 46 percent of the analysis area and about 1,214,339 acres, or about 59%, of the entire 6th codes acreage associated with the project acres) with a several impaired watersheds (about 316,800 acres, or about 32 percent of the analysis area and about 458,391 acres, or about 22%, of the entire 6th codes acreage associated with the project acres) and a few properly functioning watersheds (about 220,400 acres, or about 22 percent of the analysis area and about 394,285 acres, or about 19%, of the entire 6th codes acreage associated with the project acres) as defined by 12 indicators that were used to assess watershed condition through the Watershed Condition Framework (USDA, 2011). Watershed dysfunction in the treatment area is a result in large part from dense forests with fire regime condition classes of 2 or 3, high density of road networks that can alter hydrology, riparian condition less than functional and other factors.

Soils

Climate

The climate of the analysis area in the ponderosa pine vegetation type is classified as low sun cold climate class. It has a bimodal precipitation pattern where the majority of the precipitation falls from October 1 to March 31, mainly in the form of snow and the remainder mainly during the summer monsoon. Thus the winters are cold and soil temperatures are classified as frigid and subject to freezing and thawing. Summer precipitation is spotty, but usually takes place in the form of high-intensity, short duration thunderstorms during the monsoon season (July through September). Precipitation on the average varies from 18 to 24 inches annually in the ponderosa pine cover and up to 30 inches in the mixed conifer vegetation type.

The climate in the ponderosa pine pinyon-juniper transition is similar except annual precipitation is less ranging from about 16 – 20 inches per year with cold winters. The climate in pinyon-juniper vegetation types is dryer with precipitation ranging from about 14-18 inches per year with cold winters.

Use of Terrestrial Ecosystem Survey

Proposed treatments were selected based in part on the identified strata. The strata identify the soil type, classification and interpretations including soil limitations and hazards for mechanical treatments, and soil and vegetation production potentials including the potential plant community. During implementation, the 4 FRI implementation plan will identify on the ground soil limitations and hazards where identified BMPs will be necessary to implement.

TES, Accuracy of Data and Quality Assurance

The TES Ecological Units and soils are derived from the The Terrestrial Ecosystems Survey of the Coconino National Forest (TES) (USDA, 1995) and the TES of the Kaibab National Forest, (USDA, 1991). The TES is the result of the systematic analysis, mapping, classification and interpretation of terrestrial ecosystems also known as terrestrial ecological units delineated and numbered. It is the only seamless mapping of vegetation and soils available across the Forest that includes field visited, validated and correlated sites with a stringent Regional and National protocol stemming from decades of work. Major field work for the Coconino TES was completed by qualified Soil Scientists and Ecologists and during the period of 1987 through 1991. Soil names and descriptions were approved in 1992. Map units are identified by numbers ranging from 11 to 850. Major field work for the Kaibab TES was completed from 1979 through 1986. Map units are identified by numbers ranging from 3 to 683.

The terrestrial ecosystem survey enables practitioners to assess broad landscapes since it consists of a systematic assessment, classification, and mapping of terrestrial ecosystems found in Region 3.¹ It is an integrated survey and hierarchical with respect to classification levels and mapping intensities. A TES represents the combined influences of climate, soil and vegetation under contemporary disturbances and correlates these factors with soil temperature and moisture along

an environmental gradient.²

Interpretations based upon TES incorporate 1) soil physical and chemical properties, 2) climatic considerations, 3) topographic position and slope, 4) vegetation and anthropogenic influences as well as animal impacts, 5) productive potentials, and 6) geologic influences. As such the TES forms the ecological basis for describing existing conditions for resource areas including watershed, wildlife, fire, and timber and is a useful sideboard in determining desired conditions and analyzing effects of proposed actions.

Accuracy of Data and Quality Assurance

It is important to realize that differences in ecosystem properties including soil and vegetation can occur within short distances. The TES was mapped at a scale of 1:24,000 across the landscape. Generally, small vegetation types smaller than about 40 acres were not mapped and are included in larger TES map units. Where site-specific information is required and at a finer scale, on-site investigations will be made to validate or refine soil information.

Individual map units were based on data collected across the Forest and may or may not represent the exact same landscape existing conditions and potential plant community as depicted in the TES. Overall accuracy of mapping and information provided by the TES is considered reliable at the ecological unit or landscape level. It is estimated that over 3000 points per Forest were visited on-site and have data documenting soil classification, vegetation type present, surface components and other site characteristics present.

The TES follows National Cooperative Soil Survey Standards similar to Soil Surveys conducted by the Natural Resource Conservation Service. This is strict quality assurance including Project Leader field review, Regional Office, initial, annual progressive and final field review to approve map unit design and mapping.

There are minimum data collection requirements necessary to establish, design and map TES map units. Generally, at least 10 observations, 3 transects of 10 stops/transect and reference ecological sites per map unit are required and each Forest has more than 130 TES map units.

Since the 4-FRI is a project planned at the landscape scale; soil information used came from the Terrestrial Ecosystem Survey (TES) and was aggregated up into strata described below in Soil Stratification and Classification.

Soil Stratification and Classification

Some 94 TES map units were aggregated into 17 strata initially and then finally into 50 strata (Appendix B). All acres are approximate. These strata have similar soils and vegetation types with similar limitations, hazards and production potentials to management activities. The strata were used in part to design treatments and are based on the potential plant community and capability of the soils.

A review was conducted using the TES reports for the Coconino and Kaibab national forests. It

was based on such items as the physical properties of the TESU (slope, soil depth, color, surface and internal rock content, and surface soil texture), soil classification, potential plant community (PPC), climatic class, and slope. The TES units that were combined within the individual strata are predicted to respond the same to management actions despite the potential of variability in existing conditions.

Initially, a total of 94 unique TESU were identified for the proposed project area, which, based on similarities in soil variables and vegetation were condensed into 17 strata to be consistent with the landscape analysis approach. Under a revised strategy the number of strata increased to 45, though the total TESU considered dropped to 90. Ten of the strata (1, 2, 3, 4, 5, 6, 7, 8, 9, and 10), which combine for 87,609 acres represent grassland and/or riparian communities, invasion by ponderosa pine into these ecosystems has been noted. Twenty strata (11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 30, 31, 36, 37, 38, 39, 40, and 41) either have shallow soils (less than 20 inches to bedrock), occupy moderately steep to steep slope inclinations (15 to 40 percent), have a particle-size classification of cindery or ashy-skeletal or are on the dry side of the ponderosa pine ecosystem (climatic regime of 5-1). These strata are generally considered to have moderate to severe limitations for timber harvest, requiring implementation of BMP's and have low natural regeneration potential and low site index. These soils occupy approximately 395,495 acres. See Appendix A for a list of soil interpretations by strata.

Strata 42, 43, 44 and 45, which make up about 19,267 acres of the project area, have severe limitations for timber harvest and high erosion hazard limiting mechanical harvesting methods since these units occupy slopes greater than 40 percent. The remaining 11 strata (23, 24, 25, 26, 27, 28, 29, 32, 33, 34, and 35) represent those soils that have the highest production potentials, lowest limitations for timber harvest, slight erosion hazard and the highest natural regeneration potential. These units represent roughly 50 percent of the proposed project area or approximately 499,230 acres.

Soil Classification

Soil classification varies by strata (see Appendix B for a list by strata number) and is dominated by forest soils in the Alfisol order (boralfs suborder) and grassland soils in the Mollisols order (borolls suborder) and on some ponderosa pine forests strata where stand density has drastically increased.

Strata's 1-7 are mollisol grassland potential plant communities (PPC). Several other ponderosa pine dominated PPC's strata are also classified in the mollisol order while other slightly thinner organic surfaces classified as mollic integrate soils. Soils classified as mollisols indicate that historically, the soil was probably dominated by a competitive, herbaceous understory layer or grassland that broke down and formed a thick, organic layer over time, especially on deep soils (> 40 inches to bedrock). Mollisols have thicker organic surfaces than mollic integrate (near mollisol soils). Mollisols on deep soils have a higher capability (greater water holding capacity) to support more biomass including herbaceous understories than on rocky or shallow mollic integrate soils.

Historically, mollisols were likely dominated by grassy, herbaceous understories capable of out competing trees for soil moisture and nutrients and carrying ground fires that resulted in seedling and sapling mortality, open canopies, grassy interspaces and fewer trees. Currently, many deep soils (>40 inches to bedrock) within mollisols in the Ponderosa Pine type have closed canopies

(>30 percent) in interspaces and greater than about 45 percent on mollic integrades (Steinke 2007) stemming from decades of fire suppression and grazing disturbance. Based on soil type and field observations of canopy cover, age class and old stump presence, mollisols (especially deep ones) historically probably supported grassy interspaces or open canopy covers (10 – 30 percent) and mollic integrate soils probably supported somewhat closed stands (slightly greater than 30 percent) on rocky or shallow soils and open on deep or moderately deep soils.

s local study by Abella et al. (2013) suggest that the vast majority of ponderosa pine patches occur on forest soils (non-mollisol) and herbaceous vegetation patches occur on grassland type soils (mollisols) over a long, stable period of time.

Ponderosa pine current canopy covers on mollisols and mollic integrate soils are variable but commonly exceed 30 – 50 percent or more (representative of a closed canopy state). Historically and where these soils occur as a complex, there were probably clumps of trees on mollic integrades and grassy interspaces on mollisols.

Most other soils in other strata are classified in the Alfisol soil order and have thin organic soil surfaces indicating development under forest stand structure probably with less herbaceous understory than the mollisol and mollisol integrate soils.

A few strata have ponderosa pine , mixed conifer and pinyon-juniper PPC strata that fall into the Inceptisol, Andisol or Entisol soil order and are less developed soils with thinner organic soil surfaces than the mollisol and mollisol integrate soils mentioned above or are located on steep slopes greater than about 15%.

Use of Internal Soil Study (Steinke 2007)

Two studies were complete (Steinke 2007 and 2008) internally on representative sites on both the Kaibab and Coconino National Forests in 2007 and 2008 by Rory Steinke. These studies provided useful information used in the 4-FRI analysis into characterizing existing and desired conditions in understanding what presettlement conditions may have looked like as a sideboard to determine treatment proposals.

The analysis attempted to determine historic vegetative stand structure (grassland, open or closed forest stand) of ponderosa pine dominated mollisols (those soils with a high accumulation of surface organic matter common in grasslands), and mollic integrate soils (those soils with thinner organic matter accumulations in the soils surface) on the Coconino National Forest.

The central question posed is were current ponderosa pine vegetation types found on mollisol soils present historically or are they grassland vegetation types that have been invaded by ponderosa pine through disturbances or lack thereof? Details of methodology and findings can be found in (Steinke 2007 and 2008).

Conclusions of Study:

This analysis concludes that the ponderosa pine potential natural vegetation type (PNVT) which includes ponderosa pine type strata was dominated (possibly 68 percent to 79 percent for CNF and about 69 percent on the KNF) by an open stand structure (10 to 30 percent canopy cover) on mollisols and mollic integrate soils. In addition, the ponderosa pine PNVT occurs on other non-mollisol soils throughout the Coconino National Forest. Therefore, historically, ponderosa pine

vegetation types were found on mollisol soils historically and the great majority of sites were not grassland sites invaded by ponderosa pine. However, it is clear that over time, the majority of the ponderosa pine PNVT in the central and northern portions of the forest has increased in density and canopy cover with the lack of fire disturbance in the ecosystem.

Most sites visited in ponderosa pine PNVT's appear to have been historically dominated by open forest stands (10-30 percent tree canopy cover) especially in the central and northwest part of the Coconino and Kaibab Forests where ponderosa pine and Arizona fescue plant associations prevail. Some scattered ponderosa pine and Gambel oak plant associations located in the central or southern portions of the forest (Mogollon Rim Ranger District) appear to have been closed forest stands (>30 percent canopy cover) possibly due to slightly more annual precipitation received.

Current canopy covers on mollisols and mollic integrate soils are variable but commonly exceed 30 to 50 percent or more (representative of a closed canopy state). Historically these soils probably supported clumps of trees and grassy interspaces. It is speculated that mollisol and mollic integrate soils supported more herbaceous biomass in interspaces than soils with thinner organic surface horizons. However, this analysis cannot conclude that thinner organic soils (generally perceived to be forest soils) have smaller, less herbaceous interspaces and greater tree canopy covers than mollisol and mollic integrate soils because it was not analyzed.

Historic canopy covers were probably variable but dominated by "Open" stand structure. Natural fire disturbance probably maintained these stands in "Open" states. It is hypothesized that the entire forest was not historically "Open" because multiple seral stages probably existed forest-wide following fire disturbance or lack thereof creating areas of "Open", "Closed" and early seral "Grassland" states.

Pinyon-Juniper PNVTs:

Although the conclusions above are based on ponderosa pine vegetation types, many of the same conditions, disturbances and processes occur in the Pinyon-Juniper Woodlands including non-Woodland soils (thinner, organic layer). Acres of pinyon-juniper woodlands in the 4 FRI project area is very limited (about 1000 acres). Soils have thin organic surface classified mostly as Alfisols.

Currently many PJ stands are closed (>30 - 50 percent canopy cover) with little or no herbaceous interspaces as a result of fire suppression, grazing disturbance and drought. PJ Woodlands in less disturbed sites provide herbaceous interspaces under a more open canopy (10 – 30 percent). Personal observations indicate where PJ Woodland canopy cover exceeds about 40 percent, there is little to no herbaceous understory (with and without grazing) and soil condition declines.

Soil Interpretations

Appendix A and B lists soil interpretations by TES map (ecological) unit by strata that have similar soil properties that result in similar limitations, hazards and suitability and potentials for forest management.

Erosion Hazard

The TES defines erosion hazard (USDA 1984) as the probability of soil loss resulting from the complete removal of vegetation and litter. A slight rating indicates that all vegetative ground cover could be removed from the site and the resulting soil loss will not exceed "tolerance" soil loss rates. A moderate rate indicates that predicted rates of soil loss will result in a reduction of site productivity *if left unchecked*. Conditions in moderate erosion hazard sites are such that reasonable and economically feasible mitigation measures can be applied to reduce or eliminate soil loss. A severe rating indicates that predicted rates of soil loss have a high probability of reducing site productivity before mitigating measures can be applied.

Within the analysis area, the following strata (Appendix A) are dominated by soils with severe erosion hazard, 16, 17, 19, 20, 32, 35, 38, 41, 42, 43, 44, 45, and portions of 47, 48, and 49. Strata 18, 22, 31, 33, 34, 36, 50 (a total of about 133,850 acres or about 13 percent of the analysis area), and portions of 21, 47, and 48 have soils dominated with moderate erosion hazard (about 52,750 acres, or about 5 percent of the area). The remaining strata including, 1 – 15, 23, 24, 25, 26, 27, 28, 29, 30, 37, 39, 40, and most of 46 have soils with slight erosion hazard (about 805,700 acres, or about 81 percent of the analysis area). Identified resource protection measures are required to assure accelerated soil erosion does not occur that would impair soil productivity

Timber Harvest Limitation

Timber harvest limitations are limits to be considered when evaluating the impact of timber harvesting by equipment sue with regard to maintenance of soil productivity. It includes slope, erosion hazard, soil strength and surface rock fragment factors. A slight rating does not restrict the kind or time of year for harvesting and has low risk of soil productivity impairment.

All strata within ponderosa pine PPC's have moderate or severe limitations except most of strata 21. Identified resource protection measures are required to assure accelerated soil erosion and compaction do not impair soil productivity.

Natural Regeneration Potential

Natural regeneration potential refers to the probable success in the establishment and survival of trees under inherent site conditions and alerts the land manager to sites that have the most desirable soil and climate properties for successful natural regeneration. This rating is influenced primarily by climate and soil characteristics. A high potential rating does not have soil limitations that restrict establishment and growth of natural regeneration of trees. A low rating has soil limitations that can be expected to severely prevent establishment and growth of natural regeneration of trees and moderate has reduced potential for natural regeneration. Soils associated with a high rating offer the best opportunity for success followed by moderate and lastly low.

The following strata have low natural regeneration potential; 30, 31, 34, 36, 37, 38, 39, 40, 41, 43, 44, 47 and portions of 33, 35, 42, 46, 48, and 49. All of the remaining strata have moderate or high potential for natural regeneration. Moderate and high rated strata have the most desirable

soil and climate properties for successful regeneration of trees. These soils can be expected to regenerate and grow trees more successfully than low rated sites.

Soil Condition

A soil condition category following protocol from (USDA Forest Service, FSH 2509.18, R3 Supplement No 2509.18-99-1) is assigned to each ecological unit and the soil condition ratings are based on interpretations of the three primary soil functions: soil hydrologic function, soil stability and nutrient cycling. Under this broad scale level of analysis (landscape scale by strata), it is important to note that soil conditions within a given ecological unit may vary somewhat but most strata are one single soil condition class.

Soil condition classes used are Satisfactory, Impaired, Unsatisfactory and Inherently Unstable known as Unsited on the Kaibab National Forest. The following are definitions describe each class.

Satisfactory: Indicators signify that soil function is being sustained and soil is functioning properly and normally. The ability of the soil to maintain resource values and sustain outputs is high.

Impaired: Indicators signify a reduction in soil function. The ability of the soil to function properly and normally has been reduced and/or there exists an increased vulnerability to degradation. An impaired category indicates there is a need to investigate the ecosystem to determine the cause and degree of decline in soil functions. Changes in land management practices or other preventative measures may be appropriate.

Unsatisfactory: Indicators signify that a loss of soil function has occurred. Degradation of vital soil functions result in the inability of the soil to maintain resource values, sustain outputs or recover from impacts. Unsatisfactory soils are candidates for improved management practices or restoration designed to recover soil functions.

Inherently Unstable or Unsited: These soils have natural erosion exceeding tolerable limits. Based on the Universal Soil Loss Equation (USLE) these soils are eroding faster than they are renewing themselves but are functioning properly and normally.

Overall and in the ponderosa pine strata on slopes less than about 40 percent, soil condition is satisfactory due to the presence of high and adequate amounts of vegetative ground cover that protects the soil against accelerated erosion and compaction condition (about 841,500 acres or about 85 percent of the analysis area). On strata where slopes are greater than about 40 percent (strata 42, 43, 47 and portions of 44 and 45) soil condition is unsited or also known as inherently unstable where natural erosion exceeds tolerable erosion (about 30,000 acres). These soils and strata are not suitable for mechanical timber harvesting and identified BMP's will be used to protect soil resource when prescribed burning.). The other 15% are dominated by impaired soils located on some montane meadows and lesser amounts of inherently unstable/unsited or unsatisfactory soils.

Although most soils rate out as satisfactory, nutrient cycling is reduced in dense stands (including those in FRCC 2 and 3) and is nearly impaired soil condition overall. The amount of coarse woody material has been modeled and quantified but maintenance of 5-7 tons/acre of coarse woody material will improve soil nutrient cycling (USDA, 1994a) and listed as a BMP.

Overall and in the ponderosa pine strata on slopes less than about 40 percent, soil condition is satisfactory due to the presence of high and adequate amounts of vegetative ground cover that protects the soil against accelerated erosion and compaction (about 841,500 acres or about 85 percent of the analysis area). The other 15% are dominated by impaired soils located on some montane meadows and lesser amounts of inherently unstable/unsuited or unsatisfactory soils.

Although most soils rate out as satisfactory, nutrient cycling is reduced in dense stands (including those in FRCC 2 and 3) and is nearly impaired soil condition overall. The amount of coarse woody material has been modeled and quantified but maintenance of 5-7 tons/acre of coarse woody material will improve soil nutrient cycling (USDA, 1994a) and listed as a BMP.

On strata where slopes are greater than about 40 percent (strata 42, 43, 47, and portions of 44 and 45) soil condition is unsuited or also known as inherently unstable where natural erosion exceeds tolerable erosion (about 30,000 acres). These soils and strata are not suitable for mechanical timber harvesting and identified best management practices (BMPs) would be used to protect soil resource when prescribed burning.

Soil condition on a little more than half of the acres in montane meadows (strata 1, 2, 4, 6, and 10) are impaired on the Coconino NF and listed as satisfactory on the Kaibab NF (about 44,476 acres). However, it is probable that the soil condition in these montane meadows is impaired on the Kaibab NF. Refined soil condition assessments that included all three soil functions were not conducted and the assessment was based solely on the ability of the soil to resist erosion. Soil condition in montane meadows located in strata 3, 5, 7, and 8 (about 38,744 acres) is satisfactory.

Since these strata are located on flat slopes, it is improbable for the soils to erode faster than renew themselves but most often, these soils have reduced hydrologic and nutrient cycling functions.

Strata 9 are wetlands where soil condition is rated as unsatisfactory on the Coconino NF and satisfactory on the Kaibab NF but similar to the discussion above, soils on the Kaibab NF are likely to be in unsatisfactory condition (about 4,400 acres).

Soil condition on pinyon juniper vegetation types on slopes less than 40 percent (strata 46-about 1,000 acres) is variable and has areas of satisfactory, impaired and a few areas have unsatisfactory soil condition. Impaired and unsatisfactory soil conditions generally have overstocked tree canopy, resulting in poor herbaceous understory composition and productivity, poor nutrient cycling function, low vegetative ground cover and accelerated erosion

Watersheds and Condition

The project lies within 82, 6th code watersheds, (see Appendix C). Fifth and 6th HUC names, watershed condition class, acres within and outside of proposed treatment area (Alternative B) are listed. The Watershed Condition Framework (WCF) protocol (USDA, 2010a, 2010b) was used to classify watershed conditions at the 6th HUC level in spring, 2011 including 12 watershed indicators. Results are available at this interactive website: <http://apps.fs.usda.gov/WCFmapviewer/>

Watershed condition is the state of the physical and biological characteristics and processes within a watershed that affect the hydrologic and soil functions supporting aquatic ecosystems. The WCF (USDA, 2010a, 2010b) rates watershed condition in 3 classes defined below.

- Class 1 watersheds are **functioning properly** and exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.
- Class 2 watersheds **functioning at risk** and exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.
- Class 3 watersheds are **impaired function** and exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

The purpose of the WCF is to shift focus from species and sites to the ecosystems that support them in order to understand consequences of management actions before selecting a proposed action and implementation and was considered in the development of the proposed action. The WCF is used to disclose affected environment at the watershed scale and analyze cumulative effects of the action alternatives in 4 FRI.

Overall, ponderosa pine vegetation types are dominated by functional at risk 6th HUC watersheds (about 451,500 acres, or 46 percent of the analysis area and about 1,214,339 acres, or about 59%, of the entire 6th codes acreage associated with the project acres) with a several impaired watersheds (about 316,800 acres, or about 32 percent of the analysis area and about 458,391 acres, or about 22%, of the entire 6th codes acreage associated with the project acres) and a few properly functioning watersheds (about 220,400 acres, or about 22 percent of the analysis area and about 394,285 acres, or about 19%, of the entire 6th codes acreage associated with the project acres) as defined by 12 indicators that were used to assess watershed condition through the Watershed Condition Framework (USDA 2011). Table 13 below displays the watershed condition of the 6th code watersheds that occur within the analysis area. Watershed dysfunction in the treatment area is a result in large part from dense forests with fire regime condition classes of 2 or 3, high density of road networks that can alter hydrology, riparian condition less than functional and other factors.

Table 11. List of 6th code watersheds as defined by the Watershed Condition Framework

Impaired Function	Functioning at Risk	Functioning at Risk
Babbitt Lake	Anderson Canyon	Middle Sycamore Creek
Big Spring Canyon	Bear Canyon	Miller Wash Headwaters
Doney Park	Bear Jaw Canyon	Mormon Canyon
Dry Creek	Cataract Creek Headwaters	Porcupine Canyon-Walnut Creek
Garland Prairie	Cedar Creek	Pumphouse Wash
Grapevine Canyon	Cherry Canyon-Walnut Creek	Rabbit Canyon
MC Canyon	Coconino Wash Headwaters	Rain Tank Wash
Middle Oak Creek	Curley Wallace Tank	Rattlesnake Canyon
Pitman Valley-Scholz Lake	Dent and Sayer Tank	Rattlesnake Wash
Sawmill Tank	Devil Dog Canyon	Sawmill Wash
Tule Canyon	Dogtown Wash	Smoot Lake
Upper Hell Canyon	Double Cabin Park-Jacks Canyon	Spring Creek
Upper Red Lake Wash	Government Canyon	Upper Cataract Creek

Impaired Function	Functioning at Risk	Functioning at Risk
Upper Spring Valley Wash	Government Prairie	Upper Cedar Wash (Local Drainage)
Upper Sycamore Creek	Grindstone Wash	Upper Deadman Wash
Walnut Creek-Upper Lake Mary	Jacks Canyon	Upper Lee Canyon
Functioning Properly	Johnson Creek	Upper Oak Creek
Bar M Canyon	Kinnikinick Canyon	Upper Padre Canyon
Cinder Basin	Klostermeyer Lake	Upper Rio de Flag
Fry Canyon	Little Red Horse Wash	Upper San Francisco Wash
Juan Tank Canyon	Long Lake-Chavel Pass Ditch	Upper Woods Canyon
Little LO Spring Canyon	Lower Deadman Wash	Volunteer Canyon
Lower Rio de Flag	Lower Sycamore Creek	Volunteer Wash
Meath Wash	Lower Woods Canyon	Walnut Creek-Lower Lake Mary
Middle Spring Valley Wash	Middle Deadman Wash	Yeager Draw
Mormon Lake		
Munds Canyon		
Red Horse Wash Headwaters		
Secret Canyon		
Sinclair Wash		
Telephone Tank		
Upper Kana-a Wash		
West Fork Oak Creek		

The following 5th HUC watersheds have few to several 6th HUC watershed in the impaired function condition class totaling at least 33percent of total 5th HUC area, Cataract Creek Rio de Flag, Spring Valley, Sycamore Creek, Upper Cedar wash and Walnut Creek. Pease see Appendix C for detailed condition class by 6th HUC watershed and acres.

Conclusions

Existing Conditions:

Most soils and strata are in satisfactory soil condition and have the ability to resist accelerated erosion. Most strata in the ponderosa pine type currently have closed stand structure and appear to have high canopy covers and densities that have reduced the understory forage productivity although there is generally sufficient vegetative ground cover to reduce accelerated erosion. Due to the closed stand structure, most soils and strata have relatively high risk of crown fire that also pose a high risk of moderate or high burn severity to the watershed including life, property, soil productivity and water quality under normal or extreme fire behavior conditions (assuming current FRCC are dominated by class 2 and 3 (6th HUC Watershed Condition Classification, in process). Fires resulting in moderate or high burn severity pose substantial risk to life, property, soil productivity, watershed function and downstream water quality to connected streamcourses on soils with moderate or high erosion hazard following storm events.

Overall and in the ponderosa pine strata on slopes less than about 40 percent, soil condition is satisfactory due to the presence of high and adequate amounts of vegetative ground cover that protects the soil against accelerated erosion and compaction. On strata where slopes are greater than about 40 percent (strata 42, 43, 47 and portions of 44 and 45) soil condition is unsuited or also known as inherently unstable where natural erosion exceeds tolerable erosion. These soils and strata are not suitable for mechanical timber harvesting and identified BMP's will be used to protect soil resource when prescribed burning.

On strata where slopes are greater than about 40 percent (strata 42, 43, 47, and portions of 44 and 45) soil condition is unsuited or also known as inherently unstable where natural erosion exceeds tolerable erosion (about 30,000 acres). These soils and strata are not suitable for mechanical timber harvesting and identified best management practices (BMPs) would be used to protect soil resource when prescribed burning.

Soil condition on a little more than half of the acres in montane meadows (strata 1, 2, 4, 6, and 10) are impaired on the Coconino NF and listed as satisfactory on the Kaibab NF (about 44,476 acres). However, it is probable that the soil condition in these montane meadows is impaired on the Kaibab NF. Refined soil condition assessments that included all three soil functions were not conducted and the assessment was based solely on the ability of the soil to resist erosion. Soil condition in montane meadows located in strata 3, 5, 7, and 8 (about 38,744 acres) is satisfactory.

Since these strata are located on flat slopes, it is improbable for the soils to erode faster than renew themselves but most often, these impaired soils have reduced hydrologic and nutrient cycling functions.

Strata 9 are wetlands where soil condition is rated as unsatisfactory on the Coconino NF and satisfactory on the Kaibab NF but similar to the discussion above, soils on the Kaibab NF are likely to be in unsatisfactory condition.

Soil condition on pinyon juniper vegetation types on slopes less than 40 percent (strata 46) is variable and has areas of satisfactory, impaired and a few areas have unsatisfactory soil condition.

5th and 6th HUC watershed condition is variable. Overall, ponderosa pine vegetation types are dominated by functional at risk 6th HUC watersheds with a several impaired watersheds and properly functioning watersheds many of which are located in Wilderness Areas. Fire regime condition class (FRCC) is one of 12 indicators used to assess watershed condition and was rated as poor (FRCC 3) for the vast majority of watersheds during the watershed condition framework initial assessment, (USDA, 2010a information

available online at <http://apps.fs.usda.gov/WCFmapviewer/>).

The following 5th HUC watersheds have few to several 6th HUC watershed in the impaired function condition class totaling at least 33 percent of total 5th HUC area, Cataract Creek Rio de Flag, Spring Valley, Sycamore Creek, Upper Cedar Wash and Walnut Creek. Please see Appendix C for detailed condition class by 6th HUC watershed and acres.

Overall, the 4-FRI area selected for large-scale restoration efforts has at least 50 percent of the area, or roughly 500,000 acres, that are well suited to timber harvest and restoration treatment activities. This does not mean the other strata are automatically excluded. What it does signify is that appropriate resource protection measures, BMP's and mitigation will need to be implemented to maintain soil productivity and are listed in the Resource Protection Measures by strata above.

Other interpretations listed in Appendix A and B are defined in the TES of the Kaibab and TES of the Coconino National Forest.

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

Existing Conditions

The project lies within 82, 6th code watersheds. The Watershed Condition Framework (WCF) protocol was used to classify watershed conditions at the 6th HUC level in spring, 2011 including 12 watershed indicators.

Overall, ponderosa pine vegetation types are dominated by functional at risk 6th HUC watersheds (about 451,500 acres, or 46 percent of the analysis area and about 1,214,339 acres, or about 59%, of the entire 6th codes acreage associated with the project acres) with a several impaired watersheds (about 316,800 acres, or about 32 percent of the analysis area and about 458,391 acres, or about 22%, of the entire 6th codes acreage associated with the project acres) and a few properly functioning watersheds (about 220,400 acres, or about 22 percent of the analysis area and about 394,285 acres, or about 19%, of the entire 6th codes acreage associated with the project acres) as defined by 12 indicators that were used to assess watershed condition through the Watershed Condition Framework (USDA, 2011). Watershed dysfunction in the treatment area is a result in large part from three indicators including, dense forests with fire regime condition classes of 2 or 3, high density of road networks that can alter hydrology, riparian condition less than functional and intersection of roads and stream courses.

Environmental Consequences

This section also describes the direct, indirect, and cumulative effects of implementing each alternative on the soil resources and water quality in the project area. It presents the scientific and analytical basis for the comparison of the alternatives presented in Alternatives section. NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16).

Forest Erosion Processes

Forests generally have very low erosion rates unless they are disturbed. Common disturbances include prescribed and wild fire, and harvesting operations. Vegetative recovery after fuel treatments is generally very rapid, with erosion rates typically dropping to pre-fire levels within 1 to 2 years (Elliot et al. 2010). After that, the rapid regrowth of vegetation soon covers the surface with plant litter, and potential erosion is quickly reduced. In one study, Robichaud and Brown (1999) reported that erosion rates dropped from

almost 40 Mg ha⁻¹ the first year after a fire to 2.3 Mg ha⁻¹ the second, and 1 Mg ha⁻¹ the third year. If the year is normal or dry, then it is unlikely for there to be any significant erosion (Elliot 1999).

Soil tolerance soil loss rate is the rate of soil loss than can occur while sustaining inherent site productivity (Miller et al. 1995). Soils in each TES ecological unit are assigned tolerance soil loss rates based on individual soil and climate properties and approximate annual soil renewability levels. Maintaining soil erosion below soil tolerance levels assures soil productivity will be maintained from an erosion standpoint.

Current Soil Erosion

Current and predicted Soil erosion was modeled for all alternatives using the Water Erosion Prediction Project (WEPP) disturbed WEPP (USDA 2006) model found online at <http://forest.moscowfsl.wsu.edu/fswapp/>. Disturbed WEPP is designed to predict runoff and sediment yield from undisturbed and harvested forests and prescribed and wildfires. Table 12 displays predicted soil erosion for the most representative soil in ponderosa pine ecosystems by slope class. Tolerable soil loss values are **2-4 tons/acre** depending on soil type. Some steep slope greater than 40 percent have soil inclusions with tolerable soil loss values equal to about 1 but are generally minor in extent (less than about 15 percent). Table 12 displays erosion modeling summary information. Cells shaded gray have erosion exceeding tolerable soil loss. Soil loss exceeding tolerable amounts erode faster than renew themselves resulting in accelerated soil loss and loss of soil productivity as well as deliver high amounts of sediment to connected streamcourses.

For all action alternatives, predicted soil loss rates are below tolerable amounts on slopes less than 40 percent (table 14). On slopes greater than about 40 percent and for alternatives B, C, D and E, modeling shows erosion is about 1/tons/acre/year which is less than the TES identified tolerable limits of 2 tons/acre/year. However, it is probable that there are inclusion soils not designed in the main TES components with T values of 1 ton/acre/year on various portions of the steep landscape. Therefore, mechanical harvesting would likely result in erosion above tolerable limits in some minor portions of the landscape on steep slopes. However, mechanical harvesting is not proposed on slopes greater than about 40% and therefore, accelerated erosion is not expected to occur

Erosion exceeds tolerable soil loss rates where soils have been exposed to high burn severity predominantly in wildfires on slopes greater than about 15 percent and on some slopes greater than 40 percent in inclusion soils where prescribed or managed fire occurs (shaded gray). High burn severity is more likely to occur where forests are untreated (alternative A) and risk soil loss above tolerable levels resulting in loss of soil productivity and sediment delivery to connected streamcourses. Forests generally have very low erosion rates unless they are disturbed (Elliot 1999, WEPP technical documentation). Common disturbances include prescribed and wild fire, and harvesting operations.

Table 12. 10-Year Return Period Predicted Soil Erosion (All Alternatives)

Alternative A (Undisturbed)	Erosion in tons/acre/year	Sediment Leaving Profile in tons/acre/year	T Values in Tons/Acre/Year
Slope Class (Percent)			
0-15	0	0	2-4
15-40	0	0	2-4
40-120	0	0	2-3
High Burn Severity (Alt A Possible)			
0-15	1.23	.40	2-4
15-40	6.89	2.68	2-4
40-120	15.89	6.23	2-3
Alternative B, C, D,E (Low Burn Severity, Prescribed & Managed Fire)			
0-15	.04	.004	2-4
15-40	.43	.14	2-4
40-120	1.08	.37	2-3 (possible inclusions of 1 for some soils)
Alternative B, C, D, E (Mechanically Thinned Forests)			
0-15	0	0	2-4
15-40	0	.004	2-4
40-120	.08	.009	2-3

Summary of Soil Disturbance for All Alternatives

Across all action alternatives, total maximum soil disturbance by individual treatment type within treatment areas ranges from less than about .1 percent to about 9.7 percent with high intensity thinning causing the highest soil disturbance (Attachment 1).

Table 3 shows average total maximum soil disturbance within 6th HUC watersheds ranges from 2.9% to 3.5% and 10.3% to 11.3% within treatments areas. Based on averages within all connected watersheds and treatment areas, soil disturbance is minimal, less than 15%, short-term (less than about 2 years) and expected to maintain soil productivity.

Across all action alternatives, total maximum soil disturbance at the 6th HUC watershed scale range from .1% to 11.5% and within treatment areas range from 2.1% to 19.2% (table 4). Total maximum soil disturbance by any individual treatment type within treatment areas across all action alternatives ranges from less than .1% to 9.7 % with high intensity thinning causing the highest soil disturbance (Attachment #1 and calculations of soil disturbance and end note).

All predicted soil disturbance is less than 20%. The amount that is greater than 15% is minor in extent. All remaining soil disturbance is predicted to be well below the 15% soil disturbance threshold. Furthermore, soil disturbance would be short term (less than about 2 years) since pine needle duff is expected to fall and remaining vegetative ground cover woody is expected to adequately cover the bare soil and prevent accelerated erosion thereby maintaining soil productivity.

Alternative A would not be mechanically treated so no mechanical soil disturbance would result but up to 33% of watersheds or treatment areas could potentially result in detrimental soil disturbance as a result of wildfire.

No watersheds would have soil disturbance above 11.5 percent which is 3.5 percent below the 15 percent threshold and therefore, soil productivity should be maintained at the watershed level.

Alternatives B, C, D and E (attachment #1) have a few treatment areas in watersheds where soil disturbance would be above 15 percent but less than 20 percent located in some of the following watersheds (depending on alternative), Government Canyon, Juan Tank Canyon, Curley Wallace Tank, Sinclair Wash, Yeager Draw, Big Springs, Fry Canyon, Volunteer Wash, Walnut Creek-Upper or Lower Lake Mary, Government Prairie, Sawmill tank, and Telephone Tank. Most of these watersheds have few acres proposed for treatment and soil disturbance is expected to be short term (less than 2-3 years) and therefore are not expected to pose a risk to overall long-term soil productivity at the treatment level. In addition, 3 watersheds (Upper Oak Creek, West Fork of Oak Creek and Pumphouse Wash have predicted cumulative effects soil disturbance greater than 15% as a result of the May, 2014 Slide Fire (analyzed in detail later in this report). Implementation of identified soil and water resource mitigation measures and BMPs are expected to minimize soil erosion and maintain soil productivity and water quality. A detailed effects analysis is found and summarized by alternative in this report and also found in the section entitled comparison of alternatives at the end of the effects analysis. Below is a summary of key findings.

Key Finding

Implementation of Alternative A would not meet the projects purpose and need to improve and protect soil condition, productivity and watershed function nor move towards the desired condition of having soils in satisfactory condition and soil productivity maintained and watersheds properly functioning. It would not meet the projects purpose and need nor move towards the desired conditions of a resilient forest by reducing the potential for undesirable fire behavior and its effects and maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not

support wide-spread crown fire. Implementation of Alternative A would not increase forest resiliency to natural disturbances and would not improve or protect soil condition and soil productivity or watershed function as well as all other action alternatives. Implementation of Alternative A would put soils and watersheds at risk of continued uncharacteristic wildfires that could result in loss of soil productivity and sediment delivery to connected streamcourses.

There are no identified soils on slopes ranging from 40 percent to 120 percent where tolerable soil loss value is 1 ton/acre/year except possible minor soil inclusions that likely total less than 15 percent. Therefore, the use of prescribed or managed fire on these slopes do not pose risk to soil productivity assuming high burn severity is minimal (< about 2 percent). Slopes over 15percent subject to high burn severity (alt A possible) could result in accelerated soil loss and have erosion rates higher than tolerable soil loss posing risk to soil productivity.

Key Finding

Implementation of alternative D would not meet the projects purpose and need as well as other action alternatives but would come closer than alternative A.

Key Finding

Implementation of alternatives B, C and E meet the projects purpose and need and meet the Kaibab NF and Coconino NF forest plan standards and guidelines. Implementation of alternative D would meet the forest plans standards and guidelines but not fully meet the purpose and need of this project.

Summary of Soil Condition, Productivity and Watershed Function by Alternative

Comparison of Effects to Soil Condition and Productivity by Alternative

Soil Condition and Productivity	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres Treated for Improvement, Maintenance and Protection of Soil Condition and Productivity (Mechanical and Prescribed Fire)	0 proposed from 4FRI but about 166,897 acres would be ongoing mechanical treatments and 195,076 would be ongoing prescribed fire treatments	583,330 (fire) 384,966 (mechanical)	586,110 (fire) 431,049 (mechanical)	178,441 (fire) 384,996 (mechanical)	581,020 (fire) 403,218 (mechanical)
Overall change (Improvement, Maintenance and Protection) of Soil Condition, Function and Productivity	None proposed from 4FRI but on-going treatments would continue and improve or protect soil productivity in those areas treated but less than all other action alternatives	Would improve, maintain and protect soil productivity better than D but not as much as E and C respectively. Thinning stands combined with prescribed and maintenance burning would increase herbaceous understory productivity and improve soil productivity on about 385,000 acres. Burn only on about 198,300 acres would decrease potential wildfire severity and improve soil condition and protect productivity on about 583,330 acres in the long term.	Would improve, maintain and protect better than D and slightly more than B and E because it improves more grasslands Thinning stands combined with prescribed and maintenance burning would increase herbaceous understory and improve soil productivity on about 431,000 acres. Burn only on about 155,100 acres would decrease potential wildfire severity and improve soil condition and protect productivity on about 593,211 acres in the long-term.	Less than B, C and E. Thinning stands would increase herbaceous understory and improve soil productivity on about 388,500 acres. However, no prescribed fire would put soil productivity at risk of possible high burn severity on about 25% of those treated acres or 97,125 acres (Lata, 2014) on acres subject to high severity surface fire effects Burn only with maintenance burning on about 178,440 acres with the thinning acres not subject to high severity wildfire would decrease potential wildfire severity and improve soil condition and protect soil productivity.	Would improve, maintain and protect soil productivity better than D and slightly more than B but a little less than C. Thinning stands combined with prescribed fire would increase herbaceous understory and improve soil productivity on about 403,200 acres. Burn only on about 177,800 acres would decrease potential wildfire severity and improve soil condition and protect productivity in the long-term. However, not treating diameters in the 9-16 inch class would not allow for improved soil nutrient cycling and may put those areas at higher risk of uncharacteristic wildfire posing risk to soil condition and productivity. Overall, soil productivity would improve better than D but not as much as B and C respectively.

Summary Finding: Overall Alternative C would protect and improve soil productivity a little better than Alternatives E, B, D and much better than A respectively

Comparison of Effects to Watershed Function by Alternative

Watershed Condition Indicator and Treatment Improving and Maintaining Watershed Function	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Restoration treatment acres resulting in improvement, protection and maintenance of soil condition and productivity	0 proposed from 4FRI but about 166,897 acres would be ongoing mechanical treatments and 195,076 would be ongoing prescribed fire treatments	583,330 (fire) 384,966 (mechanical)	586,110 (fire) 431,049 (mechanical)	178,441 (fire) 384,996 (mechanical)	581,020 (fire) 403,218 (mechanical)
Potential for High Severity Burns	200,000 acres or 34%	23,000-41,000 acres or 4-7%	Same as B	23,000-41,000 acres or 4-7% in crown fire in short-term with surface fire severity similar to A on about 25% of mechanical treatment acres and 50% VCC 3 in long-term (2050). .50% revert to FRCC 3 in long-term (2050)	Same as B
Ephemeral Stream Restoration (miles)	0	39 miles. Of which 19 miles are in functioning at risk watersheds, 11 miles are in functioning proper watersheds and 9 miles are in	Same as B	Same as B	Same as B

		impaired function watersheds			
Existing & unauthorized road and route decommission and road reconstruction or relocation (miles)	0	About 860 miles of which about 500 miles are in functioning at risk watersheds, 180 miles are in functioning proper watersheds and 220 miles are in impaired function watersheds. Plus up to 40 miles may be reconstructed or relocated	Same as B	Same as B	
Springs and Seeps Restored (Number)	0	74	Same as B	Same as B	Same as B
Overall Change (Improvement & Maintenance) in Watershed Function	None from 4FRI proposal but some improvement in ongoing areas treated but much less than all other alternatives. Continue to have high amounts of and the most functioning at risk and impaired watersheds compared to all other alternatives	Would greatly improve and maintain watershed function. Moves toward improved watershed function through a positive change in fuels reduction and improved soil productivity on 23% of the functioning at risk (or about ¼ of the 58% that are currently functioning at risk) and 42% (i.e., almost half) of impaired watersheds would improve. Reduces open road density by about 500 miles are in functioning at risk watersheds, and 220 miles are in impaired function watersheds. Stream channel treatments improve water flow regime on 19 miles of functioning at risk and 9 miles in impaired watersheds.	Same as Alternative B. Roads, springs and stream channels are the same as Alt B.	Would improve in short-term but not be maintained in long-term. Moves toward improved watershed function through a positive change in fuels reduction and improved soil productivity on 18% of the functioning at risk and 34% of the impaired watersheds. Overall watershed improvement not as extensive as B and C. Roads, springs and stream channels are the same as Alt B.	Same as B.

Summary Finding: Overall Alternative C, B and E would improve and maintain watershed condition and function a little better than Alternatives D and much better than Alternative A.

Key Finding

Implementation of Alternative A would not meet the projects purpose and need to improve and protect soil condition, productivity and watershed function nor move towards the desired condition of having soils in satisfactory condition and soil productivity maintained and watersheds properly functioning. It would not meet the projects purpose and need nor move towards the desired conditions of a resilient forest by reducing the potential for undesirable fire behavior and its effects and maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire. Implementation of Alternative A would not increase forest resiliency to natural disturbances and would not improve or protect soil condition and soil productivity or watershed function as well as all other action alternatives Implementation of Alternative A would put soils and watersheds at risk of continued uncharacteristic wildfires that could result in loss of soil productivity and sediment delivery to connected streamcourses.

Alternative A proposes no treatments but on-going treatments would continue (per forest plans) to treat minimal acres but much less than all other alternatives so soil disturbance from treatments would be less than all other alternatives. However, failure to treat as many acres as alternatives propose could result in up to 33% of watersheds or treatment areas with detrimental soil disturbance as a result of wildfire. Overall, ongoing treatment acres would improve soil productivity, soil and watershed function by reducing the risk of uncharacteristic fires that could degrade soil but the acres treated would be far less than all other alternatives proposed.

Key Finding

Implementation of Alternative D would not meet the projects purpose and need as well as other action alternatives but would come closer than Alternative A. Far fewer acres would be treated with prescribed fire and maintenance resulting in long-term buildup of hazardous fuels and increased canopy cover of trees that pose risk to soil productivity and watershed function from uncharacteristic fires and nutrient cycling soil functions from sparse understories.

Key Finding

Implementation of Alternatives B, C and E) meet the projects purpose and need to varying degrees and meet the Kaibab and Coconino national forest plan standards and guidelines. Soil condition, productivity and watershed function would greatly improve, be maintained and protected. Alternative C would be slightly more beneficial than B and E because more grasslands would be treated resulting in improvement of soil condition and productivity on a slightly larger acreage than Alternative B (about 586,110 for C to 583,330 acres for B and 581,020 for E). Implementation of Alternative D would meet the forest plans standards and guidelines but not fully meet the purpose and need of this project.

Deleted:

Overall, implementation of the proposed action is expected to maintain, improve and protect long-term soil productivity and watershed function much better than Alternative A because there will be no improvement in understory response due to thinning and burning activities in the Alternative A. Alternative B does propose thinning and prescribed fire activities that are expected to provide long-term soil improvements on about 583,330 acres, while Alternative C proposes about 586,110 acres. Alternative D proposed thinning only on about 385,000 acres, and prescribed burning on about 178,000 acres. The thinning and burning will provide improvement to soils by improving understory species composition, but does still maintain high fuel loadings that can have high surface fire effects that can damage soils. This is expected to occur on about 25% of the mechanical treatment sites, so Alternative D has effective soil productivity treatments on about 563,407 acres.

Implementation and effects to soil of Alternative E would be similar to Alternative B but would not mechanically treat MSO PACS in areas with tree diameters from 9 to 18 inches but use prescribed burn only. In addition, some savanna or grassland treatments would not occur such as in Garland Prairie management area. Consequently, the lack of mechanical treatments would not fully restore the forest structure, pattern, health and vegetation composition resulting in further risk of uncharacteristic wildfire that may result in high burn severity and pose risk to soil productivity in MSO core areas and unrestored savannas.

Implementation of Alternative C would better restore grasslands than Alternative B and E and still has about the same amount of soil disturbance treatment area wide (about 12% compared to 11%) and at the 6th HUC watershed level (about 7.9% compared to 7.5%). Implementation of Alternatives B, C and E (except in core areas and Garland Prairie for E) would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.

Executive Summary of Environmental Effects All Alternatives

Overall Comparison Summary

Overall, and at the 6th HUC landscape, the average watershed scale total proposed 4FRI treatments predicted EIS ground disturbances are very similar and minimal and range from 2.9% (Alt D) to 3.5% (ALT C) with Alt B affecting 3.3% and Alt E affecting 3.2% (all averages across affected watersheds). Due to the low extent of soil disturbance and short term magnitude (1-2 years recovery periods following treatments) and implementation of BMPs, soil productivity, water quality and watershed function are not expected to be adversely impacted from 4FRI treatments.

Total past, present and reasonable foreseeable actions (including 4FRI proposed treatments) contribute about 4 to 5 percent more ground disturbance to 4FRI proposed treatments (average landscape, watershed level-wide by alternative) for a total soil disturbance average ranging from 7.6 percent (Alternative D) to 8.2 percent (Alternative C), with Alt B predicted at 8.0% and Alternative E at 7.9%. The overall extent (less than 8.5% for all action Alternatives) and magnitude (2 year recovery time) of total ground disturbance is minimal, short term and much less than the 15% soil productivity threshold indicating soil productivity would be maintained at the watershed level.

In alternatives B-E no individual watershed would have soil disturbance above 11.5 percent (table 36 and Attachment #1) (3.5 percent below the 15 percent threshold). Soil productivity and watershed function should be maintained. In alternative A, soil disturbance could range from 0 to 33 percent due to unmitigated fire risk.

To adequately protect soil productivity, water quality and watershed function within the Slide Fire affected watersheds, additional soil and water BMPs are now identified (table 2) that should allow adequate time (minimum of 5 years) for protective vegetative ground cover recovery in uplands and streamside management zones so that sediment will be trapped in the vegetative ground cover and not contribute excessive sediment into streamcourses while at the same time protecting soil productivity and watershed function.

- Short-term impacts from soil disturbances would range from and average across watersheds of 2.9 percent (lowest in alternative D) to 3.5 percent (highest in alternative C). All action alternatives provide long term soil improvement and protection of soil productivity and watershed function. Overall, implementation of the proposed action (Alternative B) is expected to maintain, improve and protect long-term soil productivity and watershed function

much better than Alternative A, a little better than D and about the same as Alternative C. However, implementation of Alternative C would probably better restore grasslands than Alternative B. Implementation of Alternatives B and C would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.

- In alternatives B-E no watershed would have soil disturbance above 11percent (4 percent below the 15 percent threshold). Soil productivity and watershed function should be maintained. In alternative A, soil disturbance could range from 0 to 33 percent due to unmitigated fire risk.
- With implementation of identified soil and water BMPs, ADEQ water quality standards would be met.
- Slopes over 15 percent subject to high burn severity could result in accelerated soil loss where erosion rates are higher than tolerable soil loss posing risk to soil productivity. Erosion exceeds tolerable soil loss rates where soils have been exposed to high burn severity predominantly in wildfires on slopes greater than 15 percent posing risk to soil productivity and sediment delivery to connected streamcourses. The highest amounts of high burn severity (predicted up to 33%) are more likely to occur where forests are untreated (Alternative A) than all action alternatives. There would be potential for high burn severity across more acres in alternative D than the other action alternatives because of the continuing accumulation of surface fuels (Lata, 2014).

Since no restoration treatments are proposed for alternative A, there would be no acres of soil disturbance in the treatment area or 6th HUC watershed from mechanical equipment and consequently no direct effects to the soil.

Implementation of Alternative A would not meet the projects purpose and need to improve and protect soil condition, productivity and watershed function nor move towards the desired condition of having soils in satisfactory condition and soil productivity maintained and watersheds properly functioning. It would not meet the projects purpose and need nor move towards the desired conditions of a resilient forest by reducing the potential for undesirable fire behavior and its effects and maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire. Implementation of Alternative A would not increase forest resiliency to natural disturbances and would not improve or protect soil condition and soil productivity or watershed function as well as all other action alternatives. Implementation of Alternative A would put soils and watersheds at risk of continued uncharacteristic wildfires that could result in loss of soil productivity and sediment delivery to connected streamcourses.

Alternative A proposes no 4FRI treatments but on-going treatments (per implementation of forest plans) would continue. Mechanical and prescribed fire treatment acreage would be much less than all other alternatives so soil disturbance would be less than all other alternatives.

However, treating far fewer acres (table 6 and 7) compared to all other alternatives would result in much more detrimental soil disturbance (up to 33% of untreated acres) from effects of uncharacteristic wildfire previously described. Where ongoing acres are treated, soil condition, soil productivity, soil and watershed function would improve but acres treated would be far less than all other alternatives so landscape-wide, implementation of Alternative A is the least effective alternative at improving and protecting soil productivity and watershed function within the 4FRI project area.

Overall, implementation of the action alternatives is expected to maintain, improve and protect long-term

soil productivity and watershed function much better than Alternative A because there will be no improvement in understory response due to thinning and burning activities in the Alternative A (except ongoing treatment acres). Alternative B does propose thinning and prescribed fire activities that are expected to provide long-term soil improvements on about 583,000 acres, while Alternative C proposes about 586,000 acres. Alternative D proposed thinning only on about 385,000 acres, and prescribed burning on about 178,000 acres. Alternative E proposes thinning on about 403,000 acres and prescribed fire on 581,000 acres.

The thinning and burning would provide improvement to soils by improving understory species composition, but does still maintain high fuel loadings that can have high surface fire effects that can damage soils. This is expected to occur on about 25% of the mechanical treatment sites, so Alternative D has effective soil productivity treatments on about 470,000 acres. However, implementation of Alternative C would better restore grasslands and savannas than Alternative B and E and still has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level.

Implementation of alternative D only partially meets the projects purpose and need as well as other action alternatives. Implementation of alternatives B, C and E more fully meet the projects purpose and need and meet the Kaibab and Coconino National Forest forest plan standards and guidelines. Implementation of alternative D would meet the forest plan standards and guidelines but not fully meet the purpose and need of this project.

Overall, implementation of Alternatives B, C and E would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D. Proposed mechanical treatments and prescribed fire

There would be no predicted soil erosion above tolerable soil loss rates where mechanical treatments or prescribed fire are proposed for all action alternatives but there could be up to about 2 percent on slopes greater than 40 percent where burn only occurs.

Across all action alternatives, total average maximum soil disturbance within treatment areas is fairly similar and the extent minimal and ranges from 10.3 percent (Alternative D) to 12.2 percent (Alternative C) (see table 3). In addition, total soil disturbance including cumulative effects are similar across all action alternatives and range from 7.6 percent (alternative D) to 8.2% (Alternative C). Soil disturbance is expected to be short-term (less than 2 - 3 years) and is minimal in extent (less than 15%) and mitigated through implementation of (BMP's) therefore not posing risk to long-term soil productivity or watershed function.

Compared to alternatives A and D, implementation of alternatives B, C or E would do a much more effective job of reducing the risk of uncharacteristic wildfire that could result in loss of soil productivity, downstream water quality and watershed function. Implementation of Alternatives B, C and E would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D. Implementation of alternatives B, C and E would more completely meet the projects purpose and need and meet the Kaibab NF and Coconino NF forest plan standards and guidelines. Implementation of alternative D would meet the forest plan standards and guidelines but not fully meet the purpose and need of this project.

Implementation of Alternative C has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level including cumulative effects as other action alternatives, is short-term (less than 2 - 3 years) and is minimal in extent (less than 15%) and mitigated through implementation of (BMP's) therefore not posing risk to long-term soil productivity or watershed function.

Implementation of Alternative C would best meet the projects purpose and need and improve soil productivity and watershed function and still meet the Kaibab and Coconino national forest plan standards and guidelines. Soil condition, productivity and watershed function would greatly improve, be maintained and protected compared to alternative A. Alternative C would be slightly more beneficial than B and E because more grasslands, savannas and PAC areas would be treated than alternatives B and E resulting in reduced risk of uncharacteristic wildfire and high burn severity that could result in substantial loss of soil.

Consequently maintenance and improvement of soil condition, soil productivity and watershed function would be greatest under alternative C followed by alternatives B and E, a little less for D and no improvement for alternative A except in current and ongoing treatment areas outside of 4Fri proposals.

Cumulative Effects Summary Including the Proposed Action (Alternative B)

At the watershed level, for past, present and reasonably foreseeable actions including the 4-FRI proposed action, the extent (about 8.0 percent) and magnitude of soil disturbance, would not exceed the 15 percent threshold with this project within the cumulative effects boundary and would maintain long-term soil productivity. Further protection of soil resources is provided by the use of Best Management Practices that minimize the potential for soil disturbance. Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds. In addition to the use of BMP's, the completion and implementation of the Travel Management EIS would further reduce the number of acres disturbed by closing and decommissioning roads within the cumulative effects boundary. Because of these facts, this alternative would not provide a detrimental cumulative effect to soil resources within the cumulative effects boundary.

Soils

Alternative A (No Action) - Direct and Indirect Effects-Soils

Since no 4FRI restoration treatments are proposed, there would be no acres of soil disturbance in the treatment area or 6th HUC watershed from mechanical equipment and consequently no direct effects to the soil from implementation of alternative A.

Since there would be no prescribed burns or managed fires, there would be no acres of high burn severity in the treatment areas or 6th HUC watersheds that would indirectly affect soil productivity and water quality. There would be no direct soil or riparian disturbance to springs, seeps, streamcourses or roads.

In the absence of mechanical treatment and fire, ponderosa pine forests identified as dense or with closed stand structures or in fire regime condition class 3 (most of treatments area) would continue to be at risk of large uncharacteristic wildfires. Soils and watersheds burned in the high burn severity class would be devoid of protective ground cover along with water repellent hydrophobic soils leading to accelerated erosion above tolerable soil loss levels, loss of soil productivity and sediment delivered to connected streamcourses from post fire short duration, high intensity storm events.

According to WEPP soil erosion modeling, approximately 24 percent of all soils left untreated could be subject to soil erosion above tolerable levels from severe wildfires where all soils burned under condition of high burn severity. However, uncharacteristic fires on the Coconino National Forest historically have ranged from about 20-45 percent of the burn acreage resulting in high severity fire (Lata 2014). According to the fire specialist report (Lata 2014) about 33 percent of ponderosa pine forest vegetation could burn with high severity effects. Therefore, if a 1,000 acre fire were to occur within the analysis

area, approximately 200 to 300 acres of high severity fire could negatively affect soil properties. It is important to realize that high burn severity from Lata (2014) is an assessment of overstory vegetation and for this soil assessment, high severity is based on the vegetative ground cover present since that is what controls the runoff and watershed condition. Based on recent wildfires, 33 percent is a good, approximate average of high burn severity in wildfires managed primarily for suppression from a watershed burn severity standpoint.

Assuming about 33 percent of wildfires managed primarily for suppression would result in high burn severity; about 9 percent (table 15) of all soils in the approximate 583,000 treatment area could result in soil erosion above threshold levels resulting in loss of soil surface and soil productivity.

Without proposed treatments soil loadings of coarse woody debris would increase over time as new woody debris is created through natural processes (wind, snow breakage, mortality). Indirect effects from no action would be an increase in coarse woody debris to very high tons per acre in both live and dead fuel loads. An increase in coarse woody debris well above the forest standard of 5-7 tons/acre in ponderosa pine could contribute excessive ground fuel loads that would burn at high temperatures resulting in mineralization of surface soil horizon and organic matter where about 50 percent of soil nutrients are stored, sterilization, loss of ground cover, hydrophobic soil conditions. Subsequently, post fire storm events could result in removal of surface soil at an accelerated rate, loss of soil productivity and sediment delivery into connected streamcourses. Lata, 2013 reports coarse woody debris about about 20-30 or more tons/acre could pose a risk to soil and cause mineralization or adverse effects to soil. Reducing coarse woody debris through the proposed action and alternatives B and C to near 5-7 tons/acre is well below the limits of 20 or more tons/acre and would result in reducing risk to soil and would maintain long-term soil productivity. Short term removal of coarse woody material through implementation of action alternatives over a 1-3 year timeframe should not affect short or long-term soil productivity since BMP #35 requires maintenance of 5-7 tons/acre/year.

Current and Ongoing projects proposed outside of 4FRI

Implementation of Alternative A would still allow forest plan implementation of current and ongoing treatments that would produce soil disturbance. The amount of mechanized treatment acres (about 166,897 acres) and prescribed fire acres (about 195,076 acres) are far fewer than other alternatives and consequently would produce less soil disturbance.

However, failure to treat as many acres as alternatives proposed could result in up to 33% of watersheds or treatment areas untreated with detrimental soil disturbance as a result of wildfire.

Implementation of Alternative A would not improve or maintain soil productivity, soil or watershed function as extensively as all other alternatives except in those minimal acres from on-going treatments.

Table 13. Alternative A Summary of 4FRI Direct Soil Effects (acres are approximate)

Indicator	Alternative A Percent of Treatment Area	Alternative A Percent of Watershed			
Soil disturbance from mechanical activities (acres/percent)	0/0	0	Soil disturbance from potential high- severity burns (acres/percent)	0/0	0 potentially 33 without treatment
Total soil disturbance from mechanical activities and high-severity fire (acres/percent)	0/0 but potentially 33	0 potentially .1-31.2			
Potential soil erosion above tolerable soil loss values when 33 percent is burned in high-severity fire (percent)	9	2 (post-treatment)			
Potential soil erosion above tolerable soil loss values when 100 percent is burned in high-severity fire (percent)	24	5 (post-treatment)			

Table 14. Alternative A (No Treatment) 10-Year Return Period Predicted Soil Erosion

Alternative A			
Slope Class (Percent)	Erosion in tons/acre/year	Sediment Leaving Profile in tons/acre/year	T Values in Tons/ Acre/Year
Undisturbed No Fire/No Mechanical treatments			
0-15	0	0	2-4
15-40	0	0	2-4

Alternative A			
40-120	0	0	2-3
High Burn Severity (Alternative A Possible)			
0-15	1.23	.40	2-4
15-40	6.89	2.68	2-4
40-120	15.89	6.23	2-3

Data by 6th HUC watershed is located in Appendix C.

Table 16 predicts soil erosion for the most representative soil in ponderosa pine ecosystems by slope class. Tolerable soil loss values are **2-4 tons/acre** depending on soil type. Cells shaded gray have erosion exceeding tolerable soil loss. Soil loss exceeding tolerable amounts erode faster than renew themselves resulting in accelerated soil loss and loss of soil productivity as well as deliver high amounts of sediment to connected streamcourses.

Table 15 shows left untreated, about 9% of the treatment area would erode above tolerable soil loss thresholds at 33% high severity or 24% at 100% high severity posing substantial risk to soil productivity. Proposed treatments (B-E) would result in only about 2% soil loss above soil loss tolerance thresholds protecting soil productivity and water quality. See attachment #2 for calculations

In the absence of fire, predicted soil loss rates are below tolerable amounts on all slopes and soils. Erosion exceeds tolerable soil loss rates only where soils have been exposed to high burn severity predominantly in wildfires on slopes greater than 15 percent and on slopes greater than 40 percent (shaded gray). High burn severity is more likely to occur where forests are untreated (Alternative A) and risk soil loss above tolerable levels resulting in loss of soil productivity and sediment delivery to connected streamcourses.

Forests generally have very low erosion rates unless they are disturbed (USDA 2000) and at <http://forest.moscowfsl.wsu.edu/fswepp/docs/distweppdoc.html>. Common disturbances include prescribed and wild fire, and harvesting operations.

See Table 6 and 7 for a comparison of effects to soil condition, soil productivity and watershed function by alternative.

Implementation of Alternative A would not meet the projects purpose and need to improve and protect soil condition, productivity and watershed function nor move towards the desired condition of having soils in satisfactory condition and soil productivity maintained and watersheds properly functioning. It would not meet the projects purpose and need nor move towards the desired conditions of a resilient forest by reducing the potential for undesirable fire behavior and its effects and maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire. Implementation of Alternative A would not increase forest resiliency to natural disturbances and would not improve or protect soil condition and soil productivity or watershed function as well as all other action alternatives Implementation of Alternative A would put soils and watersheds at risk of continued uncharacteristic wildfires that could result in loss of soil productivity and sediment delivery to connected streamcourses.

Summary

Since no restoration treatments are proposed, there would be no acres of soil disturbance in the treatment area or 6th HUC watershed from mechanical equipment and consequently no direct effects to the soil from implementation of alternative A. There would be no direct soil or riparian disturbance to springs, seeps, streamcourses or roads. Since there would be no prescribed burns or managed fires, there would be no acres of high burn severity in the treatment areas or 6th HUC watersheds that would indirectly affect soil productivity and water quality.

However, in the absence of mechanical treatment and fire, ponderosa pine forests would continue to be at risk of large uncharacteristic wildfires. Soils and watersheds burned in the high burn severity class would be devoid of protective ground cover along with water repellent hydrophobic soils leading to accelerated erosion above tolerable soil loss levels, loss of soil productivity and sediment delivered to connected streamcourses from postfire storm events. Approximately 24 percent of all soils left untreated could be subject to soil erosion above tolerable levels from severe wildfires. However, assuming about 33 percent of wildfires would result in high burn severity; about 9 percent of all soils could result in soil erosion above threshold levels resulting in loss of soil surface and soil productivity.

Implementation of Alternative A would not meet the projects purpose and need to improve and protect soil condition, productivity and watershed function nor move towards the desired condition of having soils in satisfactory condition and soil productivity maintained and watersheds properly functioning. It would not meet the projects purpose and need nor move towards the desired conditions of a resilient forest by reducing the potential for undesirable fire behavior and its effects and maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire. Implementation of Alternative A would not increase forest resiliency to natural disturbances and would not improve or protect soil condition and soil productivity or watershed function as well as all other action alternatives. Implementation of Alternative A would put soils and watersheds at risk of continued uncharacteristic wildfires that could result in loss of soil productivity and sediment delivery to connected streamcourses. Implementation of Alternative A would not reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows).

Current and Ongoing projects proposed outside of 4FRI

Implementation of Alternative A would still allow forest plan implementation of current and ongoing treatments that would produce soil disturbance. The amount of mechanized treatment acres (about 166,897 acres) and prescribed fire acres (about 195,076 acres) are far fewer than other alternatives and consequently would produce less soil disturbance.

However, failure to treat as many acres as alternatives proposed could result in up to 33% of watersheds or treatment areas untreated with detrimental soil disturbance as a result of wildfire.

Implementation of Alternative A would not improve or maintain soil productivity, soil or watershed function as extensively as all other alternatives except in those minimal acres from on-going treatments.

Cumulative Effects

The geographic setting and boundary for the cumulative effects analysis will all 82 6th HUC watersheds listed in Appendix C for a total of about 2,067,000 acres. The timeframe for past actions is 2-3 years based on vegetative and coarse woody debris recovery of the site. Vegetative recovery after fuel treatments is generally very rapid, with erosion rates typically dropping to pre-fire levels within 1 to 2 years (USDA 1996). Because no actions are proposed, no direct or indirect cumulative effects are created. However, lack of treatments would likely increase risk of uncharacteristic fires resulting in loss of soil

productivity and watershed function following wildfires that most likely would result in substantial areas of high burn severity with adverse consequences described under Alternative A and elsewhere in this report.

Current and Ongoing projects proposed outside of 4FRI

Implementation of Alternative A would still allow forest plan implementation of current and ongoing treatments that would produce soil disturbance. The amount of mechanized treatment acres (about 166,897 acres) and prescribed fire acres (about 195,076 acres) are far fewer than other alternatives and consequently would produce less soil disturbance.

However, failure to treat as many acres as alternatives proposed could result in up to 33% of watersheds or treatment areas untreated with detrimental soil disturbance as a result of wildfire.

Implementation of Alternative A would not improve or maintain soil productivity, soil or watershed function as extensively as all other alternatives except in those minimal acres from on-going treatments.

Alternative B (Proposed Action) - Direct and Indirect Effects

As mentioned under the Methodology and assumptions section earlier, proposed mechanical treatments were aggregated into 5 major treatments types because they have similar soil disturbances and effects to the soil.

Appendix A displays erosion hazard, natural regeneration potential, timber harvest limitations and strata specific BMPs identified to mitigate adverse effects to soils. Appendix B displays soil taxonomic classification, potential plant community and soil condition by strata. The description of alternatives section in the FEIS details treatment type acreage for alternative B. Attachment 1 displays soil disturbance by treatment type, treatment area and 6th HUC watershed including cumulative effects. Attachment 2 displays WEPP soil erosion modeling results. Attachment 3 displays soil interpretations by treatment type, strata, TES map unit and 6th HUC watershed.

The effects to the soil resource are analyzed by treatment type disclosing predicted soil disturbance by treatment area and watershed, predicted soil loss (erosion) above tolerable soil loss thresholds and dominant erosion hazard, timber harvest limitations and BMPs identified to mitigate possible adverse soil impacts from the treatment.

Soil disturbance is calculated and predicted based on all treatments occurring during the first year including prescribed fire and predicts the worst case scenario. In reality, prescribed fire would not occur during the same year as mechanical treatments within the same watershed but likely year 2 or 3 and would not result in cumulative soil disturbance. In addition, mechanical treatments may not all occur during the same year in the same watershed

The following analysis discloses by alternative, soil disturbance and predicted effects to soil resources by treatment type. A summary of the direct effects to soils and watershed function from soil disturbance and erosion above tolerable, is compared treatment area wide and by watershed (table 6, 7) following the analysis by treatment type.

The 4FRI treatment area occurs within 20 fifth code watersheds (table 17) and 82 sixth code watersheds (table 11). Treatments are any actions where ground disturbance will occur and include mechanical treatments and fire treatments, as well as road and channel treatments. Fifth code HUC watersheds proposed (Alt B) for the most treatment (more than 33 percent) include Beaver Creek, Heather Wash, Sycamore Creek, Heather Wash, Walnut Creek and Spring Valley Wash but would still be less than 50 percent of the entire watershed. All other watersheds would have treatments ranging from less than 1 percent to about 27 percent.

Table 15. 5th HUC Watersheds, Acres and Percent Proposed for Treatment by Alternative

Alternative B 5th Code Watershed Name	Treatment Acres	5th Code Acres	Treatment % of 5th Code
Ash Fork Draw-Jumbo Tank	3,119	45,088	6.9%
Beaver Creek	40,840	107,659	37.9%
Bright Angel Creek-Colorado River	36	22,311	0.2%
Canyon Diablo	21,403	126,805	16.9%
Cataract Creek	27,333	101,837	26.8%
Deadman Wash	23,910	88,041	27.2%
Grindstone Wash-Verde River	1,166	12,765	9.1%
Heather Wash	31,837	89,676	35.5%

Hell Canyon	19,097	155,706	12.3%
Kana-a Wash-Little Colorado River	18,721	78,665	23.8%
Lee Canyon-Little Colorado River	3,870	29,537	13.1%
Miller Wash	7,786	31,220	24.9%
Oak Creek	71,840	253,401	28.4%
Red Horse Wash	7,835	60,457	13.0%
Rio de Flag	30,429	128,758	23.6%
San Francisco Wash	15,917	75,754	21.0%
Spring Valley Wash	27,908	70,977	39.3%
Sycamore Creek	138,938	305,492	45.5%
Upper Cedar Wash	37,173	158,553	23.4%
Walnut Creek	54,172	124,313	43.6%
Grand Total	583,330	2,067,015	28.2%

Alternative C 5th Code Watershed Name	Treatment Acres	5th Code Acres	Treatment % of 5th Code
Ash Fork Draw-Jumbo Tank	3,119	45,088	6.9%
Beaver Creek	42,812	107,659	39.8%
Bright Angel Creek-Colorado River	36	22,311	0.2%
Canyon Diablo	21,716	126,805	17.1%
Cataract Creek	27,331	101,837	26.8%
Deadman Wash	23,911	88,041	27.2%
Grindstone Wash-Verde River	1,166	12,765	9.1%
Heather Wash	31,837	89,676	35.5%
Hell Canyon	19,097	155,706	12.3%
Kana-a Wash-Little Colorado River	18,721	78,665	23.8%
Lee Canyon-Little Colorado River	3,870	29,537	13.1%
Miller Wash	7,786	31,220	24.9%
Oak Creek	72,915	253,401	28.8%
Red Horse Wash	7,835	60,457	13.0%
Rio de Flag	30,437	128,758	23.6%
San Francisco Wash	15,917	75,754	21.0%
Spring Valley Wash	27,930	70,977	39.4%
Sycamore Creek	137,872	305,492	45.1%
Upper Cedar Wash	37,264	158,553	23.5%
Walnut Creek	54,628	124,313	43.9%
Grand Total	586,200	2,067,015	28.4%

Alternative D 5th Code Watershed Name	Treatment Acres	5th Code Acres	Treatment % of 5th Code
Ash Fork Draw-Jumbo Tank	1,021	45,088	2.3%
Beaver Creek	7,706	107,659	7.2%
Bright Angel Creek-Colorado River	36	22,311	0.2%
Canyon Diablo	2,736	126,805	2.2%
Cataract Creek	9,011	101,837	8.8%
Deadman Wash	15,705	88,041	17.8%
Grindstone Wash-Verde River	46	12,765	0.4%
Heather Wash	7,961	89,676	8.9%
Hell Canyon	4,442	155,706	2.9%
Kana-a Wash-Little Colorado River	18,505	78,665	23.5%
Lee Canyon-Little Colorado River	3,506	29,537	11.9%
Miller Wash	5,089	31,220	16.3%
Oak Creek	5,891	253,401	2.3%
Red Horse Wash	1,567	60,457	2.6%
Rio de Flag	19,575	128,758	15.2%
San Francisco Wash	12,160	75,754	16.1%
Spring Valley Wash	6,528	70,977	9.2%
Sycamore Creek	34,396	305,492	11.3%
Upper Cedar Wash	16,402	158,553	10.3%
Walnut Creek	6,162	124,313	5.0%
Grand Total	178,445	2,067,015	8.6%

Alternative E 5th Code Watershed Name	Treatment Acres	5th Code Acres	Treatment % of 5th Code
Ash Fork Draw-Jumbo Tank	3,119	45,088	6.9%
Beaver Creek	40,840	107,659	37.9%
Bright Angel Creek-Colorado River	36	22,311	0.2%
Canyon Diablo	21,405	126,805	16.9%
Cataract Creek	27,332	101,837	26.8%
Deadman Wash	23,910	88,041	27.2%
Grindstone Wash-Verde River	1,166	12,765	9.1%
Heather Wash	31,837	89,676	35.5%
Hell Canyon	19,097	155,706	12.3%
Kana-a Wash-Little Colorado River	18,721	78,665	23.8%
Lee Canyon-Little Colorado River	3,870	29,537	13.1%
Miller Wash	7,786	31,220	24.9%
Oak Creek	71,840	253,401	28.4%
Red Horse Wash	7,835	60,457	13.0%

Rio de Flag	30,429	128,758	23.6%
San Francisco Wash	15,917	75,754	21.0%
Spring Valley Wash	27,907	70,977	39.3%
Sycamore Creek	137,126	305,492	44.9%
Upper Cedar Wash	37,172	158,553	23.4%
Walnut Creek	53,674	124,313	43.2%
Grand Total	581,019	2,067,015	28.1%

Grassland Restoration:

The following effects of grassland restoration apply to Alternatives B, and D. About 11,200 acres are proposed for grassland restoration in several 6th HUC watersheds (see Attachment #1). Harvesting methods vary in degree of disturbance (Elliot 1999). Because this treatment is expected to be non-commercial, trees would be dropped and left on site. Fuel treatments may include lop and scatter, or machine pile concentrations. The machine piles may be either burned or chipped and removed by truck.

Harvesting either by hand or a single pass with a mechanized shear would have limited impact to soils. Some soils have moderate timber harvest restrictions due to fine textured or clayey soils. Mechanized falling can cause compaction when soils are wet with a single pass. Soil Disturbance associated with harvesting may remove a small amount of protective vegetative ground cover resulting in bare soil over the short-term (less than 3 years). Where grassland restoration occurs in the treatment area, approximately 336 acres or 3 percent of the soil is expected to be disturbed from hand thinning or mechanical equipment when removing trees. The bare soil exposed during treatment can be expected to respond by increasing herbaceous vegetation and litter including grass and forb production after the first year. Furthermore, herbaceous vegetation can be expected to expand in areas adjacent to areas where trees have been removed because there would be less competition for soil moisture and nutrients from trees. The increase in herbaceous vegetation and protective vegetative ground cover will better stabilize the soil and improve vegetation composition and productivity.

Treatment area wide, the amount of soil disturbance exposing bare soil is predicted to be about 336 acres or .06 percent and varies by watershed (Attachment #1 calculation). However, the vast majority of soils occur in areas with slight erosion hazard (see Attachment #3) indicating exposing bare soil through treatment would not result in accelerated soil loss or loss of soil productivity. There are no acres of treatment proposed on severe erosion hazards soils in this alternative.

A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Since the disturbance is less than 15 percent, soil productivity is expected to be maintained. Therefore, soil disturbance associated with grassland restoration does not pose a risk to long-term soil productivity. Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis.

Resource protection measures and BMP's are identified and are expected to mitigate erosion, loss of soil productivity and reduce nonpoint source water pollution. They are listed in table 3 for all action alternatives and by strata in Appendix A.

Harvesting operation BMP's specific for grassland restoration that would be implemented include the following, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 28, and 39.

Soil erosion modeling (Attachment #2) indicates that the grassland restoration will not result in soil erosion above tolerable soil loss rates and therefore soil productivity would be maintained.

Most soil conditions are satisfactory (see Attachment #3) but there are some areas with impaired or unsatisfactory soil conditions. Increased herbaceous cover improves soil infiltration and nutrient cycling because an increase in grass species corresponds to a larger root network essential in loosening up and improvement of soil structure and promotes better water infiltration, air exchange and soil microbial cycling of nutrients. Consequently, where soil conditions are impaired or unsatisfactory, their condition can be expected to improve both in the short and long-term (greater than 2 years).

Many 6th HUC watersheds are functional at risk and a few impaired (see Appendix C) due in part to overstocked ponderosa pine forests, road networks that alter hydrology and accelerate erosion, and less

than satisfactory soil condition. Reducing tree canopy cover and associated hazardous fuels would move the grassland towards a fire adapted ecosystem. Restoration would reduce the risk of uncharacteristic, high severity wildfire that could result in removal of protective vegetative ground cover, and accelerate soil erosion and sediment delivery into connected channels thereby reducing soil productivity and water quality.

Overall, grassland restoration along with other proposed treatments can be expected to increase ecosystem resiliency to uncharacteristic fire and move soils and watersheds towards satisfactory and functional condition in both the short and long-term and maintain or improve long-term soil productivity, water quality and watershed function. A threshold of 15percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Since the disturbance is less than 15 percent, soil productivity is expected to be maintained. Therefore, soil disturbance associated with grassland restoration does not pose a risk to long-term soil productivity.

Ponderosa Pine Restoration – Low-Intensity Thinning

Approximately 175,000 acres are proposed for low intensity thinning restoration in the ponderosa pine vegetation type. Treatment types within low intensity thinning are listed in table 18 below. Of these acres, approximately 30,200 acres (table 18) are on severe erosion hazards soil types (acres of specific treatment types where severe erosion hazards occur are listed below).

Table 16. Acres of Low-Intensity Treatments with Severe Erosion Hazard Soils

TREATMENT TYPE	ACRES	TREATMENT TYPE	ACRES
dPFA - IT10	40	PFA - IT10	63
dPFA - IT25	11	PFA - IT25	137
dPFA - SI10	1	PFA - PineSage	11
dPFA - UEA10	27	PFA - SI25	77
dPFA - UEA25	96	PFA - UEA10	43
IT10	1,038	PFA - UEA25	304
IT25	1,422	PineSage	129
MSO Restricted Trt	15,872	SI10	203
MSO Target Trt	1,522	SI25	552
MSO Threshold Trt	816	UEA10	1,827
PAC - Mechanical	2,979	UEA25	3,063
		Grand Total	30,233

Thinning can be done by hand/or mechanized felling (shear) and mechanized skidding of the logs to landings can occur. Best management practice monitoring on the Mogollon Rim Ranger District (Jagow 1994, Fleishman 1996, Fleishman 2005) has shown that ground disturbance (skidded to mineral soil) and compaction may occur on the approximately 10-15 percent of the thinning area when mechanized skidding and harvesting occur when designated ski trails are utilized. Froehlich et al. (1981) concurs that designating skid trails (BMP #28) reduces negative impacts from skidding operations.

Mechanized cutting and whole tree skidding takes entire trees to the landing, where they are subsequently delimbed at the landing. Mechanized cutting and processing the log at stump, with a forwarder gathering the logs and taking them to the landing may also occur. Machine piling of created slash from thinning activities disturbs the greatest amount of ground through re-arrangement of the soil surface. The amount of acres of ground disturbance would vary by the type of harvesting method, as well as the type of piling.

Lop and scatter could occur on limited areas across the landscape as well. Conventional logging and skidding would have more acres of ground disturbance than mechanized logging with whole-tree skidding. However, all operators in the area use mechanized equipment, so conventional logging will not be analyzed.

Soil disturbance is calculated to be approximately 21,000 acres or about 3.6 percent of entire treatment area and much less and varies by 6th HUC watershed (Attachment #1 calculation). Use of mechanized equipment removes a portion of the protective vegetative ground cover thereby leaving the soil bare of vegetative ground cover and at risk of accelerated soil erosion. Where low intensity thinning occurs in the treatment area, approximately 10-15 percent of the soil is expected to be disturbed from hand thinning or mechanical equipment when removing trees in the short-term. However, only about 10-15 percent of the immediate treatment area and only 3.6 percent of the entire treatment area could result in soil disturbance. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity is measurable and may be appreciably reduced. Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis. Since soil disturbance treatment area wide is about 3.6 percent, and 10-15 percent on-site and less than 15 percent, low intensity thinning by itself does not pose a risk to soil resource and soil productivity is expected to be maintained. The amount of bare soil associated with treatment disturbance is expected to rapidly decrease, as would any erosion that is tied to the soil disturbance (approximately 1-2 years to recover) (Elliot personal communication, 2012, Elliot et al.1999). While 10-15 percent of the immediate area may be disturbed in the short term, the area is expected to quickly be covered with new needle duff and improved herbaceous vegetative cover, improving soil nutrient cycling function and stabilizing soil and maintaining and improving soil productivity in the longer term (more than 2 years). Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis.

It is important to realize that not all ground disturbing treatments would occur in the same year and the 3.6 percent and 10-15 percent disturbance represents all treatments implemented the first year as the worst case scenario of disturbance. Total mechanized treatments are expected to occur on approximately 30,000 acres per year across the entire area by all treatment types, therefore the amount of acres disturbed per year is less than the worst-case scenario. Prescribed burning would occur after year one and some treatments may be staggered in time and place allowing time enough for the soil to begin dropping pine needle cast and recover. Identified and implemented BMPs are expected to mitigate possible negative effects to soils from mechanized harvesting including those areas that occur on soils with severe erosion hazard.

In addition, WEPP soil erosion modeling (Attachment #2) indicates soils would not erode above tolerable or threshold levels and therefore, long-term soil productivity would be maintained. Soils with severe soil erosion hazards occur on total of about 30,200 acres in this treatment type (table 18) and are at greatest risk of accelerated erosion above tolerable levels if and when all of the vegetative ground cover was to be removed. Using the same assumption we can expect about 3,800 acres of ground disturbance on severe erosion soil types within this treatment type. However, a majority of the ground disturbance in this treatment only would remove or disturb a small portion of vegetative ground cover and site specific BMP's listed below would minimize and mitigate ground disturbance and therefore, would not pose a risk to long-term soil productivity.

Resource protection measures and identified BMP's (table 2 and listed below) are identified and are expected to mitigate erosion, minimize the impacts of harvest actions on severe erosion hazard soils, loss of soil productivity and reduce nonpoint source water pollution. They are listed in table 3 for all action alternatives and by strata in Appendix A. Harvesting operation BMP's specific for ponderosa pine restoration that would be implemented include the following, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35,

36, 38 and 28.

Compaction is expected to occur from harvest and skidding activities. Designated skid trails would limit the extent of compaction during operations by limiting the amount of disturbed ground. Created slash would be whole-tree skidded to the landing and piled at this site. Compaction is limited in piling activities because of the use of track equipment, but can occur with track equipment if machine piling is done when soil conditions are wet.

Some soils have moderate or severe timber harvest restrictions due to fine textured or clayey soils are common in this treatment type (Attachment #3). Mechanized falling can cause compaction when soils are wet with a single pass. Resource protection measures and BMP's identified to mitigate timber harvest limitations are listed in Appendix A for all action alternatives and by strata in Appendix A.

Most soil conditions are satisfactory (see Attachment #3) but there are some areas with impaired or unsatisfactory soil conditions. Low intensity thinning would result in increased herbaceous cover in tree interspaces because there would be less competition for soil moisture and nutrients compared to currently dense forests (please see the wildlife and vegetation specialist reports for a discussion of understory response from thinning). The thinning would improve soil infiltration and nutrient cycling because an increase in grass species corresponds to a larger root network essential in loosening up and improvement of soil structure and promotes better water infiltration, air exchange and soil microbial cycling of nutrients (Elliot et al. 1999). Consequently, where soil conditions are impaired or unsatisfactory, their condition can be expected to improve both in the short and long-term (greater than 2 years). The amount of coarse woody material has been modeled and quantified but maintenance of 5-7 tons/acre of coarse woody material will improve soil nutrient cycling (USDA 1994a) and listed as BMP in table 3.

Many 6th HUC watersheds are functional at risk and a few impaired (see Appendix C) due in part to overstocked ponderosa pine forests, road networks that alter hydrology and accelerate erosion, and less than satisfactory soil condition. Reducing tree canopy cover and associated hazardous fuels would move the ponderosa pine forest towards a fire adapted ecosystem. Restoration would reduce the risk of uncharacteristic, high severity wildfire that could result in removal of protective vegetative ground cover, and accelerate soil erosion and sediment delivery into connected channels thereby reducing soil productivity and water quality.

Overall, ponderosa pine low intensity restoration along with other proposed treatments can be expected to increase ecosystem resiliency to uncharacteristic fire and move soils and watersheds towards satisfactory and functional condition in both the short and long-term and maintain or improve long-term soil productivity and water quality. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Since soil disturbance is about 3.6 percent, and less than 15 percent, high intensity thinning by itself does not pose a risk to soil resource and soil productivity is expected to be maintained.

Ponderosa Pine Restoration on Slopes Greater than 40 Percent

For those acres proposed for treatment above 40 percent (acres in the Dry Lake Hills area), hand sawyers or possible cable and/or helicopter logging on up to 99 acres would implement thinning and would cause minimal soil disturbance from equipment use and therefore would not cause erosion above tolerable levels. These areas have severe erosion hazard so identified BMPs would be mitigated including slash up to 5 tons per acre can be spread to mitigate ground disturbance on steep slopes. Therefore, accelerated erosion above tolerable levels would not occur and soil productivity would be maintained.

Ponderosa Pine Restoration – High-Intensity Thinning

Approximately 154,700 acres are proposed for high intensity thinning restoration in the ponderosa pine vegetation type. Treatment types included in high intensity treatment are listed in table 19. Of these acres, approximately 18,400 acres are on severe erosion hazards soil types (acres of specific treatment types where severe erosion hazards occur are listed below).

Table 17. Acres of High-Intensity Treatments with Severe Erosion Hazard Soils

TREATMENT TYPE	ACRES
dPFA - IT40	31
dPFA - UEA40	276
IT40	4,672
PFA - IT40	356
PFA - SI40	49
PFA - UEA40	1,075
SI40	1,546
UEA40	10,090
WUI55	317
Grand Total	18,412

Thinning can be done by hand/or mechanized felling (shear) and mechanized skidding of the logs to landings. Best management practice monitoring on the Mogollon Rim Ranger District (Jagow 1994, Fleishman 1996, Fleishman 2005) and observations and air photo interpretation has shown that ground disturbance (skidded to mineral soil) and compaction may occur on the approximately 10-20 percent of the thinning area when mechanized skidding and harvesting occur when designated ski trails are utilized. There may be areas where the amount of ground disturbance exceeds 20 percent but the 10-20 percent is an average across the entire area. Froehlich et al. (1981) concurs that designating skid trails (BMP #28) reduces negative impacts to soils from skidding operations.

Harvesting and treatment of slash of high intensity areas is the same as low intensity areas—mechanized harvest, with slash either being piled or chipped and removed. Lop and scatter could occur on limited areas across the landscape.

Soil disturbance from high intensity thinning is calculated to be approximately 23,000 acres (attachment #1) or about 3.9 percent (highest of all treatment types) of the entire treatment area.. Use of mechanized equipment removes a portion of the protective vegetative ground cover thereby leaving the soil bare of vegetative ground cover and at risk of accelerated soil erosion. Where high intensity thinning would occur, soil disturbance could range from 10-20 percent but only amounts to 3.9 percent of the treatment area and much less by watershed. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity is measurable and may be appreciably reduced. Since soil disturbance treatment area-wide is about 3.9 percent, high intensity thinning by itself does not pose a risk to soil productivity. Soil disturbance in the immediate treatment area may range from 10-20 percent and above the 15 percent threshold guideline signifying possible loss of soil productivity at the site level, but across the landscape is well below the threshold.

It is important to realize that not all ground disturbing treatments will occur in the same year and the 3.9 percent and 10-20 percent disturbance represents all treatments implemented the first year as the worst case scenario of disturbance. Prescribed burning will occur after year one and some treatments may be staggered in time and place allowing time enough for the soil to begin dropping pine needle cast and recover. Identified and implemented BMPs are expected to mitigate possible negative effects to soils,

including and especially soils that have a severe erosion hazard.

The amount of bare soil associated with treatment disturbance is expected to rapidly decrease, as will any erosion that is tied to the soil disturbance (approximately 1-2 years to recover) (Elliot, 1999). While 10-20 percent of the immediate area may be disturbed in the short term, the area is expected to quickly be covered with new needle duff and improved herbaceous vegetative cover, improving soil nutrient cycling function and stabilizing soil and maintaining and improving soil productivity in the longer term (more than 2 years) (Elliot et al. 1999). For this Alternative, total soil disturbance for all treatments is displayed and analyzed following all individual treatment.

In addition, WEPP soil erosion modeling (table 14 and Attachment #2) indicates soils would not erode above tolerable or threshold levels and therefore, long-term soil productivity would be maintained. Soils with severe soil erosion hazards occur on about 18,400 acres in this treatment type (table 19) and are at greatest risk of accelerated erosion above tolerable levels if and when all of the vegetative ground cover were to be removed. However, with application of BMP's, this treatment would remove or disturb a small portion of vegetative ground cover and therefore, would not pose a risk to long-term soil productivity.

Resource protection measures and BMP's are identified and are expected to mitigate erosion and potential impacts to severe erosion soil types, loss of soil productivity and reduce nonpoint source water pollution. They are listed in table 3 for all action alternatives and by strata in Appendix A. Harvesting operation BMP's specific for ponderosa pine restoration that would be implemented include the following, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 38 and 28.

Compaction is expected to occur from harvest and skidding activities. Designated skid trails would limit the extent of compaction during operations by limiting the amount of disturbed ground. Created slash would be whole-tree skidded to the landing and piled at this site. Compaction is limited in piling activities because of the use of track equipment, but can occur with track equipment if machine piling is done when soil conditions are wet.

Many soils have moderate or severe timber harvest restrictions due to fine textured, or clayey soils are common in this treatment type (Attachment #3). Mechanized falling can cause compaction when soils are wet with a single pass. Resource protection measures and BMP's identified to mitigate timber harvest limitations are listed in Appendix A for all action alternatives and by strata in Appendix A.

Most soil conditions are satisfactory (see Attachment #3) but there are some areas with impaired or unsatisfactory soil conditions. High intensity thinning would result in increased herbaceous cover in tree interspaces because there would be less competition for soil moisture and nutrients compared to currently dense forests (please see the Wildlife and Vegetation specialist reports for a discussion of understory response from thinning). The thinning would improve soil condition and productivity for soil infiltration and nutrient cycling because an increase in grass species corresponds to a larger root network essential in loosening up and improvement of soil structure and promotes better water infiltration, air exchange and soil microbial cycling of nutrients (Elliot et al. 1999). Consequently, where soil conditions are impaired or unsatisfactory, their condition can be expected to improve both in the short and long-term (greater than 2 years).

The amount of coarse woody material has been modeled and quantified but maintenance of 5-7 tons/acre of coarse woody material will reduce risk of uncharacteristic fires that may damage soil and should improve soil nutrient cycling (USDA 1994a) and listed as BMP in table 3.

Many 6th HUC watersheds are functional at risk and a few impaired (see Appendix C) due in part to overstocked ponderosa pine forests, road networks that alter hydrology and accelerate erosion, and less

than satisfactory soil condition. Reducing tree canopy cover and associated hazardous fuels would move the ponderosa pine forest towards a fire adapted ecosystem. Restoration would reduce the risk of uncharacteristic, high severity wildfire that could result in removal of protective vegetative ground cover, and accelerate soil erosion and sediment delivery into connected channels thereby reducing soil productivity and water quality. Consequently, watershed function would be greatly improved.

Overall, ponderosa pine high intensity restoration along with other proposed treatments can be expected to increase ecosystem resiliency to uncharacteristic fire and move soils and watersheds towards satisfactory and functional condition in both the short and long-term and maintain or improve long-term soil productivity and water quality. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Since soil disturbance is about 3.9 percent, and less than 15 percent, high intensity thinning by itself does not pose a risk to soil resource and soil productivity is expected to be maintained. Therefore, soil disturbance associated with high intensity thinning does not pose a risk to long-term soil productivity

Savanna Treatment

Approximately 45,470 acres are proposed for restoration in the ponderosa pine vegetation type. Of these acres, approximately 4140 acres (table 20) are on severe erosion hazards soil types (Acres of specific treatment types where severe erosion hazards occur are listed below).

Table 18. Acres of Savanna Treatment with Severe Erosion Hazard Soils

TREATMENT TYPE	ACRES
Savanna	4,143
Grand Total	4,143

Thinning can be done by hand/or mechanized felling (shear) and mechanized skidding of the logs to landings can occur. Since this treatment strives to maintain 70-90 percent in openings, soil disturbance is estimated to be higher than low intensity thinning and about equal to high intensity thinning ranging from 10-20 percent in the immediate treated area. Observations and best management practice monitoring on the Mogollon Rim Ranger District (Jagow 1994, Fleishman 1996, Fleishman 2005) has shown that ground disturbance (skidded to mineral soil) and compaction may occur on the approximately 10-20 percent of the thinning area when mechanized skidding and harvesting occur when designated ski trails are utilized. Froehlich et al. (1981) concurs that designating skid trails (BMP #28) reduces negative impacts from skidding operations.

The method of harvest (mechanized cutting and whole tree skidding) is similar to what is described under high intensity thinning. Soil disturbance is calculated to be approximately 6,811 acres or about 1.2 percent of entire treatment area and much less and varies by 6th HUC watershed (Attachment #1 calculation). A threshold of 15percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity is measurable and may be appreciably reduced. Since soil disturbance is about 1.2 percent, and less than 15 percent, savanna treatment by itself does not pose a risk to soil resource and soil productivity is expected to be maintained. Soil disturbance in the immediate treatment area may range from 10-20 percent and above the 15percent threshold guideline signifying possible loss of soil productivity.

It is important to realize that not all ground disturbing treatments will occur in the same year and the 1.2 percent and 10-20 percent disturbance represents all treatments implemented the first year as the worst case scenario of disturbance. Identified and implemented BMPs are expected to mitigate possible negative effects to soils. Similar to high intensity thinning, the amount of bare soil associated with treatment

disturbance is expected to rapidly decrease, as will any erosion that is tied to the soil disturbance (approximately 1-2 years to recover) (Elliot, 1999). While 10-20 percent of the immediate area may be disturbed in the short term, the area is expected to quickly be covered with new needle duff and improved herbaceous vegetative cover, improving soil nutrient cycling function and stabilizing soil and maintaining and improving soil productivity in the longer term (more than 2 years) (Elliot et al. 1999). Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis.

In addition, WEPP soil erosion modeling (table 12 and Attachment #2) indicates soils would not erode above tolerable or threshold levels and therefore, long-term soil productivity would be maintained. Soils with moderate or severe soil erosion hazards are common in this treatment type (Attachment #3) and at greatest risk of accelerated erosion above tolerable levels if and when all of the vegetative ground cover were to be removed. However, this treatment only would remove or disturb a small portion of vegetative ground cover and therefore, would not pose a risk to long-term soil productivity.

Resource protection measures and BMP's are identified and are expected to mitigate erosion, minimize and harvest impact on severe erosion hazards soils, loss of soil productivity and reduce nonpoint source water pollution. They are listed in table 3 and by strata in Appendix A. Harvesting operation BMP's specific for savanna restoration that would be implemented include the following, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, and 28.

Soil erosion modeling indicates that the restoration would not result in soil erosion above tolerable soil loss rates and therefore soil productivity from an erosional standpoint would be maintained.

Compaction is expected to occur from harvest and skidding activities. Designated skid trails would limit the extent of compaction during operations by limiting the amount of disturbed ground. Created slash would be whole-tree skidded to the landing and piled at this site. Compaction is limited in piling activities because of the use of track equipment, but can occur with track equipment if machine piling is done when soil conditions are wet.

Many soils have moderate or severe timber harvest restrictions due to fine textured, or clayey soils are common in this treatment type (Attachment #3). Mechanized falling can cause compaction when soils are wet with a single pass. Resource protection measures and BMP's identified to mitigate timber harvest limitations are listed in Appendix A for all action alternatives and by strata in Appendix A.

Most soil conditions are satisfactory (see Attachment #3) but there are some areas with impaired or unsatisfactory soil conditions. Savanna treatment would result in increased herbaceous cover in tree interspaces (more so than low and high intensity thinning) because there would be less competition for soil moisture and nutrients compared to currently dense forests (please see the Wildlife and Vegetation specialist reports for a discussion of understory response from thinning). The thinning would improve soil infiltration and nutrient cycling because an increase in grass species corresponds to a larger root network essential in loosening up and improvement of soil structure and promotes better water infiltration, air exchange and soil microbial cycling of nutrients (Elliot et al. 1999). Consequently, where soil conditions are impaired or unsatisfactory, their condition can be expected to improve both in the short and long-term (greater than 2 years). The amount of coarse woody material has been modeled and quantified but maintenance of 5-7 tons/acre of coarse woody material will reduce risk of damage to soil from uncharacteristic fires resulting in high severity and should improve soil nutrient cycling (USDA 1994a) and listed as BMP #7 in table 2.

Overall, savanna restoration along with other proposed treatments can be expected to increase ecosystem resiliency to uncharacteristic fire and move soils and watersheds towards satisfactory and functional condition in both the short and long-term and maintain or improve long-term soil productivity and water

quality. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Since soil disturbance is about 1.2 percent, and less than 15 percent, savanna thinning by itself does not pose a risk to soil resource and soil productivity is expected to be maintained. Therefore, soil disturbance associated with savanna restoration does not pose a risk to long-term soil productivity

Aspen Treatments

Approximately 1,227 acres are proposed for restoration in all four action Alternatives (B, C, D and E). Of these acres, approximately 361 acres are on severe erosion hazards soil types (Acres of specific treatment types where severe erosion hazards occur are listed below). Implementation of identified BMPs (table 3 and Appendix A and listed in this section) is expected to mitigate the risk of accelerated erosion on these soils and should maintain long-term soil productivity.

Table 19. Acres of Aspen Treatment with Severe Erosion Hazard Soils

TREATMENT TYPE	ACRES
Aspen Treatment	364
Grand Total	364

Soil disturbance is calculated to be approximately 360 acres or about .03 percent of the entire treatment area. Use of mechanized equipment removes a portion of the protective vegetative ground cover thereby leaving the soil bare of vegetative ground cover and at risk of accelerated soil erosion. Where aspen treatment occurs in the treatment area, approximately 10-20 percent of the soil is expected to be disturbed from hand thinning or mechanical equipment when removing trees.

However, only about .03 percent of the entire treatment area could result in soil disturbance. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity is measurable and may be appreciably reduced. Since soil disturbance treatment area wide is about .03 percent, and less than 15 percent, aspen treatment by itself does not pose a risk to soil resource and soil productivity is expected to be maintained. Soil disturbance in the immediate treatment area may range from 10-20 percent and above the 15 percent threshold guideline signifying possible loss of soil productivity.

It is important to realize that not all ground disturbing treatments will occur in the same year and the .03 percent and 10-20 percent disturbance represents all treatments implemented the first year as the worst case scenario of disturbance. Prescribed burning will occur after year one and some treatments may be staggered in time and place allowing time enough for the trees to begin dropping aspen leaves and recover. Identified and implemented BMPs are expected to mitigate possible negative effects to soils including those soils with severe erosion hazard. Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis. Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis. Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis.

Resource protection measures and BMP's are identified and are expected to mitigate erosion, loss of soil productivity and reduce nonpoint source water pollution. They are listed in table 3 for all action alternatives and by strata in Appendix A.

Harvesting operation BMP's specific for aspen restoration that would be implemented include the following, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, and 28.

Similar to high intensity thinning, the amount of bare soil associated with treatment disturbance is

expected to rapidly decrease, as will any erosion that is tied to the soil disturbance (approximately 1-2 years to recover) (Elliot, 1999). While 10-20 percent of the immediate area may be disturbed in the short term, the area is expected to quickly be covered with new leaf fall and improved herbaceous vegetative cover, improving soil nutrient cycling function and stabilizing soil and maintaining and improving soil productivity in the longer term (more than 2 years) (Elliot et al. 1999). Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis.

In addition, WEPP soil erosion modeling (Attachment #2) indicates soils would not erode above tolerable or threshold levels and therefore, long-term soil productivity would be maintained. Soils with moderate or severe soil erosion hazards are common in this treatment type (Attachment #3) and at greatest risk of accelerated erosion above tolerable levels if and when all of the vegetative ground cover were to be removed. However, this treatment only would remove or disturb a small portion of vegetative ground cover and therefore, would not pose a risk to long-term soil productivity.

Soil erosion modeling indicates that the restoration will not result in soil erosion above tolerable soil loss rates and therefore soil productivity from an erosional standpoint would be maintained.

Compaction is expected to occur on small portions of the vegetation removal treatment area. Created slash would be whole-tree skidded to the landing and piled at this site. Compaction is limited because of the use of track equipment, but can occur with track equipment if machine piling is done when soil conditions are wet.

Many soils have moderate or severe timber harvest restrictions due to fine textured, or clayey soils are common in this treatment type (Attachment #3). Mechanized falling can cause compaction when soils are wet with a single pass. Resource protection measures and BMP's identified to mitigate timber harvest limitations are listed in Appendix A for all action alternatives and by strata in Appendix A.

Almost all (more than 99 percent) of acres have satisfactory soil conditions (see Attachment #3) but there are about 50 acres that are unsatisfactory soil conditions. Aspen treatment would result in increased herbaceous cover in tree interspaces (more so than low and high intensity thinning) because there would be less competition for soil moisture and nutrients compared to currently old and dying aspen trees (please see the Wildlife and Vegetation specialist reports for a discussion of understory response from thinning). The thinning would improve soil infiltration and nutrient cycling because an increase in grass species corresponds to a larger root network essential in loosening up and improvement of soil structure and promotes better water infiltration, air exchange and soil microbial cycling of nutrients (Elliot et al. 1999). Consequently, where soil conditions are unsatisfactory, their condition can be expected to improve both in the short and long-term (greater than 2 years).

Many 6th HUC watersheds are functional at risk and a few impaired (see Appendix C) due in part to overstocked ponderosa pine forests, road networks that alter hydrology and accelerate erosion, and less than satisfactory soil condition. Reducing tree canopy cover and associated hazardous fuels would move the aspen forest towards a fire adapted ecosystem. Restoration would reduce the risk of uncharacteristic, high severity wildfire that could result in removal of protective vegetative ground cover, and accelerate soil erosion and sediment delivery into connected channels thereby reducing soil productivity and water quality. Consequently, watershed function would be greatly improved.

Overall, aspen restoration along with other proposed treatments can be expected to increase ecosystem resiliency to uncharacteristic fire and move soils and watersheds towards satisfactory and functional condition in both the short and long-term and maintain or improve long-term soil productivity and water quality. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Since soil disturbance is about .03 percent, and

less than 15 percent, aspen treatment by itself does not pose a risk to soil resource and soil productivity is expected to be maintained. Therefore, soil disturbance associated with aspen restoration does not pose a risk to long-term soil productivity

Prescribed Fire Treatment

Approximately 583,000 acres are proposed for prescribed fire. Prescribed burning only is proposed on about 198,400 of the total acres, with the remaining approximately 385,000 acres having prescribed burning and mechanical treatments proposed. Each of the roughly 583,000 acres would have maintenance burning as well over 10-20 year timeframe.

The major factor that determines the effects of burning on runoff and erosion is the amount of disturbance to the surface organic material (commonly referred to as duff or forest floor) that protects the underlying mineral soil. The effects of burning can vary from merely removing some of the litter (low burn severity) to totally consuming the duff layer and organic matter in the upper soil layers (high burn severity) (Elliot et al. 2010:89). Prescribed burning can effect soil resources through reduction of coarse woody debris, damage to soil physical structure, and damage to soil biological features (Graham et al. 1994a, Neary et al. 2005, Elliot et al. 2010), as well as providing positive effects through nutrient flushes from the burn (Covington and DeBano 1990 and Covington and Sackett 1992). This increase is short-lived due to rapid biological and chemical immobilization of released nutrients (Neary et al. 2005). The effects from fire are directly related to fire intensity, with the general rule of thumb that the greater the burn intensity, the greater the amount of damage to forest soils (Neary et al. 2005). Prescribed fires create a highly variable mosaic of burn severity, duff consumption, and unburned area. This spatial variability in postfire surface conditions results in spatially varying runoff and erosion rates (Elliot 2010:90).

This same general relationship will apply on the 4 FRI treatment area. The effect would vary by soil and fuel moisture regimes and fuels distribution however, duff/litter portions of the prescribed burn would have the least negative affect on soil properties, while allowing for release of nutrients for a one to two year period. Burning of larger material would increase the risk to soil properties as the size of material burned increases, which increases fire intensity.

Prescribed and managed fire would result in 1-3 percent (Lata 2014 indicates 1 percent) burning with high severity effects where protective vegetative ground cover could be removed and 2 percent is used as a midpoint in this analysis. This is based on recent data averages from fires managed for resource benefit on the Coconino National Forest remote sensing satellite imagery ground truthed during BAER assessments from (2009-2011) and (Lata 2014 and per. com. Mary Lata 2/2012).

Maintaining soil productivity over the long term generally requires presence of soil organic material and fire effects characteristic of the natural fire regime. Most fires characteristic of the historic fire regime or moderate severity prescribed fires are likely to enhance soil development and fertility over the long-term by periodic release of nutrients. However, extremely severe fires or large severely burned areas within fires, brought on by either rare natural events or humans, are likely to be highly detrimental to forest soils

Under severe burning conditions, soil organic matter can be removed or destructively altered, nutrients volatilized, water-absorbing capacity decreased, and living plant parts and microorganisms killed. Loss of soil organic matter that is necessary for sustaining the biological activity of soils (DeBano and others 1998) is probably the most serious long-term concern (Brown 2003).

Prescribed burning would occur under prescribed conditions to reduce the soil surface fuel load without overheating, mineralizing or sterilizing the soil. Prescribed burning is a way to lower fuel load while retaining CWD benefits (Brown et al. 2003). By controlling burning conditions, managers can manipulate

to some extent the heat produced by burning CWD (controlling damage to plants and soils) and how much of it is consumed (preserving the animal habitat and erosion control benefits), while lowering the near-term fire hazard by reducing the fine fuel (Passovoy et al. 2006).

Over the entire treatment area of nearly 583,000 acres of prescribed fire, soil disturbance is calculated to be approximately 11,700 acres or about 2 percent of entire treatment area. Prescribed fire could leave a portion of the protective vegetative ground cover thereby leaving the soil bare of vegetative ground cover and at risk of accelerated soil erosion on small portions across the landscape.

However, only about 2 percent of the entire treatment area could result in soil disturbance. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity is measurable and may be appreciably reduced. Since soil disturbance treatment area wide is about 2 percent, and less than 15 percent, prescribed fire by itself does not pose a risk to soil resource and soil productivity is expected to be maintained.

Prescribed burning would occur after year one and treatments will be staggered in time and place over 10 years allowing time enough for the vegetation to recover. Identified and implemented BMPs are expected to mitigate possible negative effects to soils. Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis.

The amount of bare soil caused by prescribed fire is expected to rapidly (after 1 year) reduce due to annual pine needle litter fall onto the soil as protective vegetative ground cover increases. While 2 percent of the immediate area may be disturbed in the short term, the soil is expected to quickly be covered with new leaf fall and improved herbaceous vegetative cover, and will benefit from ash and its macronutrients improving soil nutrient cycling function and stabilizing soil and maintaining and improving soil productivity. Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis. Where heavy concentrations of woody material have burned, soil recovery may be long-term (greater than 2 years).

Machine piling of created slash from thinning activities disturbs the greatest amount of ground through re-arrangement of the soil surface. Burning of machine piles, and to a lesser extent hand piles, negatively affect soil biotic and chemical properties due to intense soil heating (Korb et al. 2004, Seymour and Teclé 2004). The effects at these sites will be change in soil chemical and biotic properties. It is anticipated that a large portion of the created slash will be chipped and removed, thus we expect less than 1 percent of the mechanized treated acreage (about 390,000 acres) to have any effect from the burning of machine piles.

WEPP soil erosion modeling (table 14 and Attachment #2) indicates burned soils on slopes less than 40 percent would not erode above tolerable or threshold levels and therefore, long-term soil productivity would be maintained. Where high burn severity results on slopes over 40 percent (about 100 acres), soil disturbance is estimated at 2 percent, accelerated erosion could occur causing a small loss of soil productivity but because it would be limited in extent, is not expected to deliver measurable amount of soil to connected streamcourses or affect water quality.

Soils with moderate or severe soil erosion hazards are common in this treatment type (Attachment #3) and at greatest risk of accelerated erosion above tolerable levels if and when all of the vegetative ground cover were to be removed. However, burning would remove or disturb a small portion of vegetative ground cover (on average about 2 percent) and therefore, would not pose a risk to long-term soil productivity.

Resource protection measures and BMP's identified to mitigate erosion, loss of soil productivity and reduce nonpoint source water pollution are listed in table 3 and by strata in Appendix A. Prescribed burning specific BMPs include the following, 6, 7, 8, and 10.

On areas to be prescribed burned, BMP #7 assured there is sufficient coarse woody material left on site throughout all ponderosa pine treatment areas to promote soil nutrient cycling. Fires would be managed to leave 5-7 tons/acre of coarse woody debris in ponderosa pine be left on-site after the prescribed burns to maintain long-term soil productivity (USDA 1994a) on areas to be burned outside of the buffers around private land in. Within the pinyon-juniper cover type, snags would be managed for 1 per acre over 75 percent of the area and coarse woody debris (CWD) would be managed for an after treatment average of 1 to 3 tons per acre. Where available, a portion of the CWD would include two logs $\geq 10''$ and $\geq 10'$ in length to improve conditions (Huffman, personal communication, 2010). Implementation of BMP#7 is expected to improve nutrient cycling and soil productivity in both ponderosa pine and pinyon-juniper types.

Lata, 2014 reports coarse woody debris about about 20-30 or more tons/acre could pose a risk to soil and cause mineralization or adverse effects to soil. Reducing coarse woody debris through the proposed action and Alts B and C to near 5-7 tons/acre on the Coconino and 3-10 ton/acre on the Kaibab is well below 20 tons/acre and would result in reducing risk to soil and would maintain long-term soil productivity. Short term removal of coarse woody material through implementation of action alternatives over a 1-3 year timeframe should not affect short or long-term soil productivity since BMP #35 requires maintenance of 5-7 tons/acre/year. On the Coconino and 3-10 tons/acre on the Kaibab

Soil conditions vary (Appendix B). Following mechanical thinning, burning would result in increased herbaceous cover in tree interspaces because burning would reduce the century buildup of forest duff that inhibits herbaceous understory productivity (see wildlife specialist report for a full review of the effects on understory vegetation response from burning activities). Mechanical thinning followed by prescribed burning resulting in tree reduction would result in less competition for soil moisture and nutrients compared to currently overstocked stands and allow immediate native plant (forbs and grasses) regeneration. The thinning would improve soil infiltration and nutrient cycling because an increase in grass species corresponds to a larger root network essential in loosening up and improvement of soil structure and promotes better water infiltration, air exchange and soil microbial cycling of nutrients. Consequently, where soil conditions are unsatisfactory, their condition can be expected to improve both in the short and long-term (greater than 2 years).

Furthermore, prescribed burning would reduce the duff layer, fine and medium sized fuels built up on the forest floor and result in reduced risk of uncharacteristic fire that could otherwise result (such as alternative A) in large areas of high burn severity that pose risk to soil and watershed function and downstream water quality. Implementation of prescribed fire under alternative B could result in a predicted 2 percent high burn severity while implementation of alternative A (no action) could result in up to 24 percent erosion above tolerable or threshold hold soil loss rates posing a serious risk to short and long-term soil productivity, watershed function and downstream water quality

Most 6th HUC watersheds are functional at risk and a few impaired and functional(see Appendix C) due in part to overstocked ponderosa pine forests, road networks that alter hydrology and accelerate erosion, and less than satisfactory soil condition. Reducing small tree canopy cover and associated hazardous fuels would improve the fire regime condition class and move the forest towards a fire adapted ecosystem. The hydrologic effects of prescribed burning are largely a function of fire severity and area burned. High severity burns that consume protective litter and expose mineral soil generally increase runoff and sediment yields, whereas low severity burns that only consume the upper litter layers have much less hydrologic impact (Elliot et al. 2010: p138). Prescribed fire is a low severity burning technique and would reduce the risk of uncharacteristic, high severity wildfire that could result in removal of protective vegetative ground cover, and accelerate soil erosion and sediment delivery into connected channels thereby reducing soil productivity and water quality.

Overall, prescribed fire along with other proposed treatments can be expected to increase ecosystem

resiliency to uncharacteristic fire and move soils and watersheds towards satisfactory and functional condition in both the short and long-term and maintain or improve long-term soil productivity and water quality. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Since soil disturbance is about 2 percent, and less than 15 percent, prescribed fire by itself does not pose a risk to soil resource and soil productivity is expected to be maintained. Therefore, soil disturbance associated with prescribed fire does not pose a risk to long-term soil productivity or watershed function.

Effects Common To Alternatives B, C, D and E:

While the number of acres of mechanical treatments varies slightly by alternative B, C, D and E, the effects to soil and watershed function disclosed for low and high intensity thinning, savanna and grassland, aspen are similar to effects described in Alternative B. The number of acres (extent) of prescribed fire treatment and magnitude of effects to soils is similar in Alternatives B, C and E with similar effects as described in Alternative B. Alternative C has fewer acres of prescribed fire and is described under Alternative C.

In addition, the following activities, disturbances and effects are common to Alternatives B, C, D and E.

Temporary Road Construction and Decommissioning

The objective for creating temporary roads is for access during project implementation. Once treatment has occurred, temporary roads would be decommissioned. Decommission methods include options such as installing signs gates, rock barriers, or ripping and re-contouring of slopes and installing drainage features such as waterbars. Routes that have established vegetation may need minimal treatment while others may need to be entirely ripped, seeded and slopes re-contoured.

Approximately and up to 860 miles of existing system and unauthorized roads would be decommissioned (726 on Coconino NF and 134 unauthorized on Kaibab NF) plus up to 40 miles reconstructed, improved or relocated (table 1). About 520 miles of temporary roads will be constructed for haul access and decommissioned when treatments are finished. About 10 miles of existing open roads would be reconstructed for natural resource concerns (primarily moving streams out of stream channels) and about 30 miles of roads would have road improvements, such as widening turn radiuses. In addition, approximately 2,000 miles of road would receive road maintenance during the life of the project.

The road decommissioning would create about 1,645 acres of disturbance in the short term and remove approximately 860 miles of roads, or about 1645 acres of road from future disturbance in the long-term. About 38 miles (roughly 70 acres) are on severe erosion hazard soils. BMP's including SW BMP #38 (table 2) are designed to minimize impacts from decommissioning efforts. After decommissioning, there would be reduction of roads on severe erosion hazard soil type.

Temporary road construction would occur prior to harvest activities. Roads would then be decommissioned after harvest use. Thus, disturbance to soils is short-term in nature. This is expected to occur on about 520 miles of road (a total of about 950 acres). Of these roads, a vast majority would be located on soils with slight or moderate erosion hazard, it is estimated that about 22 miles of road (about 40 acres) occur on severe erosion hazard soils.

At this time, there is uncertainty whether a National Pollution Discharge Elimination System (NPDES) permit would be required for stormwater discharges from logging roads associated with this project. Although the Environmental Protection Agency has published a final rule exempting logging road stormwater discharge from NPDES permitting requirements, the United States Supreme Court is currently

reviewing the matter. Until the Supreme Court rules, it will be uncertain whether a NPDES permit is required for this project.

Reconstruction of Existing Roads

Road relocation is scheduled to occur on just less than 10 miles (about 17 acres of disturbance) of road across the project area. Of these miles, about .3 miles are severe erosion sites (about .7 acres). These miles of road are all located directly in or adjacent to stream courses throughout the analysis area. The actual miles of reconstructed road would exceed the 10 miles of road that are identified for removal and may be as many as 25 miles of reconstructed segments. Road improvements will occur on about 30 miles, and may affect up to 75-150 acres, depending on the extent of the road improvement. Activities that are considered road improvement include, but are not limited to, construction of bridges and major culverts, placing bar ditches, subgrade repairs, shoulder widening, lane widening, ditch widening, roadway prism widening, horizontal and vertical alignment changes, curve widening, and improving site distance at road intersections. Vegetation will likely be removed with these activities. These activities may occur on about 10-20 acres of soils with severe erosion hazard. Specific BMP's 1, 12, 15 and 38 would mitigate effects on severe erosion sites. At this time, there is uncertainty whether a National Pollution Discharge Elimination System (NPDES) permit would be required for stormwater discharges from logging roads associated with this project. Although the Environmental Protection Agency has published a final rule exempting logging road stormwater discharge from NPDES permitting requirements, the United States Supreme Court is currently reviewing the matter. Until the Supreme Court rules, it will be uncertain whether a NPDES permit is required for this project.

Findings: Roads affect geomorphic processes by four primary mechanisms: accelerating erosion from the road surface and prism itself by both mass and surface erosion processes; directly affecting channel structure and geometry; altering surface flow paths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and woody debris at engineered road-stream crossings (Gucinski et al. 2000). Road relocation would remove roads from stream channels and would restore natural channel function and reduce sediments that are currently being generated by the existing road bed. BMP #19 specifically states to relocate roads where feasible to minimize sediment delivery into drainages and to minimize disturbance in drainage systems and minimize sediment production within channels. Road reconstruction activities would help restore stream channel function and move the affected streamcourses to desired conditions.

Altogether, road treatments will disturb about 2,700 acres or less than 0.1 percent of treatment area. Temporary roads may have fewer adverse effects than do permanent roads, depending on the extent to which they are decommissioned (Gucinski et al. 2000). Because of this, after use, all temporary roads would be restored and may be shallow ripped ($\approx 6''$), seeded, drained and/or covered with slash from landings (BMP #23).

Although the vast majority of these roads are not located on roads with severe erosion hazard (about 130 acres out of 2,700 acres or about 4 percent of all temporary, reconstructed and decommissioned roads), BMPs have been identified and would be implemented to assure accelerated soil erosion, loss of soil productivity and sediment delivery to connected streamcourses is mitigated. Resource protection measures and BMP's identified to mitigate erosion and severe erosion hazard, loss of soil productivity and reduce nonpoint source water pollution are listed in table 3 for all action alternatives and by strata in Appendix A. Road specific BMPs include the following, 23, 25, 31, 32, 33 and 38.

An additional 2,000 miles of existing road would have improved drainage throughout the life of the project by road maintenance activities. Of those miles, approximately 140 miles of road occur on severe

erosion hazard soil types. The improved maintenance and BMP's 19, 23, 25, 31, 32, and 33 would minimize the impacts from the open road system, especially on severe erosion hazard sites for the short-term. If maintenance does not continue, the positive effects of improved drainage would decrease over time (5-10 years after the last maintenance cycle). The temporary use of dust abatement on about 7 miles of road are not expected to have detrimental effects to soils, but will have a positive effect of not detaching small sediments on these road segments.

Overall, road decommissioning and temporary road construction is limited to less than 0.1 percent soil disturbance in the treatment area and much less at the 6th HUC watershed scale. Implementation of identified BMPs is expected to mitigate accelerated erosion, and possible elevated sediment transport to connected streamcourses so as not to pose a risk to downstream water quality. This is especially true for the road segments that are scheduled to be reconstructed.

Channel Restoration:

Approximately 39 miles of degraded ephemeral channels would be restored. Actual ground disturbance from mechanized equipment and bank shaping activities would amount to about 561 acres treatment area wide. The soil disturbance is expected to be short term in nature as the bare soil is revegetated naturally and with the implementation of BMPs.

Resource protection measures and BMP's identified to mitigate erosion, loss of soil productivity and reduce nonpoint source water pollution are listed in table 3 for all action alternatives and by strata in Appendix A.

BMP's specific to channel restoration include the following, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 and 33. These BMP's would minimize impacts to soils and reduce possible nonpoint source pollution into connected streamcourses and water quality far the watershed and protect water quality.

Overall, channel restoration activities is limited to less than 0.1 percent soil disturbance in the treatment area. Implementation of identified BMPs is expected to mitigate accelerated erosion, and possible elevated sediment transport to connected streamcourses so as not to pose a risk to downstream water quality and those species that rely on it for their survival. Many streamcourses are in less than functional condition. Most 6th HUC watersheds are functional at risk and a few impaired and functional (see Appendix C) due in part to nonfunctional streamcourses that alter hydrology. Channel restoration is expected to improve streamcourse functional condition and would result in overall improvement of watershed condition.

Protective Fencing (Aspen and Springs)

Up to 82 miles of protective (aspen and springs) fencing would be constructed with maximum soil disturbance of about 184 acres. Although not quantified, ungulate grazing and OHV disturbance has degraded spring functional condition and connected soils forest-wide. Ungulate grazing in aspen stand has caused aspen decadence since ungulates thrive on newly sprouted seedlings resulting in older aged aspen stands with very little regeneration.

Protective fencing would eliminate ungulate grazing and OHV soil disturbance and is expected to improve spring functional condition and aspen stand regeneration. The amount of soil disturbance associated with implement g protective fences is very little, does not involve mechanized equipment other than for transport of materials and is not measurable at the treatment area or watershed scale.

Resource protection measures and BMP's identified to mitigate erosion, loss of soil productivity and reduce nonpoint source water pollution are listed in table 3 for all action alternatives and by strata in

Appendix A. BMP #22 is specific for spring restoration.

Overall, protective fencing restoration activates is very limited, not measurable at the treatment and watershed scale. Implementation of identified BMPs is expected to mitigate accelerated erosion, and possible elevated sediment transport to connected streamcourses so as not to pose a risk to downstream water quality and those species that rely on it for their survival. Most 6th HUC watersheds are functional at risk and a few impaired and functional (see Appendix C) due in part to spring condition. Protective fencing is expected to improve aspen stand structure and spring functional condition and connected soils and would result in overall slight improvement of watershed condition.

Spring Restoration

See the water and water quality specialist report for information on springs and seeps. Effects to soil and riparian functional condition are similar to what is described above under protective spring fencing. BMP #22 is specific for spring restoration.

Treatment Area and 6th HUC Area-Wide Soil Disturbance

Table 20. Alternative B Summary of Direct Effects

	Alt. B Acres	Alt. B % of Treatment Area	Alt. B % of Watersheds
Soil Disturbance from Mechanical Activities ³	54,488	9.3	2.7
Soil Disturbance from Potential High Severity Burns	11,667	2.0	.6
TOTAL SOIL DISTURBANCE (High severity burns and mechanical).	66,155	11.3	3.3
Soil Disturbance from Mechanical Activities & High Severity Fire (Range low to high)		2.1-18.3%	0.1-11.3%
Potential Soil Erosion Above Tolerable Levels When 33% Soils Severely Burned		Up to 2%	
Potential Soil Erosion Above Tolerable Levels When All (100%) of Soils Severely Burned		Up to 5%	
Soil Erosion Above Tolerable levels from Mechanical Activities	0	0	0

Acres and percent's are approximate

Treatment Area Wide Effects

Total maximum soil disturbance within all treatment areas from implementing all proposed treatments for alternative B would be about 11.3 percent (table 22). Approximately 9.3 percent is predicted for all mechanical treatments and 2 percent from potential high severity burns. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity is measurable and may be appreciably reduced. No 6th code watersheds exceed the 15 percent ground disturbance threshold (Walnut Canyon, Upper Lake Mary displays the most acres of disturbance-11 percent). Data by 6th HUC watershed is located in Attachment #3. Since total soil disturbance is about 3 percent for the watersheds as a whole, and less than 15 percent, the combination of all treatments do not pose a risk to soil resources

³ Includes acres of ground disturbance from all harvest treatments, road treatment acres, and channel treatment acres.

and soil productivity and watershed function is expected to be maintained.

Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds including those with soil disturbance greater than about 15 percent. It is important to realize that not all ground disturbing treatments will occur in the same year and soil disturbances represent all treatments implemented the first year as the worst case scenario of disturbance. Prescribed burning would occur after year one and some treatments may be staggered in time and place allowing time enough for the soil to begin dropping pine needle cast and recover.

For ponderosa pine types, the amount of coarse woody material has been modeled and quantified but maintenance of 5-7 tons/acre of coarse woody material would improve soil nutrient cycling (USDA 1994a) and listed as BMP in table 3. Areas of identified WUI treatments would not be subject to 5-7 tons/acre of coarse woody material to adequately reduce fire hazard adjacent to private land and homes. There are only about 2000 acres in project area. Not maintaining 5-7 tons/acre should not risk long-term soil productivity since identified WUI's are small in size and minor in extent compared to the overall treatment area of about 583,000 acres.

Within the pinyon-juniper cover type, snags would be managed for 1 per acre over 75 percent of the area and coarse woody debris (CWD) would be managed for an after treatment average of 1 to 3 tons per acre. Where available, a portion of the CWD would include two logs $\geq 10''$ and $\geq 10'$ in length (Huffman, personal communication, 2010) and (Brewer, ERI Working Paper, 2008). Identified and implemented BMPs are expected to mitigate possible negative effects to soils and improve nutrient cycling function.

Mechanical activities would not result in any soil loss above tolerable levels according to WEPP modeling. However, potential soil erosion above tolerable levels for alternative B could occur on up to about 2 percent of mechanically, untreated slopes greater than 40 percent from prescribed fire. Slopes greater than about 40 percent are proposed for low intensity fire only treatments. Fire treatments on these slopes would significantly reduce future fires risk of high-severity fires. Soil loss exceeding tolerable amounts erode faster than renew themselves resulting in accelerated soil loss and loss of soil productivity as well as potentially deliver sediment to connected streamcourses. Again burning and mechanical treatments would not occur in the first year and be staggered in time and place and along with identified and implemented BMPs are expected to mitigate possible negative effects to soils.

There would be no predicted soil erosion above tolerable soil loss rates where mechanical treatments are proposed but there could be up to about 2 percent on slopes greater than 40 percent where burn only occurs. For burning, since the amount of erosion above tolerable soil loss is limited to up to 2 percent, soil productivity is not expected to be appreciably reduced and would be maintained. In addition, implementation of identified BMPs would reduce the threat of high burn severity, accelerated erosion, sediment delivery into connected streamcourses, and not threaten water quality downstream. Implementation of alternative B meets the projects purpose and need and meets the Kaibab and Coconino National Forest forest plan standards and guidelines.

Effects to Soil Condition/Productivity and Watershed Function

See Tables 6 and 7 for a comparison of effects to soil condition, soil productivity and watershed function by alternative.

Implementation of Alternatives B would meet the projects purpose and need and meet the Kaibab and Coconino national forest plan standards and guidelines. Soil condition, productivity and watershed function would greatly improve, be maintained and protected.

Overall, implementation of the proposed action is expected to maintain, improve and protect long-term soil productivity and watershed function much better than Alternative A because there will be no improvement in understory response due to thinning and burning activities in the Alternative A. Alternative B does propose thinning and total prescribed fire activities that are expected to provide long-term soil improvements on about 583,000 acres, while Alternative C proposes about 586,000 acres and E on about 581,000 acres. Alternative D proposed thinning only on about 385,000 acres, and prescribed burning on about 178,000 acres. The thinning and burning would provide improvement to soils by improving understory species composition, but does still maintain high fuel loadings that can have high surface fire effects that can damage soils. This is expected to occur on about 25% of the mechanical treatment sites, so Alternative D has effective soil productivity treatments on about 470,000 acres. However, implementation of Alternative C would better restore grasslands than Alternative B and still has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level. Implementation of Alternatives B and C would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.

Overall, implementation of the proposed action is expected to maintain, improve and protect long-term soil productivity, and watershed function much better than Alternatives A and D, a little better than E (no amendments) but not as well as C. Implementation of Alternative C would probably better restore grasslands than other action alternatives and still has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level. Implementation of Alternatives B, C and E would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.

Cumulative Effects

The geographic setting and boundary for the cumulative effects analysis will all 82 6th HUC watersheds listed in Appendix C for a total of about 2,032,00 acres. The timeframe for past actions is 2-3 years based on vegetative and coarse woody debris recovery of the site. Vegetative recovery after fuel treatments is generally very rapid, with erosion rates typically dropping to pre-fire levels within 1 to 2 years (USDA, 1996). Cumulative effects includes past timber sales and their associated roads, hazardous fuel and prescribed burning projects that can affect the acres of soil disturbance, primarily through fuel treatments, as well as past burning and wildfires, range allotments, roads, private land, power corridors and recreation activities. Recreation activities are dispersed across the cumulative effects boundary area and are not quantifiable.

A list of past, present projects and reasonably foreseeable actions can be found in the document entitled Four-Forest Restoration Coconino and Kaibab NF Environmental Analysis (EIS) Cumulative Effects Analysis Baseline - updated 2/2014. Past Actions and are included in attachment #4 and in the DEIS. Attachment 4 summarizes the acres of disturbance by current and future foreseeable actions.

Baseline Activities

Roads, private land, grazing allotments, and powerline corridors are baseline disturbance area acres for the project area. Baseline activities are ground disturbance constants. For this analysis, roads and powerline corridors are synonymous because the area of powerline corridors that contains baseline ground disturbance is the access road. Grazing allotments occur across about 1,692,900 acres of the cumulative effects area on allotments on the Coconino, Kaibab, Prescott and State and private lands. Ground disturbance from cattle grazing is difficult to quantify, however, ground disturbance does occur from grazing where cattle congregate, which are typically associated watering sites. For this analysis, we will use the baseline disturbance for grazing as an area adjacent to stock tanks (1/8 mile buffer). For this analysis, there are approximately 1,100 acres of disturbance from grazing.

There are approximately 7,170 miles of roads within the analysis area according to three forest Geographic Information System (gis) data layers. These data layers did not differentiate between open and closed roads, so for this analysis, we assumed that all roads are open, therefore the actual acres of current ground disturbance is probably overstated for the cumulative effects analysis area. The 7,170 miles of road equate to approximately 13,030 acres of disturbance from roads.

There are 101,461 acres of private land within the cumulative effects boundary area. Of these acres, there are variable levels of development ranging from municipal development in areas such as Flagstaff, Willimans, Tusayan, and Sedona to completely undeveloped. For this analysis, each private land parcel was classified as either having high or low development by examining each parcel with air photos to determine the level of development. For areas of high development, a disturbance factor of 70 percent was applied (this is the equivalent disturbed area factor used on the Apache-Sitgreaves Equivalent Disturbed Area process for high development). For areas of low development, a 10 percent disturbance factor was applied after examining aerial photos (the Apache-Sitgreaves Equivalent Disturbed Area process for low development applies a 20 percent disturbance factor and after reviewing parcels by air photo this factor was too high because there is a general lack of any development on many of the parcels). The total ground disturbance for private land is calculated at about 30,900 acres.

The total baseline ground disturbance is about 45,040 acres for the cumulative effects area, or about 2 percent of the entire cumulative effects area. There are six, 6th code watersheds where urban development has a large impact on ground disturbance areas—Cataract Creek Headwaters (11 percent baseline ground disturbance) associated with the City of Williams, Sinclair Wash (25 percent) and Lower and Upper Rio de Flag (18 percent), Pumphouse Wash associated with the City of Flagstaff, Middle Oak Creek (11 percent) associated with Sedona and private land developed adjacent to Oak Creek.

Past Actions and Present Actions

The timeframe for past actions is 2-3 years, based on vegetative and coarse woody debris recovery of the site. Vegetative recovery after fuel treatments is generally very rapid, with erosion rates typically dropping to pre-fire levels within 1 to 2 years (Elliot et al. 2010: 93). Therefore, protective vegetative ground cover that may have been disturbed in past timber sales, hazardous fuel and prescribed burning projects older than about 2-3 years is likely recovered enough to protect against accelerated erosion, and does not contribute to adverse cumulative effects to the soil and therefore, soil productivity is now maintained. The acres used for the analysis are a summary of projects that were report in the FACTS activity layer from 2009 to the present. These acres are summarized in Attachment #4.

For the cumulative effects boundary area, there are approximately 154,720 (table 23 and Attachment #1) of total treatment acres of ongoing and current projects within the cumulative effects boundary (about 7 percent of the cumulative effects area). Assuming a 15 percent disturbance factor for treatments, there are a total of approximately 27,380 acres of ground disturbance from projects within the cumulative effects boundary area, or about 1 percent of the cumulative effects boundary area.

Vegetative ground cover in more recent projects (within the last 2 years) is in the process of recovery. Soil disturbance and erosion is less than the 4-FRI proposed action and smaller in extent and magnitude because fewer acres were treated (and therefore less than the 3.0 percent that would be generated from the 4-FRI proposed action). The magnitude of soil erosion above tolerable soil loss is believed to be similar in proportion to the 4-FRI proposed action, very minor in magnitude because similar harvesting techniques and BMPs were employed mitigating negative effects to soil and water. The combination of past and ongoing projects soil disturbance is limited in extent and magnitude and amount to about 1 percent within the cumulative effects boundary.

Reasonably Foreseeable Future Actions

Recreational activities include: hiking, viewing wildlife, hunting, dispersed car-camping, backpack camping, orienteering, horseback riding, caving, rock climbing, photography, picnicking, taking scenic drives, ORV/ATV use, bicycling, shooting, and gathering in family or social groups. Snowmobile use and cross-country skiing are increasing as popular uses in the area. During normal winters, snowmobiles are the only vehicles that access the area. Other potential uses within the project area include firewood cutting, post and pole cutting, collecting boughs and cones, collecting and transplanting wildlings, gathering antlers, collecting food and medicinal resources such as berries, nuts, mushrooms, and bracken fern, and collecting biological specimens for research. These activities are unquantifiable.

Fuels reduction related projects are expected to occur within the cumulative effects project boundary and are summarized in Attachment 4 to this report. The table within Attachment 1 summarizes the acres of disturbance for future and foreseeable actions including the Flagstaff Forest Partnership Project and Kelly Trails and Moonset Pit expansion Project. For the cumulative effects boundary area, there are approximately 157,500 acres of future and foreseeable treatment acres within the cumulative effects boundary (about 7.7 percent of the cumulative effects area). Assuming a 15 percent disturbance factor for treatments, there are a total of approximately 23,667 acres of ground disturbance from projects within the cumulative effects boundary area, or about 1 percent of the cumulative effects boundary area. Ground disturbing actions will implement BMPs to mitigate non point source pollution to connected streamcourses.

Summary of Cumulative Effects

There are about 45,000 acres of baseline ground disturbance from roads, private land, grazing allotments, and powerline corridors that occur across the cumulative effects analysis area. The total acres of past, present and future and foreseeable treatment acres within the cumulative effects project area are roughly 312,720 acres (154,720 past and present projects and 158,000 acres of future, foreseeable projects) or about 15 percent of the cumulative boundary area. Of these treatment acres, we are assuming that there would be about 15 percent of these acres will have ground disturbance, or about 43,700 acres, or just about 2 percent of the cumulative effects analysis area are expected to have ground disturbance from past, present and future or foreseeable projects. The 4FRI EIS would add an additional about 66,000 acres of ground disturbance for a total acreage of ground disturbance across the cumulative effects analysis area, for a total acreage of disturbed ground of nearly 162,200 acres, or about **8.0** percent of the cumulative effects boundary area (see table 23 below).

As stated above in the baseline disturbance assessment, there are six 6th code watersheds where urban development has a large impact on ground disturbance areas. This project, plus current and future foreseeable projects impacts these watersheds in the following manner. In the Cataract Creek Headwaters watershed there was a 9 percent past, present and future project generated ground disturbance prior to any activities. This percent of ground disturbance increases to 15 percent total cumulative ground disturbance. In the Sinclair Wash watershed, there was a 12 percent past, present and future ground disturbance prior to any activities. This percent of ground disturbance increases to 26 percent total cumulative ground disturbance with all projects, current and foreseeable projects. In the Lower Rio de Flag watershed there was an 8 percent past, present and future project generated ground disturbance that increases to 21 percent total cumulative ground disturbance. In the Middle Oak Creek watershed, there was 7 percent past, present and future project generated ground disturbance that increases to 11 percent total cumulative ground disturbance. Pumphouse Wash watershed has about 11% contributions from past, present and future projects and about 6% from 4FRI. Upper Rio de Flag watershed has about 14 percent contribution from past, present and future projects and extra about 3 percent from 4FRI. Implementation of BMP's would minimize any impacts to watersheds, and would be especially important in the

watersheds that have a high urban impact already existing.

Table 21. Summary of cumulative effects – Alternative B

	EIS			Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
	Total Cum Effects analysis area 6th code acres	TOTAL EIS Ground Disturb	TOTAL EIS treatment % ground disturb	TOTAL EIS %6th code Ground Disturb	BASE Ground Disturb	TOTAL TREAT ACRES	TOTAL Future/Fore Ground Disturb	TOTAL TREAT ACRES	TOTAL Current Ground Disturb	TOTAL CUM EFFECTS % ground disturb
	2,032,080	66,155	11.3%	3.3%	45,041	157,772	23,666	154,720	27,380	162,241 8.0%

Executive Summary of Cumulative Effects

For past, present and reasonably foreseeable actions including the 4-FRI proposed action, the extent (about 162,250 acres or 8.0 percent, up from 7.6% to include recent disturbance predicted from the Slide Fire) and magnitude of soil disturbance, would not be exceeded with this project within the cumulative effects boundary. Further protection of soil resources is provided by the use of Best Management Practices that minimize the potential for soil disturbance. Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds. In addition to the use of BMP's, the completion and implementation of the Travel Management EIS will further reduce the number of acres disturbed by closing and decommissioning roads within the cumulative effects boundary. Because of these facts, this alternative would not provide a detrimental cumulative effect to soil resources within the cumulative effects boundary.

A discussion of cumulative effects resulting from the Slide Fire is found at the end of the analysis by Alternative.

Summary of Effects to Soil Resources - Alternative B

The FEIS now contains a few additional cumulative effects not accounted for in the DEIS. They include the Flagstaff Watershed Protection Project, Kelly Trails and Moonset Pit expansion project (all contained in the cumulative effects tables 41 – 43).

Soil disturbance by treatment type within treatment areas ranges from less than .1percent to 3.9 percent with low and high intensity thinning causing the greatest soil disturbance by overall acres. Collectively and treatment area wide within watersheds, the maximum soil disturbance for implementing all mechanical treatments and prescribed burning would be approximately 3 (3.3 percent actual) within 6th HUC watershed and about 11percent (11.3 % actual) within treatment areas and varies by watershed (Attachment 1). No single treatment type would amount to more than about 9.4% with high intensity thinning being the highest. This assumes all acres are implemented and the maximum ground disturbance occurs. Since total soil disturbance is about 3.0 percent within the watersheds, the combination of all treatments do not pose a risk to soil resources and soil productivity and watershed function is expected to be maintained.

There is no predicted soil erosion above tolerable soil loss rates where mechanical treatments are proposed but there could be up to about 2 percent on slopes greater than 40 percent where burn only occurs. For burning, since the amount of erosion above tolerable soil loss is limited to up to 2 percent, soil productivity is not expected to be appreciably reduced and would be maintained. The amount of coarse woody material has been modeled and quantified but for ponderosa pine types, maintenance of 5-7 tons/acre of coarse woody material will improve soil nutrient cycling (USDA 1994a) and listed as BMP in table 2 and Appendix 1.

Within the pinyon-juniper cover type, snags would be managed for 1 per acre over 75 percent of the area and coarse woody debris (CWD) would be managed for an after treatment average of 1 to 3 tons per acre. Where available, a portion of the CWD would include two logs $\geq 10''$ and $\geq 10'$ in length (Huffman personal communication, 2010) and (Brewer, personal communication, 2008). Identified and implemented BMPs are expected to mitigate possible negative effects to soils and improve nutrient cycling function. In addition, implementation of identified BMPs would reduce the threat of high burn severity, accelerated erosion, sediment delivery into connected streamcourses, and not threaten water quality downstream.

Identified and implemented BMP's would reduce the risk of accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses, and maintain water quality in all watersheds. It is important to realize that not all ground disturbing treatments would occur in the same year and soil disturbances represent all treatments implemented the first year as the worst case scenario of disturbance. Prescribed burning would occur after year one and some treatments may be staggered in time and place allowing time enough for the soil to begin dropping pine needle cast and recover. Identified and implemented BMPs are expected to mitigate possible negative effects to soils.

6th HUC watershed wide, the maximum soil disturbance for implementing all mechanical treatments and prescribed burning would be approximately 3.0 percent and varies by watershed. This assumes all acres are implemented and the maximum ground disturbance occurs. Since total soil disturbance is about 3.0 percent, the combination of all treatments do not pose a risk to soil resources and soil productivity and watershed function is expected to be maintained or improved. Overall, proposed treatments would result if effects to soils would be similar to those described above treatment are wide but to a lesser degree due to the scale of the watershed (larger than treatment area). Compared to treatment area disturbance, watershed level disturbance is about 3 times less, effectively diluting the overall negative impacts to watershed function. Consequently, restoration of fire adapted ecosystems would begin to occur and where watersheds are functional at risk or impaired, their condition can be expected to improve both in the short and long-term (greater than 2 years) maintaining or improving soil productivity and water quality.

Overall, long-term soil productivity and watershed function for the proposed action are expected to be protected, maintained or improved on more acres than alternative A and D (respectively) but not quite as many acres as alternative C since C would include more grasslands restoration. Implementation of Alternatives B would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows). Implementation of alternative B would meet the projects purpose and need and meet the Kaibab and Coconino national forest plan standards and guidelines.

Cumulative Effects Summary Including Alternative B

For past, present and reasonably foreseeable actions including the 4-FRI proposed action, the extent of soil disturbance equals about 8 percent and the overall 15% soil disturbance threshold would not be exceeded with this project within the cumulative effects boundary. The contribution and magnitude of soil disturbance from 4FRI treatments would be short-term (about 2-3 years) minor in extent and minor in

magnitude and equal about 3.3% at the watershed scale. Further protection of soil resources is provided by the use of Best Management Practices that minimize the potential for soil disturbance. Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds. In addition to the use of BMP's, the completion and implementation of the Travel Management EIS would further reduce the number of acres disturbed by closing and decommissioning roads within the cumulative effects boundary. Because of these facts, this alternative would not provide a detrimental cumulative effect to soil resources within the cumulative effects boundary.

Alternative C - Direct and Indirect Effects

Appendix A and B identify major soil interpretations by strata including timber harvest limitation, erosion hazard, natural regeneration potential and soil condition. Tables 24 to 26 details treatment type acreage by strata for alternative C. Road, springs, aspen fencing, and stream channel effects are the same in extent and magnitude as those listed in alternative B.

Compared to alternative B, alternative C has slightly fewer acres of high intensity mechanical, more acres of grassland restoration and less acres of operation burn because there are more acres of grassland that would likely not be included in an operational burn. All other treatments and soils are similar in acres and soil disturbance to those in alternative B and the soils have similar erosion hazards (see tables below for disclosure of acres of severe erosion hazard by treatment intensity type---note a slight decrease in high intensity treatment acres on severe erosion hazard), timber harvest limitations and soil conditions. The difference in acreage between B and C for mechanical treatments is very small and accounted for in soil disturbance calculation and predictions.

Table 22. Alternative C Acres of Severe Erosion with Low-& High Intensity Treatments & Aspen & Savanna

LOW INTENSITY TREATMENTS			
TREATMENT TYPE	ACRES	TREATMENT TYPE	ACRES
AZGFD Trt	87	PAC - Mechanical	2,979
dPFA - IT10	40	PFA - IT10	63
dPFA - IT25	11	PFA - IT25	137
dPFA - SI10	1	PFA - PineSage	11
dPFA - UEA10	27	PFA - SI25	77
dPFA - UEA25	96	PFA - UEA10	43
Grassland Mechanical	832	PFA - UEA25	302
IT10	1,038	PineSage	129
IT25	1,422	SI10	203
MSO Restricted Trt	15,563	SI25	552
MSO Target Trt	1,520	UEA10	1,827
MSO Threshold Trt	816	UEA25	3,063
		Grand Total	30,839

HIGH INTENSITY TREATMENTS	
TREATMENT TYPE	ACRES
dPFA - IT40	31

dPFA - UEA40	276
IT40	4,669
PFA - IT40	356
PFA - SI40	49
PFA - UEA40	1,075
SI40	1,546
UEA40	9,987
WUI55	317
Grand Total	18,306

ASPEN TREATMENT TYPE	
TREATMENT TYPE	ACRES
Aspen Treatment	364
Grand Total	364

SAVANNA TREATMENT TYPE	
TREATMENT TYPE	ACRES
Savanna	4,141
Grand Total	4,141

Table 23. Alternative C. Acres of Severe Erosion Hazard with Grassland Treatments

TREATMENT TYPE	ACRES
GL - Restoration	279
Grand Total	279

The effects to soil and water resources including BMPs and measures to mitigate erosion hazards, timber limitations and soil condition upon implementation of alternative C for all treatments are the same as those listed under alternative B except for grassland restoration. The effects to soil and water resources for grassland restoration under implementation of alternative C is similar to other action alternatives except the extent of soil disturbance is higher and summarized below.

Grassland Restoration

There are about 59,390 acres proposed under alternative C compared to 11,185 acres for alternatives B and D and similar to B, about 49,000 for alternative E (attachment #1). Of these acres, about 279 acres (table 25) occur on soils with severe erosion hazard.

Implementation of alternative C grassland restoration would result in about 6117 acres (about 1% of treatment area) of actual soil disturbance compared to about 336 acres percent for alternatives B and D and about 1436 for alternative E. Grassland restoration in Alternative C includes the Research Natural Area Garland Park and would require a little more tree thinning since the grassland is more overstocked than other grasslands in the 4Fri project area. Consequently, soil disturbance assumption is bumped up to about 10% for Alternative C. Even though there are more acres of soil disturbance predicted than other action alternatives, the vast majority of soils occur in areas with slight erosion hazard (see Attachment #3) indicating exposing bare soil through treatment will not result in accelerated soil loss or loss of soil

productivity.

A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Since the disturbance is less than 15 percent, soil productivity is expected to be maintained. Therefore, soil disturbance associated with grassland restoration does not pose a risk to long-term soil productivity. Total soil disturbance for all treatments is displayed and analyzed following all individual treatment analysis.

The bare soil exposed during treatment can be expected to respond by increasing herbaceous vegetation and litter including grass and forb production after the first year. Furthermore, herbaceous vegetation can be expected to expand in areas adjacent to areas where trees have been removed because there will be less competition for soil moisture and nutrients from trees. The increase in herbaceous vegetation and protective vegetative ground cover will better stabilize the soil and improve vegetation composition and productivity.

Resource protection measures and BMP's are the same as those listed under alternative B, grassland restoration. They are also listed in Appendix A for all action alternatives and by strata in Appendix A. Soils with severe erosion hazard are expected to be mitigated by identified BMPs.

Most soil conditions are satisfactory (see Attachment #3) but there are some areas with impaired or unsatisfactory soil conditions. Increased herbaceous cover improves soil infiltration and nutrient cycling because an increase in grass species corresponds to a larger root network essential in loosening up and improvement of soil structure and promotes better water infiltration, air exchange and soil microbial cycling of nutrients. Consequently, where soil conditions are impaired or unsatisfactory, their condition can be expected to improve both in the short and long-term (greater than 2 years).

Many 6th HUC watersheds are functional at risk and a few impaired (see Appendix C) due in part to overstocked ponderosa pine forests, road networks that alter hydrology and accelerate erosion, and less than satisfactory soil condition. Reducing tree canopy cover and associated hazardous fuels would move the grassland towards a fire adapted ecosystem. Restoration would reduce the risk of uncharacteristic, high severity wildfire that could result in removal of protective vegetative ground cover, and accelerate soil erosion and sediment delivery into connected channels thereby reducing soil productivity and water quality.

Overall, grassland restoration along with other proposed treatments can be expected to maintain the grassland ecosystem by removing encroaching trees and increase ecosystem resiliency, to uncharacteristic fire. Grassland restoration would move soils and watersheds towards satisfactory and functional condition in both the short and long-term and maintain or improve long-term soil productivity and water quality. A threshold of 15 percent aerial extent disturbance is assigned as a guideline where soil impairment and productivity may be appreciably reduced. Since the disturbance is less than 15 percent, soil productivity is expected to be maintained. Therefore, soil disturbance associated with grassland restoration does not pose a risk to long-term soil productivity.

Treatment Area and 6th HUC Area-Wide Soil Disturbance

Predicted soil disturbance and erosion above tolerable soil loss treatment area wide and by 6th HUC watershed upon implementation of alternative C is captured in the following table 26. Predicted soil disturbance for all alternatives are compared in table 3 and under comparison of alternatives.

Table 24. Alternative C - Summary of Direct Soil Effects

	Alt. C Acres	Alt. C % of Trt Area	Alt. C % of Wshd
Soil Disturbance from Mechanical Activities ⁴	59,647	10.2	2.9
Soil Disturbance from Potential High Severity Burns	11,724	2.0	.6
TOTAL SOIL DISTURBANCE (High severity burns and mechanical).	71,371	12.2	3.5
Soil Disturbance from Mechanical Activities & High Severity Fire (Range low to high)		2.5-19.2%	.1-11.5%
Potential Soil Erosion Above Tolerable Levels When 33% Soils Severely Burned		Up to 2%	
Potential Soil Erosion Above Tolerable Levels When All (100%) of Soils Severely Burned		Up to 2%	
Soil Erosion Above Tolerable levels from Mechanical Activities	0	0	0

Acres and percents are approximate

Overall implementation of alternative C would result in soil disturbance of about 71,371 acres or 12.2 percent in the treatment area or 3.5 percent in the affected watersheds. Implementation of alternative B would result in very similar soil disturbance at about 66,155 acres or 11.3 percent of the treatment area and 3.3 percent of affected watersheds. Therefore, overall, the effects of implementation of alternative C would be similar to those described under alternative B at the treatment area scale and about the same of a little less at the 6th HUC watershed scale.

Similar to alternative B, there would be no predicted soil erosion above tolerable soil loss rates where mechanical treatments are proposed but there could be up to about 2 percent on slopes greater than 40 percent where burn only occurs. For burning, since the amount of erosion above tolerable soil loss is limited to up to 2 percent, soil productivity is not expected to be appreciable reduced and would be maintained. In addition, implementation of identified BMPs would reduce the threat of high burn severity, accelerated erosion, sediment delivery into connected streamcourses, and not threaten water quality downstream.

Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds including those with soil disturbance greater than about 15 percent. It is important to realize that not all ground disturbing treatments would occur in the same year and soil disturbances represent all treatments implemented the first year as the worst case scenario of disturbance. Prescribed burning would occur after year one and some treatments may be staggered in time and place allowing time enough for the soil to begin dropping pine needle cast and recover.

For ponderosa pine types, the amount of coarse woody material has been modeled and quantified but maintenance of 5-7 tons/acre of coarse woody material in ponderosa pine would improve soil nutrient cycling (USDA 1994a) and listed as BMP in table 3 and Attachment A. Within the pinyon-juniper cover type, snags would be managed for 1 per acre over 75 percent of the area and coarse woody debris (CWD)

⁴ Includes acres of ground disturbance from all harvest treatments, road treatment acres, and channel treatment acres.

would be managed for an after treatment average of 1 to 3 tons per acre. Where available, a portion of the CWD would include two logs $\geq 10''$ and $\geq 10'$ in length (Huffman 2010, personal communication) and , Brewer personal communication, 2008). Identified and implemented BMPs are expected to mitigate possible negative effects to soils and improve nutrient cycling function.

Mechanical activities would not result in any soil loss above tolerable levels according to WEPP modeling. However, potential soil erosion above tolerable levels for alternative C could occur on up to about 2 percent of mechanically, untreated slopes greater than 40 percent from prescribed fire. Slopes greater than about 40 percent are proposed for low severity fire –only treatments. Fire treatments on these slopes would significantly reduce future risk of high severity fires. Soil loss exceeding tolerable amounts erode faster than renew themselves resulting in accelerated soil loss and loss of soil productivity as well as potentially deliver sediment to connected streamcourses. Again burning and mechanical treatments would not occur in the first year and be staggered in time and place and along with identified and implemented BMPs are expected to mitigate possible negative effects to soils.

Treatment area wide and 6th HUC watershed level effects are similar as those described under alternative B except there would be slightly more soil disturbance at the 6th HUC watershed scale in alternative C. Overall, long-term soil productivity and watershed function are expected to be maintained or improved much better than alternative A and about the same acreage as alternative B. Grassland ecosystems would be maintained better than alternative A and B. Implementation of alternatives C would meet the projects purpose and need and meet the Kaibab and Coconino national forest plan standards and guidelines.

There would be no predicted soil erosion above tolerable soil loss rates where mechanical treatments are proposed but there could be up to about 2 percent on slopes greater than 40 percent where burn only occurs. For burning, since the amount of erosion above tolerable soil loss is limited to up to 2 percent, soil productivity is not expected to be appreciable reduced and would be maintained. In addition, implementation of identified BMPs would reduce the threat of high burn severity, accelerated erosion, sediment delivery into connected streamcourses, and not threaten water quality downstream. Implementation of alternative B meets the projects purpose and need and meets the Kaibab and Coconino NF forest plan standards and guidelines.

Reduced Mechanical Treatment Intensity Effects on Soil Productivity, Water Quality and Watershed Function - Alternatives C and E

Reducing treatment intensity on about 40,000 acres would not directly or indirectly pose risk to soil productivity, water quality or watershed function. With the implementation of identified soil and water BMPs, soil disturbance direct effects associated with 4Fri treatments has already been shown not to exceed the 15% established soil productivity threshold and therefore reduced treatment intensity would not either.

Furthermore, reducing treatment intensity on about 40,000 throughout the 4Fri footprint would not have indirect, detrimental effects from uncharacteristic wildfire on soil productivity, water quality or watershed function due to the limited number of acres proposed, small treatment stand acres and non-contiguous nature of stand treatment acres scattered across numerous 6th HUC watersheds. Treatment stand size would be small and non-contiguous throughout many watersheds ranging from about 4 to 344 acres with an average of 35 acres. Throughout the entire 4Fri footprint and all connected watersheds, only about 1880 acres (with the largest single polygon amounting to only about 90 acres) would be at higher risk of uncharacteristic crown fires that could result in soil disturbance following post fire storm events. These areas are small and disconnected allowing for maintenance of adequate vegetative ground cover

that would trap and filter sediment reducing the magnitude of soil disturbance, accelerated erosion, sediment delivery, and reduced water quality, loss soil productivity and watershed function that could otherwise result from uncharacteristic fires associated with dense forests on much larger acreages.

The largest and maximum amount of acres in any 6th HUC watershed that could result in increased fire risk due to reduced fire intensity treatments is in RMU 6-3 (646 acres, Lata, 2014) which is roughly equivalent to the Coconino Wash Headwaters 6th HUC watershed. For both Alternatives, C and E, the total number of acres in the watershed is 51,193 with soil disturbance predicted at the watershed scale from originally proposed EIS treatments of 6.1% and 8.7% for cumulative effects. Reducing treatment intensity could result in a very slight increase in soil disturbance and would raise soil disturbance from EIS disturbance from 6.1% to 7.4% while total disturbance from cumulative effects would increase from 8.7% to 9.9% for both alternatives at the watershed scale. It is highly doubtful that this slight increase would result in measurable sediment delivery to connected perennial waters downstream. All other 6th HUC watersheds would have substantially less additional disturbance or fire risk because fewer acres would have reduced mechanical treatment reduction.

For all 6th HUC watersheds, reducing treatment intensity on about 40,000 acres would still result in soil disturbance less than the 15% established threshold and therefore, soil productivity and watershed function is expected to be maintained.

The effects of the decreased mechanical treatment intensity proposed for about 3,303 acres of savanna treatments would add only about 100 acres (6th HUC watershed wide) of potential crownfire that could result in up to 100 acres of soil disturbance following post fire storm events. The largest contiguous area of potential new crownfire would be about 12 acres. The soil and water effects from decreased treatment intensity on about 3303 acres of savanna are similar to and even of less magnitude and extent than those described above on the 40,000 acre treatment reduction. It is highly unlikely that this slight increase in soil disturbance would result in measurable sediment delivery to connected perennial waters downstream.

For all 6th HUC watersheds, reducing treatment intensity on about 3303 acres of savanna would not directly or indirectly pose risk to soil productivity, water quality or watershed function, and would still result in soil disturbance similar to those listed in table 4 and less than the 15% established threshold and therefore, soil productivity and watershed function is expected to be maintained.

Paired Watershed Study Effects Alternative C and E

A paired watersheds study is proposed to evaluate the effects of vegetation treatment on water yield and water balance. Comprehensive water, mass, and energy balance data would be collected from 12 watersheds (see map in attachment #5) in a paired watershed study will be used together with hydrological modeling to quantify the benefits of various restoration treatments. The final and complete study plan was compiled and submitted by the Ecological Restoration Institute and NAU's School of earth Sciences and Environmental Sustainability and can be found in the 4FRI Project Record. It is entitled Paired watershed study to predict hydrologic responses to restoration treatments and changing climate in the Four Forest Restoration Initiative first analysis area, September, 16, 2013, 113 pages.

The calibration (pre-treatment) period will be 8 years plus or minus 1 year and depends on how variable of precipitation and flow events are within that time frame.

Instruments would be installed in flat places with slopes less than 15% located on soils with slight erosion

hazard so do not pose a risk to accelerated erosion and sediment delivery into connected streamcourses or affect water quality

Implementation of all components and instruments in the proposed paired watershed study would disturb a combined area of about 2.4 acres of soil within, 3 6th HUC watersheds (see Attachment 5 for detailed soil disturbance by instrument type and maps). The following list includes the instrumentation proposed and purpose of the instrument.

- Biophysical Monitoring – vegetation plots
- Precipitation Gauges and Weather stations (up to 12)
- Snow Water Equivalence – snow pillow and snow depth sensors
- Soil Water Storage – COSMOS probes and TDR sensors
- Evapotranspiration – sapflux sensors, eddy covariance sensors, eddy covariance towers (up to 6)
- Groundwater Recharge – precipitation sampler, lysimeters
- Surface Water Discharge – flowtopgraphy, flumes, weir plates, crest gauge
- Water Quality – in situ turbidimeter, autosampler
- Sediment Yield – silt fences

Total proposed soil disturbance for this study is up to 2.4 acres or .004% of all soil disturbance if all instruments are implemented. It is probable that some components or instruments would not be implemented so total soil disturbance would be up to 2.4 acres. Furthermore, there would be several instrument set up in several areas with the largest surface soil disturbance footprint about 2000 sq. ft. or about .05 acres (Attachment 5). Consequently, soil disturbance is not concentrated in a single area and therefore, accelerated erosion and runoff is greatly minimized. In addition, all instruments would be constructed on relatively flat soils (up to 15% slope) and are located on soils with slight erosion hazard. Even if all vegetative ground cover is removed, disturbance on soils with slight erosion hazard would not result with accelerated erosion hazard, runoff or sediment delivery into connected streamcourses. Therefore, implementing construction of all instruments would be very minor in soil disturbance extent (less than .004% of total soil disturbance) and soil erosion would not occur above threshold levels and does not pose a risk to soil productivity or water quality downstream.

There are portions of 3 6th HUC watersheds proposed for the study and include Walnut Creek Upper Lake Mary, Middle Sycamore Creek and Big Spring Canyon (Attachment 5).

There is one control watershed proposed for no treatment in each of the 3, 6th HCU watersheds totaling about 2313 acres. Overall, not treating control watersheds reduces soil disturbance very minimally and less than 2% (see below).

Total acreage in the Big Spring Canyon watershed is 31,697 with about 14,304 acres proposed for treatment or 41% of the watershed and amount to about 2265 acres of soil disturbance. The control watershed would not treat about 971 acres or 3.1% of the watershed. Assuming soil disturbance at the maximum amount of 15%, the study would reduce the soil disturbance by about 146 acres or about .6% within the watershed.

Total acreage in the Middle Sycamore Creek watershed is 18,335 with about 6928 acres proposed for treatment or 38% of the watershed which amounts 889 acres of soil disturbance. The control subwatershed would not treat about 844 acres or 4.6% of the watershed. Assuming soil disturbance at the maximum amount of 15%, the study would reduce the soil disturbance by about 127 acres or about .7% within the watershed.

Total acreage in the Walnut Creek Upper Lake Mary watershed is 34,473 with about 25,547 acres proposed for treatment or 74% of the watershed. The control subwatershed would not treat about 498 acres or 1.4% of the watershed. Assuming soil disturbance at the maximum amount of 15%, the study would reduce the soil disturbance by about 75 acres or about 1.4% within the watershed.

Implementing proposed no treatment would result in a little less soil disturbance (ranging from about 1-2% less) in the short term (up to about 2-3 years) at the 6th HUC watershed level compared to implementation of Alternatives B and D. The only measurable difference could be at the very fine scale where treated paired watersheds might deliver a little more sediment into drainages than control watersheds for the first couple of years until treated areas soils recover with protective pine needle duff. Due to the minor amount of soil disturbance expected in treated areas (generally 10-15%), the amount of sediment that might be delivered into streamcourses in the first 2 years is expected to be minimal. Furthermore, there are no treated areas directly connected to water that are impaired by total suspended sediments (prior ADEQ turbidity standard). In addition and as previously stated, under Alternative C, mechanical activities would not result in soil loss above tolerable levels. Therefore, reducing treatments in control watersheds would still not result in any soil loss above tolerable levels and soil productivity would be maintained. After the study is complete, treatment in the control watersheds would likely occur and total soil disturbance amounts would be similar to what is described under Alternatives B and D in each of the 3 watersheds.

Overall and at the watershed level, implementing construction of all instruments would be very minor in extent (up to 2.4 acres and less than .005% of total soil disturbance) and accelerated soil erosion would not occur or be measurable and does not pose a risk to soil productivity, watershed function or water quality downstream.

Not treating the much smaller control watersheds would slightly reduce soil disturbance (by about 348 acres or .5 - 2% of the 3, 6th HUC watersheds) and associated soil erosion and sediment delivery in the short-term (up to 2-3 years) after which protective duff quickly builds. Although there would be a little less soil disturbance in the short term, it would be very minor in extent and the amount of soil erosion and sediment that could be delivered into connected streamcourses is probably not measurable at the 6th HUC scale and is not connected to impaired, perennial waters. The overall effects to soils and watershed function would be similar to what is described under Alternative B, D and E.

Effects to Soil Condition/Productivity and Watershed Function

See Tables 3, 6 and 7 for a comparison effects to soil condition, soil productivity and watershed function by alternative.

Treatment area wide and 6th HUC watershed level effects are similar as those described under alternative B except there would be slightly more soil disturbance at the 6th HUC watershed scale in alternative C. Overall, long-term soil productivity and watershed function are expected to be maintained, protected and improved much better than alternative A because of treatments to increase understory response from opening of canopies by thinning and reduction of fuels from prescribed burning on about 586,000 acres. The treatment acres in alternative C are slightly greater than alternative B, with the major difference residing in treatment s to grasslands. As such, grassland ecosystems would be maintained better than alternative B. Implementation of alternatives C would meet the projects purpose and need and meet the Kaibab and Coconino national forest plan standards and guidelines. Soil condition, productivity and watershed function would greatly improve, be maintained and protected.

Summary of Effects to Soil Resources - Alternative C

Collectively and treatment area wide within 6th code watersheds, the maximum soil disturbance for implementing all mechanical treatments and prescribed burning would be approximately 3.5 percent (within 6th HUC watershed and 12.2 percent within treatment areas) and varies by watershed. This assumes all acres are implemented and the maximum ground disturbance occurs. Since total soil disturbance in affected watersheds is about 3.5 percent, the combination of all treatments do not pose a risk to soil resources and soil productivity and watershed function is expected to be maintained.

There would be no predicted soil erosion above tolerable soil loss rates where mechanical treatments are proposed but there could be up to about 2 percent on slopes greater than 40 percent where burn only occurs. For burning, since the amount of erosion above tolerable soil loss is limited to up to 2 percent, soil productivity is not expected to be appreciably reduced and would be maintained. The amount of coarse woody material has been modeled and quantified but for ponderosa pine types, maintenance of 5-7 tons/acre of coarse woody material will reduce risk of uncharacteristic fires resulting in high burn severity and soil damage and should improve soil nutrient cycling (USDA 1994a) and listed as BMP in table 3 and attachment A.

Within the pinyon-juniper cover type, snags would be managed for 1 per acre over 75 percent of the area and coarse woody debris (CWD) would be managed for an after treatment average of 1 to 3 tons per acre. Where available, a portion of the CWD would include two logs $\geq 10''$ and $\geq 10'$ in length (Huffman personal communication, 2010), and (Brewer personal communication 2008). Identified and implemented BMPs are expected to mitigate possible negative effects to soils and improve nutrient cycling function.

Identified and implemented BMP's are expected to reduce the risk of accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds including those with soil disturbance greater than about 15 percent. It is important to realize that not all ground disturbing treatments would occur in the same year and soil disturbances represent all treatments implemented the first year as the worst case scenario of disturbance. Prescribed burning would occur after year one and some treatments may be staggered in time and place allowing time enough for the soil to begin dropping pine needle cast and recover. Identified and implemented BMPs are expected to mitigate possible negative effects to soils.

6th HUC watershed wide, the maximum soil disturbance for implementing all mechanical treatments and prescribed burning would be approximately 3.5percent and varies by watershed. This assumes all acres are implemented and the maximum ground disturbance occurs. Since total watershed soil disturbance is about 3.5 percent the combination of all treatments do not pose a risk to soil resources and soil productivity and watershed function is expected to be maintained or improved. Overall, proposed treatments would result if effects to soils would be similar to those described above treatment are wide but to a lesser degree due to the scale of the watershed (larger than treatment area). Compared to treatment area disturbance, watershed level disturbance is about 3 times less, effectively diluting the overall negative impacts to watershed function. Consequently, restoration of fire adapted ecosystems would begin to occur and where watersheds are functional at risk or impaired, their condition can be expected to improve both in the short and long-term (greater than 2 years) maintaining or improving soil productivity and water quality. Implementation of Alternatives C would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows).

Treatment area wide and 6th HUC watershed level effects are similar as those described under alternative B except there would be slightly more soil disturbance at the 6th HUC watershed scale in alternative C. Overall, long-term soil productivity and watershed function are expected to be maintained, protected and improved much better than alternative A because of treatments to increase understory response from opening of canopies by thinning and reduction of fuels from prescribed burning on about 586,000 acres. The treatment acres in alternative C are slightly greater than alternative B, with the major difference

residing in treatments to grasslands. As such, grassland ecosystems would be maintained better than alternative B. Implementation of alternatives C would meet the projects purpose and need and meet the Kaibab and Coconino national forest plan standards and guidelines. Soil condition, productivity and watershed function would greatly improve, be maintained and protected.

Cumulative Effects

The geographic setting, boundary and potential projects are the same as alternative B. Acres are listed in table 27.

Baseline Activities

Baseline activities and effects are the same as alternative B. The total baseline ground disturbance is about 45,040 acres for the cumulative effects area, or about 2 percent of the entire cumulative effects area. There are six, 6th code watersheds where urban development has a large impact on ground disturbance areas—Cataract Creek Headwaters (11 percent baseline ground disturbance) associated with the City of Williams, Sinclair Wash (25 percent) and Lower and Upper Rio de Flag (18 percent), Pumphouse Wash associated with the City of Flagstaff, Middle Oak Creek (11 percent) associated with Sedona and private land developed adjacent to Oak Creek.

Past Actions and Present Actions

Past and present activities and timeframe thereof and effects are the same as alternative B. The acres used for the analysis are a summary of projects that were report in the FACTS activity layer from 2009 to the present and are the same as alternative B. These acres are summarized in Attachment #1. For the cumulative effects boundary area, there are approximately 154,720 (table 27 and Attachment #1) of total treatment acres of past and current projects within the cumulative effects boundary (about 7 percent of the cumulative effects area). Assuming a 15 percent disturbance factor for treatments, there are a total of approximately 27,380 acres of ground disturbance from projects within the cumulative effects boundary area, or about 1 percent of the cumulative effects boundary area.

Vegetative ground cover in more recent projects (within the last 2 years) is in the process of recovery. Soil disturbance and erosion is less than the 4-FRI proposed action and smaller in extent and magnitude because fewer acres were treated (and therefore less than the 3.0 percent that would be generated from the 4-FRI proposed action). The magnitude of soil erosion above tolerable soil loss is believed to be similar in proportion to the 4-FRI proposed action, very minor in magnitude because similar harvesting techniques and BMPs were employed mitigating negative effects to soil and water. The combination of past and ongoing projects soil disturbance is limited in extent and magnitude and amount to about 1 percent within the cumulative effects boundary.

Reasonably Foreseeable Future Actions

The activities and acreages of reasonably foreseeable future actions are the same as alternative B. Ground disturbing actions will implement BMPs to mitigate non point source pollution to connected streamcourses. Fuels reduction related projects are expected to occur within the cumulative effects project boundary and are summarized in Attachment #1 and table 27 to this report. The table within Attachment 1 summarizes the acres of disturbance for future and foreseeable actions. For the cumulative effects boundary area, there are approximately 157,500 acres of future and foreseeable treatment acres within the cumulative effects boundary (about 7.7 percent of the cumulative effects area). Assuming a 15 percent disturbance factor for treatments, there are a total of approximately 23,500 acres of ground disturbance from projects within the cumulative effects boundary area, or about 1 percent of the cumulative effects

boundary area. Ground disturbing actions will implement BMPs to mitigate non point source pollution to connected streamcourses.

Summary of Cumulative Effects

For past, present and reasonably foreseeable actions including the 4-FRI proposed action, the extent of soil disturbance equals about 8.2 percent (now updated to include Slide Fire predicted cumulative effects disturbance) and the overall 15% soil disturbance threshold would not be exceeded with this project within the cumulative effects boundary. The contribution and magnitude of soil disturbance from 4FRI treatments would be short-term (about 2-3 years) and equal about 3.5% at the watershed scale. Further protection of soil resources is provided by the use of Best Management Practices that minimize the potential for soil disturbance. Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds. In addition to the use of BMP's, the completion and implementation of the Travel Management EIS would further reduce the number of acres disturbed by closing and decommissioning roads within the cumulative effects boundary. Because of these facts, this alternative would not provide a detrimental cumulative effect to soil resources within the cumulative effects boundary.

There are about 45,000 acres of baseline ground disturbance from roads, private land, grazing allotments, and powerline corridors that occur across the cumulative effects analysis area. The total acres of past, present and future and foreseeable treatment acres within the cumulative effects project area are roughly 312,720 acres (154,720 past and present projects and 158,000 acres of future, foreseeable projects) or about 14 percent of the cumulative boundary area. Of these treatment acres, we are assuming that there would be about 15 percent of these acres will have ground disturbance, or about 43,700 acres, or just about 2 percent of the cumulative effects analysis area are expected to have ground disturbance from past, present and future or foreseeable projects. The 4FRI EIS would add an additional about 71,300 acres of ground disturbance for a total acreage of ground disturbance across the cumulative effects analysis area, for a total acreage of disturbed ground of nearly 167,500 acres, or about **8.2** percent of the cumulative effects boundary area (see table 27 below).

As stated above in the baseline disturbance assessment, there are six 6th code watersheds where urban development has a large impact on ground disturbance areas. This project, plus current and future foreseeable projects impacts these watersheds in the following manner. In the Cataract Creek Headwaters watershed there was a 9 percent past, present and future project generated ground disturbance prior to any activities. This percent of ground disturbance increases to 15 percent total cumulative ground disturbance. In the Sinclair Wash watershed, there was a 12 percent past, present and future ground disturbance prior to any activities. This percent of ground disturbance increases to 26 percent total cumulative ground disturbance with all projects, current and foreseeable projects. In the Lower Rio de Flag watershed there was an 8 percent past, present and future project generated ground disturbance that increases to 21 percent total cumulative ground disturbance. In the Middle Oak Creek watershed, there was 7 percent past, present and future project generated ground disturbance that increases to 11 percent total cumulative ground disturbance. Pumphouse Wash watershed has about 11% contributions from past, present and future projects and about 6% from 4FRI. Upper Rio de Flag watershed has about 14 percent contribution from past, present and future projects and extra about 3 percent from 4FRI. Implementation of BMP's would minimize any impacts to watersheds, and would be especially important in the watersheds that have a high urban impact already existing.

A discussion of cumulative effects resulting from the Slide Fire can be found at the end of the analysis of Alternatives.

Table 25. Alternative C - Summary of Cumulative Effects

	EIS			Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
Total Cum Effects analysis area 6th code acres	TOTAL EIS Ground Disturb	TOTAL EIS treatment % ground disturb	TOTAL EIS %6th code Ground Disturb	BASELINE E Ground Disturb	TOTAL TREAT ACRES	TOTAL Future/ Fore Ground Disturb	TOTAL TREAT ACRES	TOTAL Current Ground Disturb	TOTAL CUM EFFECTS ground disturb	TOTAL CUM EFFECTS % Ground Disturb
2,032,080	71,371	12.2%	3.5%	45,041	157,772	23,666	154,720	27,380	167,458	8.2%

Alternative C protection of soil resources is provided by the use of Best Management Practices that minimize the potential for soil disturbance. Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds. In addition to the use of BMP's, the completion and implementation of the Travel Management EIS would further reduce the number of acres disturbed by closing and decommissioning roads within the cumulative effects boundary. Because of these facts, this Alternative would not provide a detrimental cumulative effect to soil resources within the cumulative effects boundary.

Summary Conclusion:

Total ground disturbance of all past, present (including 4FRI EIS) and reasonable foreseeable actions results in a total ground disturbance across the cumulative effects analysis area of about 167,500 (table 27) or about 8.2 percent.

Alternative D - Direct and Indirect Effects

Alternative D responds to issue 2 (smoke) in chapter 1 by decreasing the acres to be prescribed burned by over 50 percent (in comparison to alternative B). In this alternative, prescribed burning is not occurring where mechanical harvest has occurred and is predominantly used on grassland vegetation and areas that have an existing condition that is close to desired conditions (about 178,441 acres). Road and stream channel actions and effects are the same as alternative B.

Alternative D has the same mechanical treatments on the same soils as alternative B and therefore, similar effects to soil and water resources including BMPs and measures to mitigate erosion hazards, timber limitations and soil condition as alternative B. Alternative D has more grassland restoration acres than alternative B but less than C with effects similar to alternative C. However, because alternative D would only prescribe burn about 1/3 of the acres as alternative B, and would be done mostly in grasslands, there would be different effects to soil and resources described below.

Table 26. Alternative D - Summary of Direct Soil Effects

	Alt. D Acres	Alt. D % of Trt Area	Alt. D % of Wshd
Soil Disturbance from Mechanical Activities ⁵	54,368	9.6	2.7
Soil Disturbance from Potential High Severity Burns	3,569	.6	.2
TOTAL SOIL DISTURBANCE (High severity burns and mechanical).	57,937	10.3	2.9
Soil Disturbance from Mechanical Activities & High Severity Fire (Range low to high)		2.1-16.3	.1-9.7
Potential Soil Erosion Above Tolerable Levels When 33% Soils Severely Burned		Up to 2%	
Potential Soil Erosion Above Tolerable Levels When All (100%) of Soils Severely Burned		Up to 2%	
Soil Erosion Above Tolerable levels from Mechanical Activities	0	0	0

Acres and percent's are approximate

Total soil disturbance at the treatment level is 9.6 percent and 2.7 percent at the watershed scale table 28). Predicted soil disturbance for all alternatives are compared in tables 3 and 4. Overall, implementation of alternative D would not meet the projects purpose and need as well as other action alternatives (alternative B and C) to move towards the desired condition of having a resilient forest by reducing the potential for undesirable fire behavior and its effects and maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire. The consequences to soil and water resources of removing prescribed burning from mechanically treated areas would be to greatly exceed the amount of coarse wood debris on-site above the recommended 5-7 tons per acre on some sites. In addition, thick forest duff is common on many sites and has been observed to reduce the herbaceous understory growth compared to thinner duff layers (Steinke personal observations 1989-2012). On these sites, long-term soil productivity will be met; however, if a wildfire burns within these sites, there would be a higher percentage of acreage that would burn with a higher intensity because of heavier fuel loading.). Lata in her fire ecology report for this project notes the following for fire effects for this Alternative:

“In the short term (<20 years), across the treatment area the potential for undesirable fire behavior and effects would be reduced (indirect effects of proposed treatments) by breaking up the vertical and horizontal canopy fuels (direct effects of proposed treatments). In mechanically treated areas, potential for high severity surface fires would remain the same or increase. In burn only areas, canopy base heights would increase and canopy bulk densities would decrease, decreasing the potential for crown fire, and surface fuel loads of litter and duff would be reduced (all direct effects), and replaced

⁵ Includes acres of ground disturbance from all harvest treatments, road treatment acres, and channel treatment acres.

by the light, flashy fuels that would be stimulated by post-treatment conditions (indirect effects), decreasing the potential for high severity surface fire effects (indirect effects). Air quality impacts (indirect effects) could increase some as first and second entry prescribed fires are implemented.

In the long term (>20 years), potential for undesirable fire behavior, as assessed by changes to canopy fuels, would lower than existing condition for approximately 35 percent of the ponderosa pine in the treatment area. Potential for undesirable fire effects, as assessed by changes to canopy fuels and surface fuel loading, would not remain lower than existing condition for any of the ponderosa pine in the treatment area. Air quality impacts (indirect effects) would decrease as the acres are moved in to maintenance mode and fewer emissions per acre are produced by fire.”

By eliminating prescribed burning higher severity surface wildfires would have a detrimental effect on soil heating, mineralization, soil sterilization or soil damage. Failure to control burning conditions, managers would not be able to manipulate the heat produced by burning CWD and thereby risk damage to plants and soils (Passovoy et al. 2006)

Maintaining soil productivity over the long term generally requires presence of soil organic material and fire effects characteristic of the natural fire regime. Implementation of alt. D would not restore the natural fire regime. Most fires characteristic of the historic fire regime or moderate severity prescribed fires are likely to enhance soil development and fertility over the longterm by periodic release of nutrients. However, extremely severe fires or large severely burned areas within fires would be expected with implementation of alt. D and likely to be highly detrimental to forest soils (Brown 2003).

Under severe burning conditions (predicted for many soils on alt. D) soil organic matter would be removed or destructively altered, nutrients volatilized, water-absorbing capacity decreased, and living plant parts and microorganisms killed. Loss of soil organic matter that is necessary for sustaining the biological activity of soils (Neary, 2005) is probably the most serious long-term concern (Brown 2003).

Thinning followed by prescribed burning reduces canopy, ladder, and surface fuels, thereby providing maximum protection from severe fires in the future (Peterson et al. 2003 in Graham et al. 2004:26). Potential fire intensity and/or severity in thinned stands are significantly reduced only if thinnings are accompanied by reducing the surface fuels (woody fuel stratum) created from the thinning operations (Graham and others 1999 in Graham et al. 2004:26-27). Depending on the spatial arrangement of current fuel loading, the effect of a wildfire on these sites would be similar to alternative A. The difference between the two alternatives is that the tree arrangement and relative openness of the post-harvest setting would not lend itself to large crown fire acreages (please refer to change in crown fire potential that is disclosed on the fire ecologist specialist report), thus the effects to soils from the indirect effects from wildfire would not be as extensive in alternative D as it would be in alternative A. The amount of acres that would be affected from high severity surface fire effects is not quantifiable, but we will assume that 25% of the mechanically treated acres will have these effects.

Overall, removing fire from treated areas would pose risk to short and long term soil productivity, water quality and watershed function similar to alternative A and more than alternatives B and C and not meet the projects purpose and need. Implementation of alternative D would meet the forest plans standards and guidelines but not meet the purpose and need of this project as well as alternatives B and C.

Summary of Effects to Soil Resources - Alternative D

Collectively and treatment area wide within 6th code watersheds, the maximum soil disturbance for implementing all mechanical treatments and prescribed burning would be approximately 2.9 percent (within 6th HUC watershed and 10.3 percent within treatment areas, table 28) and varies by watershed.

Since total soil disturbance is about 2.9 percent at watershed level and 10.3 percent at the treatment level, the combination of all treatments do not pose a risk to soil resources and soil productivity and watershed function is expected to be maintained.

There would be no predicted soil erosion above tolerable soil loss rates where mechanical occurs. Since burning is not proposed following mechanical treatments, soil productivity would be at risk from high severity wildfires similar to the effects described in alternative A, but probably slightly less since harvesting would reduce overall fuel load and extreme temperature, negative temperature to soil that might mineralize or sterilize organic matter. The amount of coarse woody material has been modeled and quantified but for ponderosa pine types, maintenance of 5-7 tons/acre of coarse woody material will improve soil nutrient cycling (USDA 1994a) and listed as BMP in table 3.

Within the pinyon-juniper cover type, snags would be managed for 1 per acre over 75 percent of the area and coarse woody debris (CWD) would be managed for an after treatment average of 1 to 3 tons per acre. Where available, a portion of the CWD would include two logs $\geq 10''$ and $\geq 10'$ in length (Huffman personal communication, 2010) and (Brewer personal communication, 2008). Identified and implemented BMPs are expected to mitigate possible negative effects to soils and improve nutrient cycling function.

Identified and implemented BMP's are expected to reduce the risk of accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds including those with soil disturbance greater than about 15 percent. It is important to realize that not all ground disturbing treatments would occur in the same year and soil disturbances represent all treatments implemented the first year as the worst case scenario of disturbance.

6th HUC watershed wide, the maximum soil disturbance for implementing all mechanical treatments would be approximately 2.9 percent and varies by watershed. This assumes all acres are implemented and the maximum ground disturbance occurs. Since total soil disturbance is about 2.9 percent, the combination of all treatments do not pose a risk to soil resources and soil productivity and watershed function is expected to be maintained or improved. Overall, proposed treatments would result in effects to soils similar to those described above treatment are wide but to a lesser degree due to the scale of the watershed (larger than treatment area). Compared to treatment area disturbance, watershed level disturbance is about 3 times less, effectively diluting the overall negative impacts to watershed function. Consequently, restoration of fire adapted ecosystems would begin to occur and where watersheds are functional at risk or impaired, their condition can be expected to improve both in the short and long-term (greater than 2 years) maintaining or improving soil productivity and water quality. Implementation of Alternative D would not reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows).

Overall, long-term soil productivity and watershed function are expected to be maintained, protected or improved much better than alternative A, but not on as many acres as alternatives B and C since prescribed fire would not be fully utilized. Implementation of alternative D would partially meet the projects purpose and need and be consistent with the Kaibab and Coconino National Forest forest plan standards and guidelines.

Alternative D protection of soil resources is provided by the use of Best Management Practices that minimize the potential for soil disturbance. Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds. However, the absence of prescribed fire puts the soil resource at risk of adverse effects of high severity wildfire similar but slightly less due to lower fuel loading to those described alternative A. Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses

and maintain water quality in all watersheds.

Effects to Soil Condition/Productivity and Watershed Function

See tables 6 and 7 for a comparison of effects to soil condition, soil productivity and watershed function by alternative.

Implementation of Alternative D would not meet the projects purpose and need as well as other action alternatives but would come closer than Alternative A. Far fewer acres would be treated with prescribed fire and maintenance resulting in long-term buildup of hazardous fuels and increased canopy cover of trees that pose risk to soil productivity and watershed function from uncharacteristic fires and nutrient cycling soil functions from sparse understories.

Cumulative Effects Alternative D

The geographic setting, boundary and potential projects are the same as alternative B.

Baseline Activities

Baseline activities and effects are the same as alternative B.

Baseline activities are the same as alternative B. The total baseline ground disturbance is about 45,040 acres for the cumulative effects area, or about 2 percent of the entire cumulative effects area. There are six, 6th code watersheds where urban development has a large impact on ground disturbance areas—Cataract Creek Headwaters (11 percent baseline ground disturbance) associated with the City of Williams, Sinclair Wash (25 percent) and Lower and Upper Rio de Flag (18 percent), Pumphouse Wash associated with the City of Flagstaff, Middle Oak Creek (11 percent) associated with Sedona and private land developed adjacent to Oak Creek.

Past Actions and Present Actions

Past and present activities and timeframe thereof, are the same as alternative B. The acres used for the analysis are a summary of projects that were report in the FACTS activity layer from 2009 to the present and are the same as alternative B. These acres are summarized in Attachment #1. For the cumulative effects boundary area, there are approximately 157,772 (table 29 and Attachment #1) of total treatment acres of past and current projects within the cumulative effects boundary (about 7 percent of the cumulative effects area). Assuming a 15 percent disturbance factor for treatments, there are a total of approximately 27,380 acres of ground disturbance from projects within the cumulative effects boundary area, or about 1 percent of the cumulative effects boundary area.

Vegetative ground cover in more recent projects (within the last 2 years) is in the process of recovery. Soil disturbance and erosion is less than the 4-FRI proposed action and smaller in extent and magnitude because fewer acres were treated (and therefore less than the 3.0 percent that would be generated from the 4-FRI proposed action). The magnitude of soil erosion above tolerable soil loss is believed to be similar in proportion to the 4-FRI proposed action, very minor in magnitude because similar harvesting techniques and BMPs were employed mitigating negative effects to soil and water. The combination of past and ongoing projects soil disturbance is limited in extent and magnitude and amount to about 1 percent within the cumulative effects boundary.

Reasonably Foreseeable Future Actions

The activities and acreages of reasonably foreseeable future actions are the same as alternative B. Ground

disturbing actions will implement BMPs to mitigate non point source pollution to connected streamcourses. Fuels reduction related projects are expected to occur within the cumulative effects project boundary and are summarized in Attachment #1 and table 29 to this report. The table within Attachment 1 summarizes the acres of disturbance for future and foreseeable actions. For the cumulative effects boundary area, there are approximately 157,700 acres of future and foreseeable treatment acres within the cumulative effects boundary (about 7.7 percent of the cumulative effects area). Assuming a 15 percent disturbance factor for treatments, there are a total of approximately 23,667 acres of ground disturbance from projects within the cumulative effects boundary area, or about 1 percent of the cumulative effects boundary area.

Fuels reduction related projects are expected to occur within the cumulative effects project boundary and are summarized in Attachment 1 to this report. The table within Attachment 1 and table 29 summarize the acres of disturbance for future and foreseeable actions including the Flagstaff Forest Partnership Project and Kelly Trails and Moonset Pit Expansion Project. Ground disturbing actions will implement BMPs to mitigate non point source pollution to connected streamcourses.

Summary of Cumulative Effects

For past, present and reasonably foreseeable actions including the 4-FRI proposed action, the extent of soil disturbance equals about 7.6 percent and the overall 15% soil disturbance threshold would not be exceeded with this project within the cumulative effects boundary. The contribution and magnitude of soil disturbance from 4FRI treatments would be short-term (about 2-3 years) and equal about 2.9% at the watershed scale. Further protection of soil resources is provided by the use of Best Management Practices that minimize the potential for soil disturbance. Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds. In addition to the use of BMP's, the completion and implementation of the Travel Management EIS would further reduce the number of acres disturbed by closing and decommissioning roads within the cumulative effects boundary. Because of these facts, this alternative would not provide a detrimental cumulative effect to soil resources within the cumulative effects boundary.

There are about 45,000 acres of baseline ground disturbance from roads, private land, grazing allotments, and powerline corridors that occur across the cumulative effects analysis area. The total acres of past, present and future and foreseeable treatment acres within the cumulative effects project area are roughly 312,720 acres (157,772 past and present projects and 158,000 acres of future, foreseeable projects) or about 14 percent of the cumulative boundary area. Of these treatment acres, we are assuming that there would be about 15 percent of these acres will have ground disturbance, or about 43,700 acres, or just about 2 percent of the cumulative effects analysis area are expected to have ground disturbance from past, present and future or foreseeable projects. The 4FRI EIS would add an additional about 57,937 acres of ground disturbance for a total acreage of ground disturbance across the cumulative effects analysis area, for a total acreage of disturbed ground of nearly 154,000 acres, or about **7.6** percent of the cumulative effects boundary area (see table 29 below).

A discussion of cumulative effects resulting from the Slide Fire is found at the end of the analysis by Alternative.

In addition the use of BMP's, the completion and implementation of the Travel Management EIS would further reduce the number of acres disturbed by closing and decommissioning roads within the cumulative effects boundary. Because of these facts, this alternative would not provide a detrimental cumulative effect to soil resources within the cumulative effects boundary.

Table 27. Alternative D - Summary of Cumulative Effects

	EIS			BASELINE	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
Total Cum Effects analysis area 6th code acres	TOTAL EIS Ground Disturb	TOTAL EIS treatment % ground disturb	TOTAL EIS %6th code Ground Disturb	BASELINE Ground Disturb	TOTAL TREAT ACRES	TOTAL Future/Fore Ground Disturb	TOTAL TREAT ACRES	TOTAL Current Ground Disturb	TOTAL CUM EFFECTS ground disturb	TOTAL CUM EFFECTS % Ground Disturb
2,032,080	57,937	10.3%	2.9%	45,041	157,772	23,666	157,772	27,380	154,023	7.6%

Summary Conclusion:

Total ground disturbance of all past, present (including 4FRI EIS) and reasonable foreseeable actions results in a total ground disturbance across the cumulative effects analysis area of about 154,000 (table 29) or about 7.6 percent.

Alternative E - Direct and Indirect Effects

Overall, proposed treatments could result in an average of about 11.1% (table 31) soil disturbance in the treatment area (about 581,000 acres) and 3.2% soil disturbance in affected 6th HUC watersheds with a range of 0-18% (table 31) disturbance within the treatment area in any one watershed.

Treatment area wide and at the 6th HUC watershed scale, effects to soil productivity, soil and watershed function from implementation of Alternative E are similar to those described in Alternative B except in the areas affected by forest plan amendments described below.

Since predicted soil erosion and soil disturbance is similar at the treatment and watershed scale to Alternative B (see tables 3-7, 31), effects to soil productivity, soil and watershed function from implementation of Alternative E are similar to those described in Alternative except in the areas affected by forest plan amendments described below.

Alternative E was included following response to comments to analyze the effects without forest plan amendments (MSO Management, Canopy Cover Open Reference Condition in Goshawk Habitat, Management of Garland Prairie RNA and Cultural Resource Effects Determination.

Because of lack of these amendments, for soil function and productivity concerns, the applicable differences in treatments between E, B, C and D are no grasslands (including Garland Prairie RNA) or savannas would be restored totally about 56,000 acres and no mechanical treatments would occur in 18 MSO PACS (excluding core areas) from 9-16 inch diameter trees totally and prescribed fire would be allowed in both. In addition, the amendment and treatments implementing desired percentages of interspaces within uneven-aged stands are essential in restoring grasslands and savannas to improve soil nutrient cycling and reduce risk of uncharacteristic wildfire that may result in accelerated erosion and loss of soil productivity in these areas.

Not implementing restoration treatments in these amendment affected areas (grasslands, savannas, PACS, canopy cover open reference areas) would not fully restore the fire-adapted ecosystem and could put soil function and productivity and watershed function including downstream water quality at risk from high severity wildfire and pose risk to the sustainability of PACs, core areas, restricted and threshold habitat. Not implementing the effect determination of cultural resources would not have an effect on soil productivity, watershed function since it would not affect protective vegetative ground or soil nutrient cycling function.

Not implementing the MSO, Goshawk Habitat, Canopy Cover Conditions, and Garland Prairie amendments would not protect the soil and watershed from uncharacteristic wildfire that could result in accelerated erosion and sediment transport downstream into connected streamcourses in these areas.

See the amendment analysis section in this report (4FRI Forest Plan Amendment Analysis for Soil Productivity and Watershed Function for more detailed effects analysis comparison amongst alternatives.

The effects to soil and water resources including BMPs and measures to mitigate erosion hazards, timber limitations and soil condition upon implementation of alternative E for all treatments are the same as those listed under alternative B.

Resource protection measures and BMP's are identified and are expected to mitigate erosion and potential impacts to severe erosion soil types, loss of soil productivity and reduce nonpoint source water pollution. They are listed in table 3 for all action alternatives and by strata in Appendix A. Harvesting operation BMP's specific for ponderosa pine restoration that would be implemented include the following, 23, 24,

25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 38 and 28.

Table 28. Alt E - Acres of Severe Erosion Hazard, Low, High, Aspen, Grassland & Savanna Treatments

LOW INTENSITY TREATMENTS

TREATMENT TYPE	ACRES	TREATMENT TYPE	ACRES
AZGFD Trt	87	PAC - Mechanical	2,979
dPFA - IT10	40	PFA - IT10	63
dPFA - IT25	11	PFA - IT25	137
dPFA - SI10	1	PFA - PineSage	11
dPFA - UEA10	27	PFA - SI25	77
dPFA - UEA25	96	PFA - UEA10	43
Grassland Mechanical	832	PFA - UEA25	302
IT10	1,038	PFA - UEA40	1,075
IT25	1,422	PineSage	129
MSO Restricted Trt	15,484	SI10	203
MSO Target Trt	1,598	SI25	552
MSO Threshold Trt	816	UEA10	1,827
		UEA25	3,063
		Grand Total	31,913

HIGH INTENSITY TREATMENTS

TREATMENT TYPE	ACRES
dPFA - IT40	31
dPFA - UEA40	276
IT40	4,807
PFA - IT40	356
PFA - SI40	49
SI40	1,608
UEA40	12,911
WUI55	317
Grand Total	20,355

ASPEN TREATMENT TYPE	
TREATMENT TYPE	ACRES
Aspen Treatment	364
Grand Total	364

SAVANNA TREATMENT TYPE	
TREATMENT TYPE	ACRES

Savanna	0
Grand Total	0

TREATMENT TYPE	ACRES
GL - Restoration	0
Grand Total	0

Table 29. Alt. E - Summary of Direct Soil Effects (acres and percents are approximate)

	Alt. E Acres	Alt.E % of Trt Area	Alt. E % of Wshd
Soil Disturbance from Mechanical Activities ⁶	52,632	9.1	2.6
Soil Disturbance from Potential High Severity Burns	11,620	2.0	.6
TOTAL SOIL DISTURBANCE (High severity burns and mechanical).	64,252	11.1	3.2
Soil Disturbance from Mechanical Activities & High Severity Fire (Range low to high)		0-18.4%	0-10.8%
Potential Soil Erosion Above Tolerable Levels When 33% Soils Severely Burned		Up to 2%	
Potential Soil Erosion Above Tolerable Levels When All (100%) of Soils Severely Burned		Up to 2%	
Soil Erosion Above Tolerable levels from Mechanical Activities	0	0	0

Effects to Soil Condition/Productivity and Watershed Function

See Tables 3, 6 and 7 for a comparison effects to soil condition, soil productivity and watershed function by alternative.

Summary of Effects to Soil Resources - Alternative E

Collectively and treatment area wide within 6th code watersheds, the maximum soil disturbance for implementing all mechanical treatments and prescribed burning would be approximately 3.2 percent (within 6th HUC watershed and 11.1 percent within treatment areas) and varies by watershed. This assumes all acres are implemented and the maximum ground disturbance occurs. Since total soil disturbance in affected watersheds is about 3.2 percent, the combination of all treatments do not pose a risk to soil resources and soil productivity and watershed function is expected to be maintained.

There would be no predicted soil erosion above tolerable soil loss rates where mechanical treatments are proposed but there could be up to about 2 percent on slopes greater than 40 percent where burn only occurs. For burning, since the amount of erosion above tolerable soil loss is limited to up to 2 percent, soil productivity is not expected to be appreciably reduced and would be maintained. The amount of coarse

⁶ Includes acres of ground disturbance from all harvest treatments, road treatment acres, and channel treatment acres.

woody material has been modeled and quantified but for ponderosa pine types, maintenance of 5-7 tons/acre of coarse woody material will reduce risk of uncharacteristic fires resulting in high burn severity and soil damage and should improve soil nutrient cycling (USDA 1994a) and listed as BMP in table 3 and attachment A.

Within the pinyon-juniper cover type, snags would be managed for 1 per acre over 75 percent of the area and coarse woody debris (CWD) would be managed for an after treatment average of 1 to 3 tons per acre. Where available, a portion of the CWD would include two logs $\geq 10''$ and $\geq 10'$ in length (Huffman personal communication, 2010) and (Brewer personal communication, 2008). Identified and implemented BMPs are expected to mitigate possible negative effects to soils and improve nutrient cycling function.

Identified and implemented BMP's are expected to reduce the risk of accelerated erosion (including areas with severe erosion hazard), sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds including those with soil disturbance greater than about 15 percent. It is important to realize that not all ground disturbing treatments would occur in the same year and soil disturbances represent all treatments implemented the first year as the worst case scenario of disturbance. Prescribed burning would occur after year one and some treatments may be staggered in time and place allowing time enough for the soil to begin dropping pine needle cast and recover. Identified and implemented BMPs are expected to mitigate possible negative effects to soils.

Treatment area wide and 6th HUC watershed level effects are similar as those described under alternative B except in areas affected by the amendments described above. Outside of areas affected by the amendments, long-term soil productivity and watershed function are expected to be maintained, protected and improved much better than alternative A and D and about the same as B but not as well as C. The with the major difference residing in treatments to grasslands in C. As such, grassland ecosystems would be maintained better. Outside of areas affected by the amendments, implementation of alternative E would meet the projects purpose and need but not meet the purpose in need in untreated amendment affected areas (grasslands, savannas, PACS, open canopy areas). Soil condition, productivity and watershed function would greatly improve, be maintained and protected.

Implementation of Alternative E would meet the Kaibab and Coconino national forest plan standards and guidelines in all areas.

Not implementing restoration treatments in amendment affected areas (grasslands, savannas, PACS, canopy cover open reference areas) would not fully restore the fire-adapted ecosystem and could put soil function and productivity and watershed function including downstream water quality at risk from high severity wildfire and pose risk to the sustainability of PACs, core areas, restricted and threshold habitat. Implementation of other prosed treatments would result in maintaining, protecting and improving soil productivity, soil and watershed function.

Cumulative Effects Alternative E

The geographic setting, boundary and potential projects are the same as alternative B.

Baseline Activities

Baseline activities and effects are the same as alternative B.

Baseline activities are the same as alternative B. The total baseline ground disturbance is about 45,040 acres for the cumulative effects area, or about 2 percent of the entire cumulative effects area. There are six, 6th code watersheds where urban development has a large impact on ground disturbance areas—Cataract Creek Headwaters (11 percent baseline ground disturbance) associated with the City of Williams, Sinclair Wash (25 percent) and Lower and Upper Rio de Flag (18 percent), Pumphouse Wash associated with the City of Flagstaff, Middle Oak Creek (11 percent) associated with Sedona and private land developed adjacent to Oak Creek.

Past Actions and Present Actions

Past and present activities and timeframe thereof, are the same as alternative B. The acres used for the analysis are a summary of projects that were report in the FACTS activity layer from 2009 to the present and are the same as alternative B. These acres are summarized in Attachment #1. For the cumulative effects boundary area, there are approximately 154,720 (table 32 and Attachment #1) of total treatment acres of past and current projects within the cumulative effects boundary (about 7 percent of the cumulative effects area). Assuming a 15 percent disturbance factor for treatments, there are a total of approximately 27,380 acres of ground disturbance from projects within the cumulative effects boundary area, or about 1 percent of the cumulative effects boundary area.

Vegetative ground cover in more recent projects (within the last 2 years) is in the process of recovery. Soil disturbance and erosion is less than the 4-FRI proposed action and smaller in extent and magnitude because fewer acres were treated (and therefore less than the 3.0 percent that would be generated from the 4-FRI proposed action). The magnitude of soil erosion above tolerable soil loss is believed to be similar in proportion to the 4-FRI proposed action, very minor in magnitude because similar harvesting techniques and BMPs were employed mitigating negative effects to soil and water. The combination of past and ongoing projects soil disturbance is limited in extent and magnitude and amount to about 1 percent within the cumulative effects boundary.

Reasonably Foreseeable Future Actions

The activities and acreages of reasonably foreseeable future actions are the same as alternative B. Ground disturbing actions will implement BMPs to mitigate non point source pollution to connected streamcourses. Fuels reduction related projects are expected to occur within the cumulative effects project boundary and are summarized in Attachment #1 and table 29 to this report. The table within Attachment 1 summarizes the acres of disturbance for future and foreseeable actions. For the cumulative effects boundary area, there are approximately 157,500 acres of future and foreseeable treatment acres within the cumulative effects boundary (about 7.7 percent of the cumulative effects area). Assuming a 15 percent disturbance factor for treatments, there are a total of approximately 23,667 acres of ground disturbance from projects within the cumulative effects boundary area, or about 1 percent of the cumulative effects boundary area.

Fuels reduction related projects are expected to occur within the cumulative effects project boundary and are summarized in Attachment 1 to this report. The table within Attachment 1 and table 32 summarize the acres of disturbance for future and foreseeable actions including the Flagstaff Forest Partnership Project

and Kelly Trails and Moonset Pit expansion Project. Ground disturbing actions will implement BMPs to mitigate non point source pollution to connected streamcourses.

For past, present and reasonably foreseeable actions including the 4-FRI proposed action, the extent of soil disturbance equals about 7.9 percent and the overall 15% soil disturbance threshold would not be exceeded with this project within the cumulative effects boundary. The contribution and magnitude of soil disturbance from 4FRI treatments would be short-term (about 2-3 years) and equal about 3.2% at the watershed scale. Further protection of soil resources is provided by the use of Best Management Practices that minimize the potential for soil disturbance. Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality in all watersheds. In addition to the use of BMP's, the completion and implementation of the Travel Management EIS would further reduce the number of acres disturbed by closing and decommissioning roads within the cumulative effects boundary. Because of these facts, this alternative would not provide a detrimental cumulative effect to soil resources within the cumulative effects boundary.

As stated above in the baseline disturbance assessment, there are six 6th code watersheds where urban development has a large impact on ground disturbance areas. This project, plus current and future foreseeable projects impacts these watersheds in the following manner. In the Cataract Creek Headwaters watershed there was a 9 percent past, present and future project generated ground disturbance prior to any activities. This percent of ground disturbance increases to 15 percent total cumulative ground disturbance. In the Sinclair Wash watershed, there was a 12 percent past, present and future ground disturbance prior to any activities. This percent of ground disturbance increases to 26 percent total cumulative ground disturbance with all projects, current and foreseeable projects. In the Lower Rio de Flag watershed there was an 8 percent past, present and future project generated ground disturbance that increases to 21 percent total cumulative ground disturbance. In the Middle Oak Creek watershed, there was 7 percent past, present and future project generated ground disturbance that increases to 11 percent total cumulative ground disturbance. Pumphouse Wash watershed has about 11% contributions from past, present and future projects and about 6% from 4FRI. Upper Rio de Flag watershed has about 14 percent contribution from past, present and future projects and extra about 3 percent from 4FRI. Implementation of BMP's would minimize any impacts to watersheds, and would be especially important in the watersheds that have a high urban impact already existing.

In addition the use of BMP's, the completion and implementation of the Travel Management EIS would further reduce the number of acres disturbed by closing and decommissioning roads within the cumulative effects boundary. Because of these facts, this alternative would not provide a detrimental cumulative effect to soil resources within the cumulative effects boundary.

Table 30. Alt E - Summary of Cumulative effects

Total Cum Effects analysis area 6th code acres	EIS			BASELIN E	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
	TOTAL EIS Ground Disturb	TOTAL EIS treatm ent % groun d distur b	TOTAL EIS %6th code Groun d Distur b	BASELIN E Ground Disturb	TOTAL TREAT ACRES	TOTAL Future/ Fore Ground Disturb	TOTAL TREAT ACRES	TOTAL Curre nt Groun d Distur b	TOTAL CUM EFFECTS ground disturb	TOTAL CUM EFFE CTS % Groun d Distu rb
2,032,080	64,252	11.1%	3.2%	45,041	157,772	23,666	154,720	27,380	160,338	7.9%

Summary Conclusion:

Total ground disturbance of all past, present (including 4FRI EIS) and reasonable foreseeable actions results in a total ground disturbance across the cumulative effects analysis area of about 160,300 (table 32) or about 7.9 percent. A discussion of cumulative effects resulting from the Slide Fire is found below.

Cumulative Effects Slide Fire

The Slide Fire started on May 20th, 2014, was human caused and burned over 7800 acres in the 4FRI project area footprint including areas of moderate and high burn severity. Protective vegetative ground cover in areas of high burn severity is nearly totally consumed while mostly consumed (estimated about 66%) in areas of moderate burn severity. The remainder of the fire burned in low or unburned mosaic with adequate protective vegetative ground cover except there are very minor areas (<5%) that have either moderate or high burn patches within. Slide Fire total ground disturbance was calculated based on low severity (2% of acres disturbance), moderate severity (62%) high severity (90%) for a total of about 7455 acres.

The Burned Areas Emergency Response team assessed burn severity, values at risk and recommended emergency stabilization treatments including seeding and helimulching to improve the immediate ground cover and reduce the amount of runoff, erosion and sediment delivery into connected streamcrouses on over 2175 acres of moderate and high burn severity.

The fire resulted in disturbances to 3 watersheds that cumulatively exceed the 15% ground disturbance threshold (Attachment 4). They include Upper Oak Creek with a total of 4362 acres or 20.6% of the watershed, West Fork of Oak Creek with a total of 16,432 acres or 30.1% and Pumphouse Wash with 11,423 acres or 18.2% of the watershed. The fire burned in portions of Fry Canyon and Dry Creek but cumulative ground disturbance total less than 10%.

To adequately protect soil productivity, water quality and watershed function, additional soil and water BMPs are now identified (table 2) that should allow adequate time (minimum of 5 years) for protective vegetative ground cover recovery in uplands and streamside management zones so that sediment will be trapped in the vegetative ground cover and not contribute excessive sediment into streamcourses. Personal experience and observations on several wildfire over the last 20 years and research indicate vegetative ground cover recovery occurs within about 5 years sufficient to be similar to prefire conditions at levels that prevent erosion above tolerable limits after which treatment scan be considered.

The combined cumulative effects of post fire soil disturbance plus 4FRI treatments are not expected to disturb more than about 15% of the soil and do not pose risk to soil productivity or water quality when implementing Slide Fire BMPs (table 2 and mentioned above, treatment deferred for at least 5 years and assure adequate vegetative ground cover in streamside management zone). Soil productivity is expected to be maintained and water quality is expected to meet designated beneficial uses and meet state water quality standards

Executive Summary of Treatment and Cumulative Effects for all Alternatives:

Overall, and at the 6th HUC watershed scale total proposed 4FRI treatments EIS ground disturbances are very similar and range are from 2.9% (Alt D) to 3.5% (ALT C).

Total past, present and reasonable foreseeable actions (including 4FRI proposed treatments) contribute about 4 to 5 percent more ground disturbance to 4FRI proposed treatments (average watershed level-wide by alternative) for a total soil disturbance ranging from 7.6 percent (Alternative D) to 8.2 percent (Alternative C) at the 6th HUC watershed scale. The overall extent (less than 8.5% for all action Alternatives) and magnitude (2 year recovery time) of total ground disturbance is minimal, short term and much less than the 15% soil productivity threshold indicting soil productivity would be maintained at the watershed level.

Current and Ongoing projects proposed outside of 4FRI

Implementation of Alternative A would still allow forest plan implementation of current and ongoing treatments that would produce soil disturbance. The amount of mechanized treatment acres (about 166,897 acres) and prescribed fire acres (about 195,076 acres) are far fewer than other alternatives and consequently would produce less soil disturbance.

However, failure to treat as many acres as alternatives proposed could result in up to 33% of watersheds or treatment areas untreated with detrimental soil disturbance as a result of wildfire.

Implementation of Alternative A would not improve or maintain soil productivity, soil or watershed function as extensively as all other alternatives except in those minimal acres from on-going treatments.

To adequately protect soil productivity, water quality and watershed function within the Slide Fire affected watersheds, additional soil and water BMPs are now identified (table 2) that should allow adequate time (minimum of 5 years) for protective vegetative ground cover recovery in uplands and streamside management zones so that sediment will be trapped in the vegetative ground cover and not contribute excessive sediment into streamcourses while at the same time protecting soil productivity and watershed function.

Comparison of Alternatives (see tables 3, 4, 6, 7)

Alternative A

Since no restoration treatments are proposed, there would be no acres of soil disturbance in the treatment area or 6th HUC watershed from mechanical equipment and consequently no direct effects to the soil. There would be no direct soil or riparian disturbance to springs, seeps, streamcourses or roads. Under alternative A, there would be no mechanical activities and therefore no soil erosion above tolerable levels would occur from treatments.

Since there would be no prescribed burns or managed fires, there would be no acres of high burn severity in the treatment areas or 6th HUC watersheds that would indirectly affect soil productivity and water quality whereas there could be up to 2 percent in the action alternatives.

Under alternative A, and in the absence of proposed treatments in alternatives B, C, D and E, according to WEPP soil erosion modeling, approximately 24 percent of all soils left untreated could be subject to soil erosion above tolerable levels from severe wildfires. However, assuming about 33 percent of wildfires would result in high burn severity; about 8 percent of all soils could result in soil erosion above threshold levels resulting in loss of soil surface and soil productivity.

Summary of Effects to Soils and Watershed Function for all Alternatives

Across all action alternatives, total average maximum soil disturbance within treatment areas is fairly similar and the extent minimal and ranges from 10.3 percent (Alternative D) to 12.2 percent (Alternative C) (see table 3). In addition, total soil disturbance including cumulative effects are similar across all action alternatives and range from 7.5 percent (alternative E) to 7.9% (Alternative C).

There would be no predicted soil erosion above tolerable soil loss rates where mechanical treatments are proposed but there could be up to about 2 percent on slopes greater than 40 percent where burn only occurs. For burning, since the amount of erosion above tolerable soil loss is limited to up to 2 percent, soil productivity is not expected to be appreciably reduced and would be maintained. In addition, implementation of identified BMPs would reduce the threat of high burn severity, accelerated erosion, sediment delivery into connected streamcourses, and not threaten water quality downstream.

Erosion exceeds tolerable soil loss rates where soils have been exposed to high burn severity predominantly in wildfires on slopes greater than about 15 percent and on some slopes greater than 40 percent in inclusion soils where prescribed or managed fire occurs (shaded gray). High burn severity is more likely to occur where forests are untreated (alternative A) and risk soil loss above tolerable levels resulting in loss of soil productivity and sediment delivery to connected streamcourses.

Implementation of alternative D would cause very similar but a little less soil disturbance than E, B and C respectively at both the treatment and watershed scale. Treatment area wide, D would cause about 10.3 percent, E about 11.1 percent, B about 11.3 percent and C about 12.2 percent. At the watershed level, D would cause about 2.9 percent, E would cause about 3.2 percent, B would cause about 3.3 percent and C would cause about 3.5 percent. Implementation of alternative D would cause less soil disturbance treatment area wide and at the 6th HUC watershed level than other action alternatives because there would be at least 50 percent less prescribed fires from lack of proposed fire treatment in areas of mechanical treatment.

Even though alternative D soil disturbance would be a little less than alternatives B, C and E, implementation of B, C and E would better protect, maintain or improve soil condition, productivity and watershed function (table 29 a, and 29b). Implementation of treatments in B, C and E (with C the best) including restoration treatments, prescribed and maintenance burning, decommissioning of roads, stream restoration would greatly improve soil condition, protect and maintain soil productivity and improve and maintain watershed function. Implementation of Alternative D (with much less prescribed and maintenance burning than B, C and E), would improve soil condition, productivity and watershed function in the short-term (less than 10 years) on a portion of the mechanical treatment areas. However, following treatments and without maintenance burning, about 25% of the area would build fuel loadings posing risk of uncharacteristic wildfire that could cause high burn severity resulting in accelerated soil erosion and loss of soil productivity and watershed function in the long-term. . Soil disturbance in B, C and E would be minimal (less than 15 percent and of low magnitude, short-term) and mitigated through

implementation of (BMPs). Compared to D, implementation of alternatives B, C or E would do a much more effective job of reducing the risk of uncharacteristic wildfire that could result in loss of soil productivity, downstream water quality and watershed function.

Under alternatives B, C, D and E, equipment use and mechanical activities would only occur on slopes ranging from 0–40 percent and according to WEPP modeling predictions, no erosion above tolerable levels would occur because the treatments do not remove appreciable amounts of protective vegetative ground cover. Under alternative B, C, D and E, only untreated slopes (greater than 40 percent) would be subject to wildfires resulting in about 2 percent of all soils with potential erosion above tolerable amounts. Road relocation in alternatives B, C, D and E would move just under 10 miles of road out of stream channels and would decrease sediments created from these roads, as well as decreasing peak flows from these sites. Restoration of stream channels would also moderate peak flows across the landscape.

Across all action alternatives, maximum soil disturbance of all treatment types combined within the treatment area by 6th HUC watershed are similar and range from about 0 percent - 19 (Attachment 1). These soil disturbances are minimal in extent, and of short duration (less than 2-3 years). Identified and implemented BMP's are expected to reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality and long-term soil productivity in all watersheds.

See table 5a and 5b for a comparison of effects to soil condition, productivity and watershed function by alternative. The calculations used to determine and compare differences in watershed function and soil productivity are found in a spreadsheet in the project record named Soil Productivity Acre Effectiveness, Fleishman, 12, 2012.

Implementation of Alternative A would not meet the projects purpose and need to improve and protect soil condition, productivity and watershed function nor move towards the desired condition of having soils in satisfactory condition and soil productivity maintained and watersheds properly functioning. It would not meet the projects purpose and need nor move towards the desired conditions of a resilient forest by reducing the potential for undesirable fire behavior and its effects and maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire. Implementation of Alternative A would not increase forest resiliency to natural disturbances and would not improve or protect soil condition and soil productivity or watershed function as well as all other action alternatives. Implementation of Alternative A would put soils and watersheds at risk of continued uncharacteristic wildfires that could result in loss of soil productivity and sediment delivery to connected streamcourses. Implementation of Alternative A would not reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows).

Overall, implementation of the proposed action is expected to maintain, improve and protect long-term soil productivity, and watershed function much better than Alternatives A and D, a little better than E but not as well as C. Implementation of Alternative C would probably better restore grasslands than other action alternatives and still has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level. Implementation of Alternatives B, C and E would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.

Current and Ongoing projects proposed outside of 4FRI

Implementation of Alternative A would still allow forest plan implementation of current and ongoing treatments that would produce soil disturbance. The amount of mechanized treatment acres (about

166,897 acres) and prescribed fire acres (about 195,076 acres) are far fewer than other alternatives and consequently would produce less soil disturbance.

However, failure to treat as many acres as alternatives proposed could result in up to 33% of watersheds or treatment areas untreated with detrimental soil disturbance as a result of wildfire.

Implementation of Alternative A would not improve or maintain soil productivity, soil or watershed function as extensively as all other alternatives except in those minimal acres from on-going treatments.

Implementation of alternative B meets the projects purpose and need and meets the Kaibab and Coconino NF forest plan standards and guidelines but does not implement grassland restoration like C does to about 48,000 acres slightly increasing risk of uncharacteristic wildfire followed by high burn severity and consequently to loss of soil, reduced nutrient cycling function and loss of soil productivity in these areas.

Implementation of Alternative D would meet the forest plans standards and guidelines but not fully meet the purpose and need of this project because follow-up prescribed burning on mechanically treated areas would not occur and would not fully restore the ponderosa pine vegetation types and could pose risk to soil and watershed function from effects of uncharacteristic fire in these areas.

Implementation of Alternative C has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level including cumulative effects as other action alternatives, is short-term (less than 2 - 3 years) and is minimal in extent (less than 15%) not posing risk to long-term soil productivity or watershed function.

Even though alternative D soil disturbance would be a little less than alternatives B and C, implementation of B and C would better protect, maintain or improve soil condition, productivity and watershed function (table 5a and 5b). Implementation of treatments in B and C including restoration treatments, prescribed and maintenance burning, decommissioning of roads, stream restoration would greatly improve soil condition, protect and maintain soil productivity and improve and maintain watershed function. Implementation of Alternative D (with much less prescribed and maintenance burning than B and C), would improve soil condition, productivity and watershed function in the short-term (less than 10 years) on a portion of the mechanical treatment areas. However, following treatments and without maintenance burning, about 25% of the area would build fuel loadings posing risk of uncharacteristic wildfire that could cause high burn severity resulting in accelerated soil erosion and loss of soil productivity and watershed function in the long-term. . Soil disturbance in B and C would be minimal (less than 15 percent and of low magnitude, short-term) and mitigated through implementation of (BMPs). Implementation of alternatives B or C would do a much more effective job of reducing the risk of uncharacteristic wildfire that could result in loss of soil productivity, downstream water quality and watershed function.

Overall, implementation of Alternatives B, C and E would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.

Implementation of Alternative C would best meet the projects purpose and need and improve soil productivity and watershed function and still meet the Kaibab and Coconino national forest plan standards and guidelines. Soil condition, productivity and watershed function would greatly improve, be maintained and protected compared to alternative A. Alternative C would be slightly more beneficial than B and E because more grasslands, savannas and PAC areas would be treated than alternatives B and E resulting in reduced risk of uncharacteristic wildfire and high burn severity that could result in substantial loss of soil.

Consequently maintenance and improvement of soil condition, soil productivity and watershed function would be greatest under alternative C followed by alternatives B and E, a little less for D and no

improvement for alternative A except in those minimal areas treated under continuation of the forest plan.

Overall Comparison Summary

- Short-term impacts from soil disturbances would range from 2.9 percent (lowest in alternative D) to 3.4 percent (highest in alternative C). All action alternatives provide long term soil improvement and protection of soil productivity and watershed function. Overall, implementation of the proposed action (Alternative B) is expected to maintain, improve and protect long-term soil productivity and watershed function much better than Alternative A, a little better than D and about the same as Alternative C. However, implementation of Alternative C would probably better restore grasslands than Alternative B. Implementation of Alternatives B and C would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.
- In alternatives B-E no watershed would have soil disturbance above 11percent (4 percent below the 15 percent threshold). Soil productivity and watershed function should be maintained. In alternative A, soil disturbance could range from 0 to 33 percent due to unmitigated fire risk.
- With implementation of identified soil and water BMPs, ADEQ water quality standards would be met.
- Slopes over 15 percent subject to high burn severity could result in accelerated soil loss where erosion rates are higher than tolerable soil loss posing risk to soil productivity. Erosion exceeds tolerable soil loss rates where soils have been exposed to high burn severity predominantly in wildfires on slopes greater than 15 percent posing risk to soil productivity and sediment delivery to connected streamcourses. The highest amounts of high burn severity (predicted up to 33%) are more likely to occur where forests are untreated (Alternative A) than all action alternatives. There would be potential for high burn severity across more acres in alternative D than the other action alternatives because of the continuing accumulation of surface fuels (Lata, 2014).

4-FRI Forest Plan Amendment Analysis for Soil Productivity and Watershed Function

1. Effects of the Forest Plan Amendment Theme Management in Mexican Spotted Owl Habitat on Soil Productivity and Watershed Function

The proposed amendment for alternatives B, C, and D would result in removal of more trees in 18 MSO PACs since trees up to 16 inches dbh (alternative B, D) and 17.9 inches (alternative C) could be removed in these areas. Removal of additional trees would improve vegetative ground cover over the long term by increasing light interception at the forest floor and providing conditions conducive to the establishment of a more vigorous understory of grasses, forbs and shrubs. Increased vegetative ground cover would improve soil stability by reducing soil erosion rates, improve and protect soil productivity and watershed function. Reduced stand densities would also provide for improved protection of treated areas from the effects of high severity fire, further improving overall soil stability and watershed conditions. Reduced evapotranspiration resulting from removal of trees up to 16 and 17.9 inches dbh would likely improve soil moisture status. Treatments in PACS, and restricted habitat would improve and protect soil productivity, watershed function and water quality meeting the purpose and need of the project. Overall, implementation of these amendments and associated treatments in MSO PACs and their associated habitats would improve and protect

soil productivity, watershed function, water quality and riparian area function, meeting the purpose and need of the project. Implementation of the amendments would provide greater protection of water quality and riparian area function by reducing the potential for sediment delivery to streamcourses and riparian habitats, improving soil moisture in upland areas, and improving snowpack retention in treated areas.

Proposed population and habitat monitoring would not pose a risk to soil, watershed function, water quality, and riparian area function.

Not implementing the amendments (Alternative A and E) would not protect or improve soil productivity and watershed function in these areas from uncharacteristic wildfire that would result in accelerated erosion and sediment transport downstream into connected streamcourses. Not implementing the amendments could put soil productivity and watershed function including downstream water quality at risk from high severity wildfire and pose risk to the sustainability of PACs, core areas, restricted and threshold habitat.

Identified BMPs (see Appendix A, table 2) are expected to protect the soil, water quality, and riparian area function and soils with severe erosion hazard in PACs, restricted and threshold habitat.

Alternative A does not propose forest plan amendments so no effects to soil, water quality or riparian areas would occur, but risks to goshawk habitat would remain as described above.

2. Effects of the Forest Plan Amendment Theme Management of Canopy Cover and Ponderosa Pine with an Open Reference Condition within Goshawk Habitat on the Coconino NF.

The proposed amendments (CNF #2) for Alternatives B, C and D meet the projects purpose and need for soil and watersheds including water quality and riparian function by improving and protecting soil productivity and watershed function in Goshawk habitat while Alternative A and E does not.

Coconino National Forest Plan Amendment 2 would improve soils and watershed conditions on 28,952 acres in alternative B, D and 28,653 acres in alternative C within the CNF since these treatment areas would be returned to open stand condition representative of historic, or reference condition. The lower stand densities and increased interspaces would provide conditions conducive to the establishment of a more vigorous understory of grasses, forbs and shrubs, thus providing greater soil protection than litter alone. The increased interspaces would likely improve snowpack retention and therefore, soil moisture status. Similar to the effects described in MSO PACs and their associated habitat, treatment towards lower stand densities would improve and provide greater protection of soil productivity, watershed function, water quality and riparian conditions from the adverse effects of high severity wildfire. Implementing the Goshawk amendments would meet the projects purpose and need to improve and protect soil productivity and watershed function and protect water quality and riparian area conditions by reducing the threat to these resources posed by high severity wildfire, including the associated risk of sediment delivery to streamcourses and riparian areas.

Alternative C (treat 27,675 acres) would treat an additional 38 acres in grasslands compared to Alternatives B and D (treat 27,637). 38 acres would be better improved and protected under Alternative C but is negligible in overall acreage extent. Similar to the effects describe under MSP PACS and associated habitat, not implementing the Goshawk amendments would not protect the soil and watershed from uncharacteristic wildfire and not protect soil nutrient cycling function and could result in accelerated erosion and sediment transport downstream into connected streamcourses in unrestored grasslands and savannas.

Similar to the effects describe under MSO PACS and their associated habitat, not implementing the Goshawk amendments would not protect the soil and watershed resources from uncharacteristic wildfire that would result in accelerated erosion and sediment transport downstream into connected streamcourses. Proposed population and habitat monitoring would not pose a risk to soil, watershed function or water quality.

Not implementing the Goshawk amendments (Alternative A, E) could put soil productivity and watershed function including downstream water quality and riparian function at risk from high severity wildfire and pose risk to the sustainability of Goshawk habitat.

Identified BMPs (see Appendix A, table 2) are expected to protect the soil and water quality and riparian area conditions and soils with severe erosion hazard in Goshawk habitat.

Alternative A and E does not propose forest plan amendments so no effects to soil and water would occur but risks to Goshawk habitat would remain as described above.

3. Effects of the Forest Plan Amendment Theme Effect Determination for Cultural Resources on the Coconino NF

The proposed amendment (CNF #3) would meet the project purpose and need in identified cultural resource areas by improving and protecting soil productivity, watershed function including downstream water quality for Alternatives B,C, and D. Allowing mechanical and prescribed fire treatments with resource protection measures (see Appendix D) for both cultural and soil and water resources reduce the adverse threat of high burn severity associated with wildfire and improve and protect the soil from accelerated erosion and sediment delivery into connected waters downstream.

Not implementing the amendment (AlternativeE) would result in a no effect similar to Alternative A since no treatmetns would be implemented on soils in cultural resource sites and therefore would not affect soil productivity, watershed function or downstream water quality at risk from moderate and high severity wildfire. Since cultural sites are relatively few and small in size, the absence of treatments including fire wold not substantially reduce fuel loadings or the risk of uncharacteristic fire and high burn severity and therefore, not result in measurable erosion

or sediment delivery into connected stream courses.

Alternative E Amendment Analysis: (updates from comments and additional Alt E

Because of lack of these amendments, for soil function and productivity concerns, the applicable differences in treatments between E, B, C and D are no grasslands or savannas would be restored totally about 56,000 acres and no mechanical treatments would occur in 18 MSO PACS (excluding core areas) from 9 to 17.9-inch diameter trees totally and prescribed fire would be allowed in both. In addition, the amendment and treatments implementing desired percentages of interspaces within uneven-aged stands are essential in restoring grasslands and savannas to improve soil nutrient cycling and reduce risk of uncharacteristic wildfire that may result in accelerated erosion and loss of soil productivity in these areas.

Not implementing restoration treatments in these amendment affected areas (grasslands, savannas, PACS, canopy cover open reference areas) would not fully restore the fire-adapted ecosystem and could put soil function and productivity and watershed function including downstream water quality at risk from high severity wildfire and pose risk to the sustainability of PACs, core areas, restricted and threshold habitat. Not implementing the effect determination of cultural resources would not have an effect on soil productivity, watershed function since it would not affect protective vegetative ground or soil nutrient cycling function.

Not implementing the MSO, Goshawk Habitat, Canopy Cover Conditions, and Garland Prairie amendments would not protect the soil and watershed from uncharacteristic wildfire that could result in accelerated erosion and sediment transport downstream into connected streamcourses in these areas.

Executive Summary of Effects to Soil Productivity and Watershed Function for all Alternatives

Short-term impacts from soil disturbances would range from an average across affected watersheds of 2.9 percent (lowest in alternative D) to 3.5 percent (highest in alternative C). All action alternatives provide long term soil improvement and protection of soil productivity and watershed function to varying degrees. Overall, implementation of the proposed action (alternative B) is expected to maintain, improve and protect long-term soil productivity and watershed function much better than alternative A, a little better than D and about the same as alternative C. Implementation of Alternatives B and C is expected to maintain, improve and protect long-term soil productivity and watershed function better than D because the vast majority of D does not follow mechanical treatments with prescribed fire necessary to maintain soil productivity and watershed function processes. The absence of prescribed fire following mechanical treatments increases the risk of uncharacteristic fire that could result in areas of high burn severity which leads to accelerated erosion, runoff and sediment delivery into connected streamcourses following storm events. Implementation of alternative C is likely to better restore grasslands than alternative B. Implementation of alternatives B and C would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D.

Implementation of 4 FRI proposed treatments under Alternative A would not meet the projects purpose and need to improve and protect soil condition, productivity and watershed function nor move towards the desired condition of having soils in satisfactory condition and soil productivity maintained and watersheds properly functioning. It would not meet the projects purpose and need nor move towards the desired conditions of a resilient forest by reducing the potential for undesirable fire behavior and its effects and maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire. Implementation of Alternative A would not increase forest resiliency to natural disturbances and would not improve or protect soil

condition and soil productivity or watershed function as well as all other action alternatives. Implementation of Alternative A would put soils and watersheds most at risk of continued uncharacteristic wildfires that could result in loss of soil productivity and sediment delivery to connected streamcourses.

Current and Ongoing projects proposed outside of 4FRI

Implementation of Alternative A would still allow forest plan implementation of current and ongoing treatments that would produce soil disturbance. The amount of mechanized treatment acres (about 166,897 acres) and prescribed fire acres (about 195,076 acres) are far fewer than other alternatives and consequently would produce less soil disturbance.

However, failure to treat as many acres as alternatives proposed could result in up to 33% of watersheds or treatment areas untreated with detrimental soil disturbance as a result of wildfire.

Implementation of Alternative A would not improve or maintain soil productivity, soil or watershed function as extensively as all other alternatives except in those minimal acres from on-going treatments.

Overall, implementation of the action alternatives is expected to maintain, improve and protect long-term soil productivity and watershed function much better than Alternative A because there will be no improvement in understory response due to thinning and burning activities in the Alternative A. Alternative B does propose thinning and prescribed fire activities that are expected to provide long-term soil improvements on about 583,000 acres, while Alternative C proposes about 586,000 acres. Alternative D proposed thinning only on about 385,000 acres, and prescribed burning on about 178,000 acres. Alternative E proposes thinning on about 403,000 acres and prescribed fire on 581,000 acres.

The thinning and burning will provide improvement to soils by improving understory species composition, but does still maintain high fuel loadings that can have high surface fire effects that can damage soils. This is expected to occur on about 25% of the mechanical treatment sites, so Alternative D has effective soil productivity treatments on about 470,000 acres. However, implementation of Alternative C would better restore grasslands and savannas than Alternative B and E and still has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level.

Implementation of alternative D only partially meets the projects purpose and need as well as other action alternatives. Implementation of alternatives B, C and E more fully meet the projects purpose and need and meet the Kaibab and Coconino National Forest forest plan standards and guidelines. Implementation of alternative D would meet the forest plan standards and guidelines but not fully meet the purpose and need of this project.

Overall, implementation of Alternatives B, C and E would reduce the risks to life, property, soil productivity and water quality from post wildfire storm events (flooding and debris flows) much better than A and D. Proposed mechanical treatments and prescribed fire

There would be no predicted soil erosion above tolerable soil loss rates where mechanical treatments or prescribed fire are proposed for all action alternatives but there could be up to about 2 percent on slopes greater than 40 percent where burn only occurs.

Across all action alternatives, total average maximum soil disturbance within treatment areas is fairly similar and the extent minimal and ranges from 10.3 percent (Alternative D) to 12.2 percent (Alternative C) (see table 3). In addition, total average soil disturbance including cumulative effects are similar across all action alternatives and range from 7.6 percent (alternative D) to 8.2% (Alternative C) across affected watersheds.

Implementation of Alternative C has about the same amount of soil disturbance treatment area wide and at the 6th HUC watershed level including cumulative effects as other action alternatives, is short-term (less than 2 - 3 years) and is minimal in extent (less than 15%) not posing risk to long-term soil productivity or watershed function.

Implementation of Alternative C would best meet the projects purpose and need and improve soil productivity and watershed function and still meet the Kaibab and Coconino national forest plan standards and guidelines. Soil condition, productivity and watershed function would greatly improve, be maintained and protected compared to alternative A. Alternative C would be slightly more beneficial than B and E because more grasslands, savannas and PAC areas would be treated than alternatives B and E resulting in reduced risk of uncharacteristic wildfire and high burn severity that could result in substantial loss of soil.

Consequently maintenance and improvement of soil condition, soil productivity and watershed function would be greatest under alternative C followed about equally by alternatives B and E, a little less for D and no improvement for alternative A.

Short-term Uses and Long-term Productivity

Overall, ponderosa pine, aspen and grassland restoration along with other proposed treatments including prescribed burning can be expected to increase ecosystem resiliency to uncharacteristic fire and move soils and watersheds towards satisfactory and functional condition in both the short and long-term and maintain, protect or improve long-term soil productivity, water quality and watershed function. Implementation of Alternative A and D would put soil productivity and watershed function most at risk.

Short term (less than 2-3 years) soil disturbance would be limited to less than 15 percent throughout all treatment areas and affected 6th HUC watersheds, with the exception of four 6th code watersheds that have a high percentage of baseline disturbance due to urbanization (Upper Oak Creek, Lower Rio, Pumphouse Wash, Sinclair). Pine tree, aspen and grass leaf litter can be expected to build up rapidly (within 2-3 years) following treatments offering suitable and adequate protection of long term soil productivity.

Furthermore, the timing of treatments being spread out over 10-15 years, as well as identified and implemented BMP's are expected to further reduce the risk on accelerated erosion, sediment delivery and nonpoint source pollution to connected streamcourses and maintain water quality and long-term soil productivity in all watersheds for all action alternatives. Identified and implemented BMPs are expected to mitigate possible negative effects to soils.

Unavoidable Adverse Effects

There are no unavoidable adverse effects to soil and water resources that cannot be avoided with implementation of any alternative.

Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable commitments: There would be no irreversible or irretrievable impacts to soil and water resources with implementation of the proposed action (alternative B) or alternatives C and D.

Soil disturbance associated with removal of vegetative ground cover from mechanized equipment or an area of high burn severity is minor in extent and will recover in the short term (within 2-3 years) and maintain long-term soil productivity as described in the effects analysis. Soil disturbance associated with compacted soils would be very minor in extent also but may take several years to improve soil properties to allow for improved water infiltration but it is not irreversible.

Monitoring Requirements

The intergovernmental agreement currently in effect between the Arizona Department of Environmental Quality and the USDA Forest Service, Southwestern Region (ADEQ USDA 2008) requires implementation and effectiveness monitoring of Best Management Practices. This project includes soil and water BMP implementation and effectiveness monitoring as required by the MOU with ADEQ. Implementation monitoring determines whether the BMPs are being implemented as intended and is in compliance with forest plan standards and guidelines. BMP effectiveness monitoring determines whether the BMPs are effective at minimizing soil loss, nonpoint source pollution and maintain long-term soil productivity in compliance with forest plan standards. Protocols include BMP monitoring forms and national BMP's Technical Guide (USDA 2012), soil condition assessment (FSH 2509.18) and the Soil Disturbance Field Guide protocol (USDA 2009).

This project also includes implementation and effectiveness monitoring plan for other resource areas including fire, vegetation, silviculture, botany, noxious weeds and range. Implementation monitoring determines whether the project is being implemented as intended and is in compliance with forest plan standards and guidelines. Effectiveness monitoring determines whether the project is moving towards achieving restoration objectives and compares the monitoring results to this analysis' predicted results.

The effectiveness plan displays the minimum level of monitoring. The plans provide for multiparty monitoring and evaluation to assess in the positive and negative ecological, social, and economic effects of the project. Additional monitoring and research opportunities that could be implemented would be developed outside of this NEPA analysis. The project implementation monitoring plan is located in the DEIS.

Certification

Rory Steinke prepared the report considering the Best Available Science and locally gathered data. Many of the effects of fire on soil and water attributes were attained through research review. Local data used include the use of Terrestrial Ecosystems Survey of the Coconino National Forest (Miller et al. 1995), local Best Management Practice monitoring data (Fleishman 1996, Fleishman 2005, Jagow 1994), on-site observations and water quality data from the Arizona Department of Environmental Quality (ADEQ 2008, 2010).

My education includes a Bachelor's of Science degree in Soil Science from University of Wisconsin Stevens Point, Stevens Point, Wisconsin. I am an ARCPACS Certified Professional Soil Scientist since 1994. I have more than 32 years of experience in soil survey, soil conservation, water rights and watershed, riparian and wetland, wildfire assessment and burned area rehabilitation and forest management. This experience includes resource assessment, planning, budgeting, environmental analysis (mainly soil, water, and riparian resources) environmental writing and project implementation.

I have worked with the Natural Resource Conservation Service, BLM, US Peace Corps (developed about 70 agricultural conservation plans in Honduras) and the Forest Service and have collaborated with outside agencies, tribes and environmental groups. More recently I have assisted the USFS International Programs in Morocco as Soil Scientist technical advisor.

Prepared by: /s/ *Rory Steinke* Date: May 8, 2012 . Final revision March 24, 2014

Rory Steinke, Watershed Program Manager, Coconino National Forest

Certified Professional Soil Scientist CPSSc Revised 7/18/2012, 11/28/2012, 1/2/2013, 1/8/2013

Reviewed by Dick Fleishman, Assistant Team Leader, 4FRI

Dick Fleishman reviewed the document. His experience includes a Bachelor's degree in Forest Management, and Master's degree in Public Administration and 32 years of experience in the US Forest Service. Since 1994, Dick has been the soil and water specialist for the Long Valley Ranger District, and when the Long Valley Ranger District was combined with the Blue Ridge Ranger District to form the Mogollon Rim Ranger District, Dick assumed the soil and water specialist position for the Mogollon Rim Ranger District. Since 2007, Dick was moved into a zone soil and water specialist position that added the soil and water specialist position for the Flagstaff Ranger District (formerly Peaks and Mormon Lake Ranger Districts) of the Coconino National Forest to the Mogollon Rim district duties. Since 2011, Dick has been the Assistant Team Leader for the Four Forest Restoration Initiative (4FRI).

Prepared by: /s/ *Dick Fleishman*

Date: June 17, 2012

Literature Cited and References

- Abella, S. C. Denton, R. Steinke, and D. Brewer. 2013. Soil development in vegetation patches of *Pinus ponderosa* forests: Interface with restoration thinning and carbon storage. *Forest Ecology and Management*. 642 pages.
- Arizona Department of Environmental Quality and USDA. 2008. Intergovernmental agreement between the State of Arizona and US Department of Agriculture, Forest Service Southwestern Region. February 15, 2008.
- Arizona Department of Environmental Quality Website. 2008, 2010. Arizona's Integrated 305(b) Assessment and 303(d) Listing Report. <http://www.azdeq.gov/enviro/water/assessment/assess.html>
- Bolton, S. and T. Ward. 1991. Hydrologic Processes in the Pinyon-Juniper Vegetation Zone of Arizona and New Mexico. New Mexico Water Resource Research Institute. 44 pages.
- Brewer, D. R. Jorgensen, L. Munk, and W. Robbie. 1991. Terrestrial Ecosystems Survey of the Kaibab National Forest. USDA Forest Service, Southwestern Region. 319 pp.
- Brewer, D. 2011. Combining Terrestrial Ecosystem Survey Units to Assist in the Analysis of Existing Conditions for Forest Restoration at the Landscape Scale. 24 pp.
- Brown, James. 2003. Coarse Woody Debris: Managing Benefits and Fire Hazard in the Recovering Forest. RMRS GTR 105. 16 pages
- Covington, W.W., DeBano, L.F., 1990. Effects of fire on pinyon-juniper soils. In: J. S. Krammes (Technical Coordinator), Effects of Fire Management of Southwestern Natural Resources. USDA For. Serv. Gen. Tech. Re RM-191, pp. 78-86.
- Covington, W.W. and S.S. Sackett. 1992. Soil mineral nitrogen changes following prescribed burning in ponderosa pine. *Forest Ecology and Management* 54 (1992) 175-191.
- Elliot, W.J., I. S. Miller, and L. Audin Eds. 2010. Cumulative watershed effects of fuel management in the western United States. Gen. Tech. Rep. RMRS-GTR-231. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 299 p.
- Elliot, W.J., D. Page-Dumroese, and P. R. Robichaud. 1999. The effects of forest management on erosion and soil productivity. Proceedings of the Symposium on Soil Quality and Erosion Interaction, Keystone, CO, July 7, 1996. Ankeney, IA: Soil and Water Conservation Society. 16 p. Available on-line at http://forest.moscowfl.wsu.edu/smp/docs/docs/Elliot_1-57444-100-0.html. Accessed March 24, 2010.
- Fleishman, R. 1996. Best management practices monitoring U-Bar and Merritt Forest Product sale. USDA Forest Service Blue Ridge Ranger District. Letter file code 2520 and 2450. 16p.
- Fleishman, R. 2005. Monitoring of Best Management Practices-Pack Rat Salvage Sale. USDA Forest Service Mogollon Rim Ranger District. Letter file code 2520.
- Froehlich, H.A., D. E. Aulerich, and R. Curtis. 1981. Designing skid trail systems to reduce soil impacts from tractive logging machines. Forest Research Lab, Oregon State University, Corvallis. Research Paper 44. 15p.
- Graham, R. T., S. McCaffrey, and T. B. Jain (tech. eds.) 2004. Science basis for changing forest structure to modify wildfire behavior and severity. Gen. Tech. Rep. RMRS-GTR-120. Fort Collins, CO:

- U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 43p.
- Graham, R. T., A. E. Harvey, M. F. Jurgensen, T. B. Jain, J. R. Tonn, and D. S. Page-Dumroese. 1994a. Managing coarse woody debris in forests of the Rocky Mountains. INT-RP-477. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 12 p.
- Gucinski, H., M. Furniss, R. R. Ziemer, and M. H. Brookes. 2000. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNWGTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 p.
- Huffman, D. 2010. Personal Communication. Managing Coarse Woody Debris in SW Fire Adapted Ecosystems. Ecological Restoration Institute at Northern Arizona University.
- Jagow, P. 1994. Best Management Practices monitoring forms for the Anchor Timber Sale and Hospital Timber Sale. From Arizona Department of Quality, 10 p.
- Korb, J. E., N. C. Johnson, and W.W. Covington. 2004. Slash pile burning effects on soil biotic and chemical properties and plant establishment: Recommendations for amelioration. *Restoration Ecology* 12:52-62.
- Lata, M. 2014. Four Forest Restoration Initiative Fire Ecology and Air Quality Specialist Report. Unpublished report on file with USDA, Forest Service, Coconino National Forest, Flagstaff, Arizona.
- Masek-Lopez, S. September, 16, 2013. Paired watershed study to predict hydrologic responses to restoration treatments and changing climate in the Four Forest Restoration Initiative first analysis area, 113 pages.
- MacDonald, C. 2014. Water Quality and Riparian Specialist Report. USDA, Forest Service. Unpublished report, Kaibab National Forest, Williams, Arizona.
- McCusker, N., R. Gonzalez, and R. Fuller. 2014. Four Forest Restoration Initiative Silviculture Specialist Report. Unpublished report on file with USDA, Forest Service, Coconino National Forest, Flagstaff, Arizona.
- Miller, G., N. Ambos, P. Boness, D. Reyher, G. Robertson, K. Scalzone, R. Steinke, and T. Subirge. 1995. Terrestrial Ecosystems Survey of the Coconino National Forest. USDA Forest Service, Southwestern Region. 405 pp. Available online @ <http://alic.arid.arizona.edu/tes/tes.html>
- Neary, D. G., K. Ryan, L. DeBano. 2005. Wildland Fire in Ecosystems. Effects of Fire on Soil and Water. USDA Forest Service. RMRS-GTR-42-Volume 4. Ft Collins, CO. 250p.
- Passovoy, D. and P. Z. Fulé. 2006. Snag and woody debris dynamics following severe wildfires in northern Arizona ponderosa pine forests. *Forest Ecology and Management*. 246 pages.
- Robichaud, P. R. and R. E. Brown, R.E. 1999. (revised 2000). What happened after the smoke cleared: onsite erosion rates after a wildfire in eastern Oregon. In: Proceedings: wildland hydrology conference; D. S. Olsen and J. P. Potyondy eds. 1999 June; Bozeman, MT. Hernon, VA: American Water Resource Association: 419-426.
- Seymour, G., and A. Tecle. 2004. Impact of slash pile size and burning on ponderosa pine forest soil physical characteristics. *Journal of the Arizona-Nevada Academy of Science* 37(2):74-82
- USDA Forest Service. 1984. Terrestrial Ecosystems Survey (TES) Handbook. Chapter 5.
- USDA Forest Service. 1987. Coconino National Forest Land and Resource Management Plan and amendments. USDA Forest Service, Southwestern Region. 270 pp. Available online

@ <http://www.fs.fed.us/r3/coconino/projects/plan-revision-2006/current-plan.shtml>

- USDA Forest Service. 1991. Terrestrial Ecosystem Survey of the Kaibab National Forest, Southwestern Region. 319 pages.
- USDA Forest Service. 1995. Terrestrial Ecosystems Survey of the Coconino National Forest, Southwestern Region. 405 pages.
- USDA Forest Service. 2014. Kaibab National Forest Land and Resource Management Plan. Southwestern Region. Albuquerque, NM.
- USDA Forest Service. 1991a. FSH 2509.22. Soil and Water Conservation Handbook.
- USDA Forest Service. 1991b. Soil Management Handbook 2509.18-91-1. WO Amendment. Chapter 2.2, Soil Quality Monitoring (now superceded by FSM 2500).
- USDA Forest Service, National Technology & Development Program. 2009. Soil-Disturbance Field Guide. 0819 1815.
- USDA Forest Service, 2010. Forest Service Manual 2500-2010-1. (Supercedes FSM 2550).
- USDA Forest Service, 1999. FSH 2509.18, R3 Supplement No 2509.18-99-1
- USDA, Rocky Mountain Research Station and San Dimas Tech Center. 2000. WEPP Technical Documentation also at <http://forest.moscowfsl.wsu.edu/fswapp/docs/distweppdoc.html>
- USDA Agricultural Research Service, National Soil Erosion Research Laboratory. 1996. Moscow, Idaho. WEPP:Road (Draft 12/1999) Interface for Predicting Forest Road Runoff, Erosion and Sediment Delivery, Technical Documentation Website at <http://forest.moscowfsl.wsu.edu/fswapp/docs/wepproaddoc.html>. Elliot, Hall, Scheele, December, 1999. WEPP website <http://forest.moscowfsl.wsu.edu/fswapp/>
- USDA Forest Service. 2012b. National Best Management Practices for Water Quality on National Forest System Lands. Technical Guide. FS-990a. 165 pages. Washington Office
- USDA Agricultural Research Service, National Soil Erosion Research Laboratory. 2006. Moscow, Idaho. Water Erosion Prediction Project Website <http://forest.moscowfsl.wsu.edu/fswapp/>. 9/22/2006.
- Steinke, R. W. 2007. Historic Ponderosa Pine Stand Structure of Mollisols, and Mollic Integgrade Soils on the Coconino National Forest, (Internal Study)
- Steinke, R. W. 2008. Historic Ponderosa Pine Stand Structure of Mollisols, and Mollic Integgrade Soils on the Kaibab National Forest, (Internal Study)
- USDA Forest Service. 2011. Watershed Condition Framework Implementation Guide. Available at <http://wwwtest.fs.fed.us/publications/watershed/>
- USDA Forest Service. 2010a. Watershed Condition Assessment of the Coconino National Forest and maps available at <http://apps.fs.usda.gov/WCFmapviewer/>
- USDA Forest Service. 2010b updated 2011. Forest Service Watershed Condition Classification Technical Guide. 85 pages. Available at <http://wwwtest.fs.fed.us/publications/watershed/>

Appendix A. Strata, TES Map Units, Approximate Acreage, Soil Interpretations and Strata-Specific BMP's (all acres approximate)

Table 31. Strata TES Units, Approximate Acreage, Soil Interpretations and Strata-Specific BMP Acres

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
1	0-5%	13,193	6, 9, 11	53	LSC 5 0	Popr/Fear	Slight	NA	NA	2,6,8,24,25,26,28,33,36,38
					LSC 5 0	Popr/Agsm	Slight	NA	NA	
					LSC 5 0	Popr/Mumo	Slight	NA	NA	
2	0-5%	12,15`	NA	55	LSC 5 0	Popr/Fear/Agsm	Slight	NA	NA	2,6,8,24,25,26,28,33,36,38
3	0-15%	32,884	513	595	LSC 5 0	Fear/Mumo	Slight	NA	NA	2,6,8,24,25,26,28,33,36,38
4	15-40%	873	440	NA	LSC 5 0	Fear/Mumo	Slight	NA	NA	2,6,8,24,25,26,28,33,36,38
5	0-15%	3,174	NA	640	LSC 6 0	Fear/Bran/Mumo	Slight	NA	NA	2,6,8,24,25,26,28,33,36,38
6	0-15%	21,305	36, 507	566	HSC 4 0	Chna/Agsm/Pied	Slight	NA	NA	2,6,8,24,25,26,28,33,36,38
					HSC 5 -1	Chna2/Fear2/Bogr2	Slight	NA	NA	
					HSC 5 -1	Sihy/Arlo/Bogr	Slight	NA	NA	
7	0-	1,478	NA	594	LSC 5 0	Fear/Mumo	Slight	NA	NA	2,6,8,24,25,26,28,33

⁷ Climatic class locates terrestrial ecosystems into one of four major climatic areas including High Sun Mild (HSM), High Sun Cold (HSC), Low Sun Mild (LSM), and Low Sun Cold (LSC).

⁸ Potential Plant Community (PPC) indicates site potential and is classified according to late successional vegetation species that would be expected to occupy the site in absence of major disturbances. The PPC does not represent desired conditions but serves as a sideboard to identify vegetation composition diversity and vegetation that could potentially exist.

⁹ Refers to the probability of success in the establishment and survival of trees under inherent site conditions.

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
	15%									3,36,38
8	0-15%	6,741	518, 630	NA	LSC 5 0	Fear/Mumo	Slight	NA	NA	2,6,8,24,25,26,28,3 3,36,38
9	0-5%	3,701	20	50	LSC 5 0	CARE/ELEO/ Pola/Alge	Slight	NA	NA	2,6,8,11,12,13,14,1 5,16,17,18,19,20,2 2,23
					LSC 5 0	Caaq/Elma3/ Pola/Alge	Slight	NA	NA	
10	0-5%	3,246	37	60	LSC 5 0	Popr/CARE/ Fear	Slight	NA	NA	2,6,8,11,12,13,14,1 5,16,17,18,19,20,2 2,23
					LSC 6 0	Poan3/Juma/ Psmeg	Slight	NA	NA	
11	0-15%	98,131	265, 519	585	LSC 5 0	Pipo/Quga	Mod	Low	Moderate	2,6,7,8,25,26,28,29 ,30,33,35,36,38
					LSC 5 0	Pipo/Quga	Slight	Low	Moderate	
12	0-15%	21,917	NA	579	LSC 5 0	Pipo/Jude/ Quga	Slight	Low	Moderate	2,6,7,8,25,26,28,29 ,30,33,35,36,38
13	0-15%	10,382	275, 282, 631	NA	LSC 5 -1	Pipo/Pied/ Quga/Artr	Slight	Low	Mod	2,6,7,8,25,26,28,29 ,30,33,35,36,38
					LSC 5 -1	Pipo/Pied/ Quga/Artr	Mod	Low	Slight	
14	0-15%	5,208	326, 565	NA	HSC 5 -1	Pipo/Pied/ Quga	Slight	Low	Moderate	2,6,7,8,25,26,28,29 ,30,33,35,36,38
				NA	HSC 5 -1	Pipo/Pied/ Quga	Slight	Low	Severe	
15	0-15%	7,637	NA	520, 572	LSM 5 -1	Pipo/Pifa/ Jude/Qutu	Slight	Low	Severe	2,6,7,8,25,26,28,29 ,30,33,35,36,38
					LSM 5 -1	Pipo/Jude/	Slight	Low	Severe	

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
						Quar/Arpu5				
16	15-40%	275	276	NA	LSC 5 -1	Pipo/Pied/Quga/Artr	Severe	Low	Severe	2,6,7,8,25,26,28,29,30,33,35,36,38
17	15-40%	1,150	266	NA	LSC 5 0	Pipo/Quga	Severe	Low	Mod	2,6,7,8,25,26,28,29,30,33,35,36,38
18	15-40%	2,413	NA	530	LSM 5 0	Pipo/Jude/Qutu	Mod	Low	Mod	2,6,7,8,25,26,28,29,30,33,35,36,38
19	15-40%	10,781	406	515	HSC 5 -1	Pipo/Pied/Quga	Severe	Low	Severe	2,6,7,8,25,26,28,29,30,33,35,36,38
					HSC 5 -1	Agsm/Chna	Mod	Low	NA	
20	15-40%	2,570	407	NA	LSC 5 0	Pipo/Quga	Severe	Mod	Severe	2,6,7,8,25,26,28,29,30,33,35,36,38
21	15-40%	12,175	NA	11, 14, 15, 511, 513	HSC 5 -1	Pipo/Pied/Jumo/Fapa	Slight	Low	Slight	2,6,7,8,25,26,28,29,30,33,35,36,38
					HSC 5 -1	Pipo/Pied/Jumo/Fapa	Slight	Low	Slight	
					HSC 5 -1	Pipo/Pied/Jumo/Fapa	Mod	Low	Moderate	
					HSC 5 -1	Pipo/Pied/Jumo/Fapa	Mod	Low	Mod	
22	15-40%	1,688	NA	527	HSC 5 -1	Pipo/Pied/Jude/Comes	Mod	Low	Mod	2,6,7,8,25,26,28,29,30,33,35,36,38
23	0-15%	195,007	290, 293,401, 537	557, 582, 586	LSC 5 0	Pipo/Quga	Slight	High	Mod	2,6,7,8,25,26,28,29,30,33,35,36,38
					LSC 5 0	Pipo/Quga	Slight	Mod	Mod	
					LSC 5 0	Pipo/Quga	Slight	High	Mod	

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
					LSC 5 0	Pipo/Quga	Slight	Mod	Mod	
					LSC 5 0	Pipo/Quga	Slight	High	Mod	
					LSC 5 0	Pipo/Quga	Slight	High	Mod	
24	0-15%	10,266	NA	546	LSC 5 0	Pipo/Quga/ Muvi	Slight	High	Severe	2,6,7,8,25,26,28,29,30,33,35,36,38
25	0-15%	12,633	NA	567, 578	LSC 5 0	Pipo/Jude/Quga	Slight	Mod	Severe	2,6,7,8,25,26,28,29,30,33,35,36,38
					LSC 5 0	Pipo/Jude/Quga	Slight	Mod	Severe	
26	0-5%	5,730	10	NA	LSC 5 0	Pipo/Quga	Slight	Mod	Moderate	2,6,7,8,25,26,28,29,30,33,35,36,38
27	0-15%	135,203	304, 324, 401a, 537a	536, 551, 557a ¹⁰ , 570, 582a	LSC 5 0	Pipo/Fear	Slight	Mod	Mod	2,6,7,8,25,26,28,29,30,33,35,36,38
					LSC 5 0	Pipo/Fear	Slight	Mod	Mod	
					LSC 5 0	Pipo/Fear	Slight	High	Mod	
					LSC 5 0	Pipo/Fear	Slight	High	Severe	
28	0-15%	5,527	NA	560	LSC 5 0	Pipo/Fear	Slight	Mod	Slight	2,6,7,8,25,26,28,29,30,33,35,36,38
29	0-15%	9,552	325	NA	LSC 5 0	Pipo/Fear	Slight	Mod	Mod	2,6,7,8,25,26,28,29,30,33,35,36,38
30	0-15%	13,413	NA	558, 559	LSC 5 0	Pipo/Fapa	Slight	Low	Slight	2,6,7,8,25,26,28,29,30,33,35,36,38

¹⁰ Coconino TESU acres not accounted for in total for strata.

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
31	15-40%	5,604	NA	561	LSC 5 0	Pipo/Fapa	Mod	Low	Mod	27, 2,6,7,8,25,26,28,29 ,30,33,35,36,38
32	15-40%	79,947	294,402 , 525	549, 550, 565, 584	LSC 5 0	Pipo/Quga	Severe	Mod	Mod	2,6,7,8,25,26,28,29 ,30,33,35,36,38
					LSC 5 0	Pipo/Quga	Severe	Mod	Severe	
					LSC 5 0	Pipo/Quga	Severe	Low	Mod	
					LSC 5 0	Pipo/Quga/ Muvi2	Mod	High	Moderate	
					LSC 5 0	Pipo/Quga	Mod	High	Mod	
					LSC 5 0	Pipo/Quga	Severe	High	Severe	
33	15-40%	5,593	291, 310	NA	LSC 5 0	Pipo/Quga	Mod	Mod	Mod	2,6,7,8,25,26,28,29 ,30,33,35,36,38
					LSC 5 0	Pipo/Quga	Mod	Low	Mod	
34	15-40%	2,740	300	NA	LSC 5 0	Pipo/Quga	Mod	Low	Mod	2,6,7,8,25,26,28,29 ,30,33,35,36,38
35	15-40%	8,291	NA	553, 565a, 584a	LSC 5 0	Pipo/Fear	Slight	Low	Mod	2,6,7,8,25,26,28,29 ,30,33,35,36,38
					LSC 5 0	Pipo/Fear	Severe	High	Severe	
36	15-40%	11,614	300a, 310a	537	LSC 5 0	Pipo/Fear	Mod	Low	Severe	2,6,7,8,25,26,28,29 ,30,33,35,36,38
					LSC 5 0	Pipo/Fear	Mod	Low	Mod	
					LSC 5 0	Pipo/Fear	Mod	Low	Mod	
37	0-15%	5,160	283, 297	NA	LSC 5 -1	Pipo/Pied/ Quga/Artr	Slight	Low	Mod	2,6,7,8,25,26,28,29 ,30,33,35,36,38
					LSC 5 -1	Pipo/Pied/ Quga/Artr	Slight	Low	Mod	

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
38	15-40%	356	284	NA	LSC 5 -1	Pipo/Pied/Quga/Artr	Severe	Low	Mod	2,6,7,8,25,26,28,29,30,33,35,36,38
39	0-15%	43,805	305, 405, 563, 649	500, 505, 506, 517, 523	HSC 5 -1	Pipo/Pied/ Quga	Slight	Low	Mod	2,6,7,8,25,26,28,29,30,33,35,36,38
					HSC 5 -1	Pipo/Pied/ Quga	Slight	Low	Mod	
					HSC 5 -1	Pipo/Pied/ Jude/Quga	Slight	Low	Severe	
					HSC 5 -1	Pipo/Pied/ Jumo/Quga	Slight	Low	Mod	
					HSC 5 -1	Pipo/Pied/ Jude/Quga	Slight	Low	Mod	
					HSC 5 -1	Pipo/Pied/ Jumo/Quga	Slight	Low	Severe	
					HSC 5 -1	Pipo/Pied/ Quga	Slight	Low	Mod	
					HSC 5 -1	Pipo/Pied/ Quga	Mod	Low	Moderate	
40	0-15%	10,749	NA	510	HSC 5 -1	Pipo/Pied/ Jumo/Fapa	Slight	Low	Slight	2,6,7,8,25,26,28,29,30,33,35,36,38
			NA	512	HSC 5 -1	Pipo/Pied/ Jumo/Fapa	Slight	Low	Slight	
41	15-40%	7,863	311, 564	524	HSC 5 -1	Pipo/Pied/ Quga	Severe	Low	Severe	2,6,7,8,25,26,28,29,30,33,35,36,38
					HSC 5 -1	Pipo/Pied/ Jumo/Quga	Severe	Low	Severe	
					HSC 5 -1	Pipo/Pied/ Quga	Severe	Low	Severe	
42	40-	16,245	320,	562, 575,	LSC 5 0	Pipos	Severe	Low	Severe	Steep slopes limit

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
	120%		539, 681	596						mechanical harvesting (severe limitation). Soils have severe erosion hazard and accelerated erosion would occur upon soil disturbance. Handcrews/ (chainsaw or heli-logging may be appropriate to not cause soil disturbance.
					LSC 5 0	Pipo/Quga	Severe	Low	Severe	
					LSC 5 0	Pipos	Severe	Low	Severe	
					LSC 5 0	Pipos	Severe	Mod	Severe	
					LSC 5 0	Pipos	Severe	Low	Severe	
					LSC 5 0	Pipos	Severe	Mod	Severe	
43	40-120%	495	431, 648	NA	HSC 5 -1	Pipo/Pied/ Quga	Severe	Low	Severe	Same as strata 42
					HSC 5 -1	Pipo/Pied/ Quga	Severe	Low	Severe	
44	40-120%	6,085	NA	555, 620	LSC 6	Psmeg	Severe	Low	Severe	Same as 42.
					LSC 6 -1	Psmeg/Pipo Jude/Qutu	Severe	Low	Severe	
45	40-120%	1,552	660	NA	LSC 5	Quga/Rone	Severe	NA	Severe	Same as 42.
46	0 – 15%	7,853	260, 495, 514, 543,	426, 433, 438, 440, 443, 444, 445, 453,	LSC 4 +1	Pied/Quga/ Artr/Stco	Mod	Low ¹¹	NA	2,6,8,24,26,33,36,38, 39

¹¹ Unlike the Pipo and mixed conifer ecosystems Natural Regeneration Potential **does not mean** probability of success in the establishment and survival of trees but probable success and ease in establishment of native grasses.

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
			586, 587, 599	465, 473, 490, 492, 495						
					HSC 4 0	Pied/Jumo/ Fapa	Slight	Low	NA	
					HSC 4 0	Pied/Jumo	Slight	Low	NA	
					HSC 4 0	Pied/Jude/ Jumo/Bogr	Slight	Low	NA	
					HSC 4 0	Pied/Jumo/ Bogr	Slight	Low	NA	
					HSC 4 0	Pied/Jumo/ Bogr/Stco	Slight	Low	NA	
					HSC 4 0	Bogr/Stco	Slight	High	NA	
					HSC 4 0	Pied/Jumo/ Bogr	Slight	High	NA	
					HSC 4 0	Agsm/Bogr	Mod	Low	NA	
					HSC 4 0	Pied/Jumo/ Bogr	Slight	Low	NA	
					HSC 4 +1	Pied/Jumo/ Bogr	Slight	High	NA	
					HSC 4 +1	Pied/Jude/ Jumo/Quga	Slight	High	NA	
					LSM 4 +1	Pifa/Jude/ Qutu/Bogr	Mod	Low	NA	
					LSM 4+1	Pifa/Jude/ Qutu/Bogr	Slight	Low	NA	
					HSC 4 0	Pied/Jumo	Slight	Mod	NA	
					HSC 4 0	Pied/Jumo	Slight	Low	NA	
47	15 to 120%	9,413	261, 274, 476, 496, 523, 541,	427, 430, 439, 441, 449, 450, 455, 470, 471, 493	LSC 4 +1	Pied/Quga/ Artr/Stco	Severe	Low	NA	Steep slopes (greater than 40%) limit mechanical harvesting (severe limitation). Soils have severe erosion

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
			589							hazard and accelerated erosion would occur upon soil disturbance. Slopes less than about 40% in pinyon-juniper woodlands, use BMP's listed in strata 46.
					LSC 4 0	Pied/Juos/Artr/Stco	Severe	Low	NA	
					HSC 4 0	Pied/Jumo/Fapa	Mod	Low	NA	
					LSM 4 0	Juos	Mod	Low	NA	
					HSC 4 0	Pied/Juos/Jumo/Bogr	Mod	Low	NA	
					HSC 4 0	Pied/Jude/Jumo/Fapa	Mod	Low	NA	
					HSC 4 0	Jumo	Severe	Low	NA	
					HSC 4 0	Jumo	Mod	Low	NA	
					HSC 4 0	Pied/Jumo/Come/Stco	Severe	Low	NA	
					LSM 4 0	Qutu/Cemo	Severe	Low	NA	
					LSM 4 0	Qutu/Arpu/Cemo	Severe	Low	NA	
					HSC 4 0	Pied/Jumo	Severe	Low	NA	
					LSM 4 +1	Pifa/Jude/Qutu/Bogr	Mod	Low	NA	
					HSC 4 0	Pied/Jumo	Mod	Mod	NA	
					LSM 4 +1	Pied/Jude/Qutu/ Arpu	Severe	Low	NA	
					LSM 4 +1	Pied/Jude/Qutu/ Arpu	Severe	Low	NA	
					HSC 4 0	Pied/Jumo	Mod	Low	NA	
48	0 to 80%	27,786	302, 312, 322	614, 651, 653, 654	LSC 6 0	Abco/Psmeg/Pipo/Quga	Severe	Mod	Moderate	Steep slopes (greater than 40%) limit mechanical harvesting (severe limitation). Soils have severe erosion hazard and accelerated erosion
					LSC 6 0	Psmeg	Severe	Low	Severe	
					LSC 6 0	Abco/Psmeg/Pipo/Quga	Severe	High	Severe	
					LSC 6 0	Abco/Psmeg/Pipo/Quga	Severe	High	Severe	

Stratum	Slope	Total Acres for Strata	Kaibab TESU	Coconino TESU	Climatic Class ⁷	PPC ⁸	Erosion Hazard	Nat. Regen Potent ⁹	Timber Harvest Limitation	Strata Specific BMP Mitigation Measure
					LSC 6 0	Abco/Psmeg/Pipo/Quga	Mod	High	Moderate	would occur upon soil disturbance. Slopes less than about 40% in, use BMP's listed in strata 11 except coarse woody material TBD.
					LSC 6 0	Abco/Psmeg/Pipo/Quga	Mod	Low	Mod	
49	40 to 120%	11,498	540, 625	612, 612	LSC 5 -1	Psmeg/Pipo/Jude/Qutu	Severe	Low	Severe	Steep slopes (greater than 40%) limit mechanical harvesting (severe limitation). Soils have severe erosion hazard and accelerated erosion would occur upon soil disturbance.
					LSC 6 0	Psmeg	Severe	Mod	Severe	
					LSC 6 0	Psmeg	Severe	Low	Severe	
					LSC 6 0	Psmeg	Severe	Low	Severe	
50	0 - 15%	8,080		610, 611	LSC 6 -1	Potr/Psmeg/Pipo	Mod	High	Moderate	2,6,7,8,25,26,28,29,30,33,35,36,38

Other required BMP's listed in the Resource Protection Measures will apply depending on the activity.

Appendix B. Taxonomic Classifications and Potential Plant Community by Strata and TES Map Unit and Soil Condition within the Four-Forest Initiative Proposed Action

Table 32. Proposed Action Taxonomic Classifications and Potential Plant Community by Strata and TES Map Units

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climatic Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
1	0-5	6 ¹²	Pachic Argiborolls, fine, montmorillonitic	LSC 5 0	Popr/Fear	Sat	-0-
		9 ¹³	Cumulic Haploborolls, fine-loamy, mixed Cumulic Haploborolls, loamy-skeletal, mixed	LSC 5 0	Popr/AgsmPopr/Agsm	Sat	-0-
		11 ¹⁴	Cumulic Haploborolls, fine-loamy, mixed	LSC 5 0	Popr/ Mumo	Sat	-0-
		53 ¹⁵	Cumulic Haploborolls, fine-loamy, mixed	LSC 5 0	Popr/Fear	Impaired	-0-
2	0-5	55 ¹⁶	Pachic Argiborolls, fine, montmorillonitic Vertic Argiustolls, fine, montmorillonitic	LSC 5 0	Popr/FearAgsm	Impaired	-0- 3,185
3	0-15	513 ¹⁷	Typic Argiborolls, clayey-skeletal, mont. Pachic Argiborolls, fine, montmorillonitic	LSC 5 0	Fear/Mumo Fear/Mumo	Sat	-0-
		595 ¹⁸	Pachic Argiborolls, fine, montmorillonitic	LSC 5 0	Fear/Mumo	Sat	-0-

¹² Kaibab TESU, no TESU 6 on Coconino

¹³ Kaibab TESU no TESU 9 within Coconino

¹⁴ Kaibab TESU Coconino TESU 11 in Strata 21

¹⁵ Coconino TESU no TESU 53 within Kaibab

¹⁶ Coconino TESU no TESU 55 within Kaibab

¹⁷ Kaibab TESU, Coconino 513 in Strata 21

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
4	15-40	440 ¹⁹	Mollic Vitrandepts, cindery, frigid	LSC 5 0	Fear/Mumo	Unsat.	873
5	0-15	640 ²⁰	Pachic Udic Argiborolls, loamy-skeletal, mixed	LSC 6 0 LSC 6 0	Fear/Bran/Mumo	Sat	-0-
6	0-15	36 ²¹	Pachic Argiustolls, fine, mixed, mesic	HSC 4-0	Chna/Agsm/Pied	Sat	-0-
		507 ²²	Vertic Argiborolls, fine, mont. Vertic Argiborolls, clayey-skeletal, mont.	HSC 5 - 1	Chan/Fear/Bo gr	Sat	-0-
		566 ²³	Typic Haploborolls, fine-loamy, mixed	HSC 5 - 1	Sihiy/Arlo/Bo gr	Impaired	-0-
7	0-15	594 ²⁴	Vitrandid Haploborolls, ash-skeletal over cindery	LSC 5 0	Fear/Mumo	Sat	-0-
8	0-15	630 ²⁵	Lithic Eutroboralfs, clayey-skeletal, mont.	LSC 5 0	Fear/MumoF	Sat	-0-

¹⁸ Coconino TESU, no TESU 595 within Kaibab

¹⁹ Kaibab TESU, Coconino NF TESU 440 in Strata 46

²⁰ Coconino TESU no TESU 640 within Kaibab

²¹ Kaibab TESU, no TESU 36 on Coconino

²² Kaibab TESU no TESU 507 on Coconino

²³ Coconino TESU no TESU 566 within Kaibab

²⁴ Coconino TESU no TESU 594 within Kaibab

²⁵ Kaibab TESU no TESU 630 within Coconino

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			Mollic Eutroboralfs, clayey-Skeletal, mont.		ear/Mumo		
9	0-5	20 ²⁶	Vertic Haplaqualls, very fine, mont, frigid	LSC 5 0	CARE/ELEO /Pola/ Alge	Impaired	-0-
		50 ²⁷	Vertic Haplaqualls, very fine, mont, frigid	LSC 5 0	Caaq/Elma/Pola/Alge	Unsat	-0-
10	0-5	37 ²⁸	Aquic Haploborolls, loamy-skeletal, mixed	LSC 5 0	Popr/CARE/Fear	Sat	-0-
		60 ²⁹	Fluventic Haploborolls, sandy-skeletal, mixed	LSC 6-0	Poan3/Juma/Psmeg	Sat	0
11	0-15	265 ³⁰	Lithic Eutroboralfs, loamy-skeletal, mixed	LSC 5 0	Pipo/Quga	Sat	-0-
		519 ³¹	Lithic Eutroboralfs, clayey-skeletal, mont. Lithic Argiborolls, fine, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
		585 ³²	Lithic Eutroboralfs, clayey-skeletal, mont. Mollic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-

²⁶Kaibab TESU no TESU 20 within Coconino

²⁷Coconino TESU no TESU 50 within Kaibab

²⁸Kaibab TESU no TESU 37 within Coconino

²⁹Coconino TESU no TESU 60 on Kaibab

³⁰Kaibab TESU no TESU 265 within Coconino

³¹Kaibab TESU no TESU 519 within Coconino

³²Coconino TESU no TESU 585 within Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
		631	Lithic Eutroboralfs, clayey-skeletal, mont. Typic Eutroboralfs, c-sk, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
12	0-15	579 ³³	Lithic Eutroboralfs, clayey-skeletal, mont. Mollic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Jude/Qu ga	Sat	-0-
13	0-15	275 ³⁴ ,	Lithic Ustochrepts, loamy-skeletal, mixed	LSC 5 - 1	Pipo/Pied/Qu ga/Artr	Sat.	-0-
		282 ³⁵	Typic Eutroboralfs, fine-loamy, mixed	LSC 5 - 1	Pipo/Pied/Qu ga/Artr	Sat	-0-
14	0-15	326 ³⁶	Udic Ustochrepts, Loamy-skeletal, mixed, frigid	HSC 5 - 1	Pipo/Pied/Qu ga	Sat	-0-
		565 ³⁷	Lithic Argiborolls, clayey-skeletal, mont. Lithic Argiborolls, fine, mont.	HSC 5 - 1	Pipo/Pied/Qu ga	Sat.	-0-
15	0-15	520 ³⁸	Udic Haplustalfs, fine, mont., mesic Lithic Haplustalfs, clayey-skeletal, mont., mesic	LSM 5 - 1	Pipo/Pifa/ Jude/Qutu	Sat.	-0-

³³ Coconino TESU no TESU 579 within Kaibab

³⁴ Kaibab TESU no TESU 275 within Coconino

³⁵ Kaibab TESU no TESU 282 within Coconino

³⁶ Kaibab TESU no TESU 324 on Coconino

³⁷ Kaibab TESU, TESU 565 within Coconino found in Strata 32

³⁸ Coconino TESU no TESU 520 within Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
		572 ³⁹	Udic Haplustalfs, fine, mont.	LSM 5 - 1	Pipo/Jude2/Quar/Arpu5	Sat.	-0-
16	15-40	276 ⁴⁰	Lithic Haploborolls, Loamy-skeletal, mixed, frigid Rock Outcrop	LSC 5 - 1	Pipo/Pied/Quga/Artr	Unsat.	3,002
17	15-40	266 ⁴¹	Lithic Eutroboralfs, loamy-skeletal, mixed Rock Outcrop	LSC 5 0	Pipo/Quga	Unsat.	1,318
18	15-40	530 ⁴²	Udic Haplustalfs, clayey-skeletal, mont., mesic Lithic Haplustalfs, clayey-skeletal, mont., mesic	LSM 5 0	Pipo/Jude/Qutu	Sat Unsat	-0- 2,610
19	15-40	406 ⁴³	Mollic Eutroboralfs, fine, montmorillonitic Lithic Eutroboralfs, clayey-skeletal, mont	HSC 5 - 1	Pipo/Pied/Quga	Unsat.	7,965
	0-15	515 ⁴⁴	Vertic Argiborolls, fine, mont.	HSC 5 - 1	Agsm/Chna	Impaired.	

³⁹ Coconino TESU, no TESU 572 on Kaibab

⁴⁰ Kaibab TESU no TESU 276 within Coconino

⁴¹ Kaibab TESU no TESU 266 within Coconino

⁴² Coconino TESU no TESU 530 within Kaibab

⁴³ Kaibab TESU no TESU 406 within Coconino

⁴⁴ Coconino TESU, no TESU 515 on Kaibab, note this unit is 0 - 15% whereas 406 is 15 – 40%

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
20	15-40	407 ⁴⁵	Typic Vitrandepts, cindery, frigid Lithic Vitrandepts, cindery, frigid	LSC 5-0	Pipo/Quga	Unsat. Unsat.	2,570
21	0 - 40	11 ⁴⁶	Lava Flows Typic Ustorthents, cindery, frigid	HSC 5 - 1	Pipo/Pied/ Jumo/Fapa	NA Sat.	NA -0-
		14 ⁴⁷	Cinder Land Typic Ustorthents, cindery, frigid	HSC 5 - 1	Pipo/Pied/ Jumo/Fapa	NA Sat.	NA -0-
		15 ⁴⁸	Cinder Land Typic Ustorthents, cindery, frigid	HSC 5 - 1	Pipo/Pied/ Jumo/Fapa	NA Sat.	NA -0-
		511 ⁴⁹	Typic Ustorthents, cindery, frigid	HSC 5 - 1	Pipo/Pied/ Jumo/Fapa	Sat.	-0-
		513 ⁵⁰	Typic Ustochrepts, cindery, frigid	HSC 5 - 1	Pipo/Pied/ Jumo/Fapa	Unsat.	4,543
22	15-40	527 ⁵¹	Lithic Haploborolls, loamy-skeletal, mixed Typic Haploborolls, loamy-skeletal, mixed	HSC 5 - 1	Pipo/Pied/ Jude/Come	Sat	-0-

⁴⁵ Kaibab TESU no TESU 407 within Coconino

⁴⁶ Coconino TESU, TESU 11 on Kaibab within Strata 1

⁴⁷ Coconino TESU, no TESU 14 on Kaibab

⁴⁸ Coconino TESU, TESU 15 on Kaibab mapped in Kanab Creek on NKRD which is outside of project area.

⁴⁹ Coconino TESU, no TESU 511 on Kaibab

⁵⁰ Coconino TESU, TESU 513 on Kaibab located in Strata 2

⁵¹ Coconino TESU, no TESU 527 on Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
23	0-15	290 ⁵²	Typic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
		293 ⁵³	Typic Eutroboralfs, clayey-skeletal, mont Mollic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
		401 ⁵⁴	Mollic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
		537 ⁵⁵	Mollic Eutroboralfs, clayey-skeletal, mont Typic Argiborolls, fine, montmorillonitic.	LSC 5 0	Pipo/Quga	Sat	-0-
		557 ⁵⁶	Mollic Eutroboralfs, clayey-skeletal, mont.	LSC 5 0	Pipo/Quga	Sat	-0-
		582 ⁵⁷	Typic Argiborolls, fine, mont Mollic Eutroboralfs, c-sk, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
		586 ⁵⁸	Mollic Eutroboralfs, fine, montmorillonitic Mollic Eutroboralfs, c-sk, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
24	0-15	546 ⁵⁹	Typic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Quga/ Muvi	Sat	-0-
25	0-15	567 ⁶⁰	Typic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Jude/	Sat	-0-

⁵² Kaibab TESU, no TESU 290 on Coconino

⁵³ Kaibab TESU, no TESU 293 on Coconino

⁵⁴ Kaibab TESU, Coconino 401 TESU found in LSM -1 (Redberry Juniper PPC)

⁵⁵ Kaibab TESU, Coconino 537 found in Strata 36

⁵⁶ Coconino TESU, no TESU 557 on Kaibab

⁵⁷ Coconino TESU, no TESU 582 on Kaibab

⁵⁸ Coconino TESU, TESU 586 on Kaibab found in Strata 46

⁵⁹ Coconino TESU, no TESU 546 on Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			Mollic Eutroboralfs, fine, montmorillonitic		Quga		
		578 ⁶¹	Mollic Eutroboralfs, fine, montmorillonitic Typic Argiborolls, fine, montmorillonitic	LSC 5 0	Pipo/Jude/ Quga	Sat	-0-
26	0-5	10 ⁶²	Typic Argiborolls, fine, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
27	0-15	304 ⁶³	Typic Eutroboralfs, c-sk, montmorillonitic	LSC 5 0	Pipo/Fear	Sat	-0-
		324 ⁶⁴	Typic Eutroboralfs, c-sk, montmorillonitic Typic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Fear	Sat	-0-
		401a ⁶⁵	Mollic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Fear	Sat	-0-
		536 ⁶⁶	Mollic Eutroboralfs, fine, montmorillonitic Typic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Fear	Sat	-0-
		537a ⁶⁷	Mollic Eutroboralfs, clayey-skeletal, mont Typic Argiborolls, fine, montmorillonitic.	LSC 5 0	Pipo/Fear	Sat	-0-

⁶⁰ Coconino TESU, no TESU 567 on Kaibab

⁶¹ Coconino TESU, no TESU 578 on Kaibab

⁶² Kaibab TESU, no TESU 10 on Coconino

⁶³ Kaibab TESU, no TESU 304 on Coconino

⁶⁴ Kaibab TESU, no TESU 324 on Coconino

⁶⁵ Kaibab TESU, Coconino 401 TESU found in LSM -1 (Redberry Juniper PPC)

⁶⁶ Coconino TESU, no TESU 536 on Kaibab

⁶⁷ Kaibab TESU, no 537a TESU on Coconino

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
		551 ⁶⁸	Mollic Eutroboralfs, loamy-skeletal, mixed	LSC 5 0	Pipo/Fear	Sat	-0-
		557a ⁶⁹	Mollic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
		570 ⁷⁰	Typic Eutroboralfs, fine, montmorillonitic Typic Eutroboralfs, c-sk, montmorillonitic	LSC 5 0	Pipo/Fear	Sat	-0-
		582a ⁷¹	Typic Argiborolls, fine, montmorillonitic Mollic Eutroboralfs, c-sk, montmorillonitic	LSC 5 0	Pipo/Fear	Sat	-0-
28	0-15	560 ⁷²	Vitrandid Ustochrepts, ashy-skeletal over cindery, frigid	LSC 5 0	Pipo/Fear	Sat	-0-
29	0-15	325 ⁷³	Udic Ustochrepts, loamy-skeletal, mixed	LSC 5 0	Pipo/Fear ⁷⁴	Sat	-0-
30	0-15	558 ⁷⁵	Vitrandid Ustochrepts, ashy-skeletal, frigid	LSC 5 0	Pipo/Fapa	Sat	-0-
		559 ⁷⁶	Vitrandid Ustorthents, cindery, frigid	LSC 5 0	Pipo/Fapa	Sat	-0-

⁶⁸ Coconino TESU, no TESU 551 on Kaibab

⁶⁹ Coconino TESU, no TESU 557 on Kaibab

⁷⁰ Coconino TESU, no TESU 570 on Kaibab

⁷¹ Coconino TESU, no TESU 582a on Kaibab

⁷² Coconino TESU, no TESU 560 on Kaibab

⁷³ Kaibab TESU, no TESU 325 on Coconino

⁷⁴ Mapped Pipo/Quga in Kaibab TES

⁷⁵ Coconino TESU, no TESU 558 on Kaibab

⁷⁶ Coconino TESU, no TESU 559 on Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
31	15-40	561 ⁷⁷	Typic Ustorthents, cindery, frigid	LSC 5 0	Pipo/Fapa	Sat	-0-
32	15-40	294 ⁷⁸	Mollic Eutroboralfs, clayey-skeletal, mont Mollic Eutroboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
		402 ⁷⁹	Mollic Eutroboralfs, fine, mixed Lithic Eutroboralfs, c-sk, mixed	LSC 5 0	Pipo/Quga	Sat Unsat.	-0- 2,850
		525 ⁸⁰	Typic Argiborolls, c-sk, mont. Typic Argiborolls, fine, mont.	LSC 5 0	Pipo/Quga	Unsat	13,447
		549 ⁸¹	Glossic Eutroboralfs, fine, montmorillonitic Typic Paleboralfs, fine, montmorillonitic	LSC 5 0	Pipo/Quga/M uvi2	Sat. Sat	-0- -0-
		565 ⁸²	Mollic Eutroboralfs, clayey-skeletal, mixed	LSC 5 0	Pipo/Quga	Sat	-0-
		584 ⁸³	Mollic Eutroboralfs, clayey-skeletal, mont. Typic Argiborolls, fine, montmorillonitic	LSC 5 0	Pipo/Quga	Sat	-0-
33	15-40	291 ⁸⁴	Typic Eutroboralfs, clayey-skeletal, mixed	LSC 5 0	Pipo/Quga	Unsat	2,958

⁷⁷ Coconino TESU, no TESU 561 on Kaibab

⁷⁸ Kaibab TESU, no 294 TESU on Coconino

⁷⁹ Kaibab TESU, TESU 402 on Coconino found in LSM -1 (Utah Juniper PPC)

⁸⁰ Kaibab TESU, no TESU 525 on Coconino

⁸¹ Coconino TESU,. No TESU 549 on Kaibab

⁸² Coconino TESU, TESU 565 on Kaibab found in Strata 14

⁸³ Coconino TESU, no TESU 584 on Kaibab

⁸⁴ Kaibab TESU, no 291 TESU on Coconino

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			Typic Eutroboralfs, loamy-skeletal, mixed				
		310 ⁸⁵	Typic Eutroboralfs, clayey-skeletal, mixed	LSC 5 0	Pipo/Quga	Sat	-0-
34	15-40	300 ⁸⁶	Udic Ustochrepts, loamy-skeletal, mixed, frigid	LSC 5 0	Pipo/Quga	Sat	-0-
35	15-40	553 ⁸⁷	Typic Argiborolls, loamy-skeletal, mixed	LSC 5 0	Pipo/Fear	Sat	-0-
		565a ⁸⁸	Mollic Eutroboralfs, clayey-skeletal, mixed	LSC 5 0	Pipo/Fear	Sat	-0-
		584a ⁸⁹	Mollic Eutroboralfs, clayey-skeletal, mont. Typic Argiborolls, fine, montmorillonitic	LSC 5 0	Pipo/Fear	Sat	-0-
36	15-40	300a	Udic Ustochrepts, loamy-skeletal, mixed, frigid	LSC 5 0	Pipo/Fear	Sat	-0-
		310a	Typic Eutroboralfs, c-sk, montmorillonitic	LSC 5 0	Pipo/Fear	Sat	-0-
		537 ⁹⁰	Lithic Argiborolls, loamy-skeletal, mixed Mollic Eutroboralfs, loamy-skeletal, mixed	LSC 5 0	Pipo/Fear	Sat	-0-
37	0-15	283 ⁹¹	Typic Eutroboralfs, fine, montmorillonitic	LSC 5 -	Pipo/Pied/	Sat	-0-

⁸⁵ Kaibab TESU, no 310 TESU on Coconino

⁸⁶ Kaibab TESU, no 300 TESU on Coconino

⁸⁷ Coconino TESU, no TESU 563 on Kaibab

⁸⁸ Coconino TESU, no TESU 565a on Kaibab

⁸⁹ Coconino TESU, no TESU 584 on Kaibab

⁹⁰ Coconino TESU, Kaibab 537 found in Strata 23

⁹¹ Kaibab TESU, no 283 TESU on Coconino

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climatic Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			Typic Eutroboralfs, c-sk, montmorillonitic	1	Quga/Artr		
		297 ⁹²	Mollic Eutroboralfs, fine, montmorillonitic Mollic Eutroboralfs, c-sk, montmorillonitic	LSC 5 - 1	Pipo/Pied/ Quga/Artr	Sat	-0-
38	15-40	284 ⁹³	Typic Eutroboralfs, c-sk, montmorillonitic Typic Eutroboralfs, fine, montmorillonitic	LSC 5 - 1	Pipo/Pied/ Quga/Artr	Unsat	1,704
39	0-15	305 ⁹⁴	Typic Eutroboralfs, c-sk, montmorillonitic	HSC 5 - 1	Pipo/Pied/ Quga	Sat	-0-
		405 ⁹⁵	Mollic Eutroboralfs, fine, montmorillonitic	HSC 5 - 1	Pipo/Pied/ Quga	Sat	-0-
		500 ⁹⁶	Mollic Eutroboralfs, fine, montmorillonitic	HSC 5 - 1	Pipo/Pied/ Jude/Quga	Sat	-0-
		505 ⁹⁷	Mollic Eutroboralfs, fine, montmorillonitic	HSC 5 - 1	Pipo/Pied/ Jude/Quga	Sat	-0-
		506 ⁹⁸	Mollic Eutroboralfs, fine-loamy, mixed	HSC 5 - 1	Pipo/Pied/ Jumo/Quga	Sat	-0-

⁹² Kaibab TESU, no 297 TESU on Coconino

⁹³ Kaibab TESU, no 284 on Coconino, originally TESU 298 part of this strata, no acres reported

⁹⁴ Kaibab TESU, no TESU 305 on Coconino

⁹⁵ Kaibab TESU, no 405 on Coconino

⁹⁶ Coconino TESU, no TESU 500 on Kaibab

⁹⁷ Coconino TESU, no TESU 505 on Kaibab

⁹⁸ Coconino TESU, no TESU 506 on Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
		517 ⁹⁹	Typic Eutroboralfs, c-sk, montmorillonitic	HSC 5 - 1	Pipo/Pied/Jude/Quga		
		523 ¹⁰⁰	Mollic Eutroboralfs, fine, montmorillonitic	HSC 5 - 1	Pipo/Pied/Jumo/Quga	Sat	-0-
		563 ¹⁰¹	Mollic Eutroboralfs, c-sk, montmorillonitic Typic Argiborolls, fine, montmorillonitic	HSC 5 - 1	Pipo/Pied/Quga	Sat	-0-
		649 ¹⁰²	Vertic Argiborolls, fine, montmorillonitic	HSC 5 - 1	Pipo/Pied/Quga	Sat	-0-
40	0-15	510 ¹⁰³	Typic Ustorthents, cindery, frigid	HSC 5 - 1	Pipo/Pied/Jumo/Fapa	Sat	-0-
		512 ¹⁰⁴	Vitrandic Ustochrepts, ashy-skeletal, frigid	HSC 5 - 1	Pipo/Pied/Jumo/Fapa	Sat	-0-
41	15-40	311 ¹⁰⁵	Typic Eutroboralfs, c-sk, montmorillonitic	HSC 5 - 1	Pipo/Pied/Quga	Unsat.	1,854
		524 ¹⁰⁶	Typic Argiborolls, fine, mont	HSC 5 -	Pipo/Pied/	Sat	-0-

⁹⁹ Coconino TESU, no TESU 517 on Kaibab

¹⁰⁰ Coconino TESU, TESU 523 on Kaibab mapped in Strata 47

¹⁰¹ Kaibab TESU, no TESU 563 on Coconino

¹⁰² Kaibab TESU, no TESU 649 on Coconino

¹⁰³ Coconino TESU, no TESU 510 on Kaibab

¹⁰⁴ Coconino TESU, no TESU 512 on Kaibab

¹⁰⁵ Kaibab TESU, no TESU 311 on Coconino

¹⁰⁶ Coconino TESU, no TESU 524 on Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			Mollic Eutroboralfs, c-sk, mont	1	Jumo/Quga		
		564 ¹⁰⁷	Typic Argiborolls, c-sk, montmorillonitic Typic Argiborolls, fine, montmorillonitic Rock Outcrop	HSC 5 - 1	Pipo/Pied/Quga	Unsat.	8,588
42	40-120	320 ¹⁰⁸	Lithic Ustorthents, frigid Udic Ustochrepts, frigid	LSC 5	Pipos	Unsuit ¹⁰⁹	-0-
		539 ¹¹⁰	Typic Argiborolls Rock Outcrop	LSC 5	Pipo/Quga	Unsuit	-0-
		562 ¹¹¹	Vitrantic Eutroboralfs, ashy-skeletal, frigid Vitrantic Eutroboralfs, ashy-skeletal, frigid	LSC 6	Psmeg	Sat	-0-
		575 ¹¹²	Mollic Eutroboralfs Lithic Eutroboralfs Rock Outcrop	LSC 5	Pipos	Unsuit	-0-
		596 ¹¹³	Rock Outcrop Lithic Haploborolls, loamy-skeletal, mixed Eutric Glossoboralfs, loamy-skeletal, mixed	LSC 5 LSC 6	Pipos Psmeg	Sat Sat	NA -0- -0-

¹⁰⁷ Kaibab TESU, no TESU 564 on Coconino

¹⁰⁸ Kaibab TESU, no TESU 320 on Coconino

¹⁰⁹ Unsited – Geologic soil erosion exceeds soil loss tolerance because of site influences not management induced factors.

¹¹⁰ Kaibab TESU, no TESU 539 on Coconino

¹¹¹ Coconino TESU no TESU 562 on Kaibab

¹¹² Coconino TESU, no TESU 575 on Kaibab

¹¹³ Coconino TESU, no TESU 596 on Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
		681 ¹¹⁴	Typic Eutroboralfs Lithic Eutroboralfs	LSC 5	Pipos	Sat Sat	-0-
43	40-80	431 ¹¹⁵	Mollic Eutroboralfs Lithic Eutroboralfs	HSC 5 - 1	Pipo/Pied/ Quga	Unsuit Unsuit	-0- -0-
		648 ¹¹⁶	Typic Argiborolls Lithic Argiborolls	HSC 5 - 1	Pipo/Pied/ Quga	Unsuit	-0-
44	40-120	555 ¹¹⁷	Typic Dystrochrepts, frigid Rock Outcrop Mollic Eutroboralfs	LSC 6	Psmeg Pipos	Sat	-0-
		620 ¹¹⁸	Typic Eutrochrepts, frigid Udic Haploborolls Rock Outcrop	LSC 6 - 1	Psmeg/Pipo Jude/Qutu	Inherently Unstable	-0-
45	40-120	660 ¹¹⁹	Typic Eutrochrepts, frigid Typic Haploborolls	LSC 5	Quga/Rone	Sat Unsuit	-0- -0-
46	0 – 15	260 ¹²⁰	Lithic Ustochrepts, calcareous, l-sk, carb.,	LSC 4	Pied/Quga/Ar	Sat	-0-

¹¹⁴ Kaibab TESU, no TESU 681 on Coconino

¹¹⁵ Kaibab TESU, no TESU 431 on Coconino

¹¹⁶ Kaibab TESU, no TESU 648 on Coconino

¹¹⁷ Coconino TESU, no TESU 555 on Kaibab

¹¹⁸ Coconino TESU, TESU 620 on Kaibab located on NKRD

¹¹⁹ Kaibab TESU, no TESU 660 on Coconino

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			mesic Typic Ustochrepts, calcareous, l-sk, mixed, mesic	+1	tr2/Stco4	Sat	-0-
		426 ¹²¹	Typic Ustorthents, cindery, mesic	HSC 40	Pied/Jumo/Fapa	Sat	-0-
		433 ¹²²	Vitrantic Ustochrepts, ashy-skeletal, mesic	HSC 40	Pied/Jumo	Sat	-0-
		438 ¹²³	Typic Argiustolls, fine, mont., mesic	HSC 40	Pied/Jude2/Jumo/Bogr	Sat	-0-
			Typic Argiustolls, c-sk, mont., mesic			Sat	-0-
		440 ¹²⁴	Typic Argiustolls, fine, mont., mesic	HSC 40	Pied/Jumo/Bogr	Sat	-0-
		443 ¹²⁵	Typic Durustands, medial, mesic	HSC 40	Pied/Jumo/Bogr/Stco	Sat	-0-
			Calcic Haplustands, medial-skeletal, mesic			Sat	-0-
		444 ¹²⁶	Calcic Haplustands, medial, mesic	HSC 40	Bogr/Stco	Sat	-0-
			Typic Durustands, medial, mesic			Sat	-0-
		445 ¹²⁷	Typic Argiustolls, l-sk, mixed., mesic	HSC 4	Pied/Jumo/Bo	Sat	-0-

¹²⁰ Kaibab TESU, no TESU 260 on Coconino

¹²¹ Coconino TESU, no TESU 426 on Kaibab

¹²² Coconino TESU, no TESU 433 on Kaibab

¹²³ Coconino TESU, no TESU 438 on Kaibab

¹²⁴ Coconino TESU, Kaibab TESU 440 in Strata 4

¹²⁵ Coconino TESU, no TESU 443 on Kaibab

¹²⁶ Coconino TESU, no TESU 444 on Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
				0	gr		
		453 ¹²⁸	Vertic Haplustalfs, c-sk, mont., mesic	HSC 4 0	Agsm/Bogr	Unsat	
		465 ¹²⁹	Typic Haplustalfs, fine, mont., mesic	HSC 4 0	Pied/Jumo/Agsm	Sat	-0-
			Vertic Haplustalfs, fine, mont., mesic			Unsat	
		473 ¹³⁰	Typic Haplustalfs, fine-loamy, mont., mesic	HSC 4 +1	Pied/Jumo/Bogr	Sat	-0-
		490 ¹³¹	Typic Haplustalfs, fine, mont., mesic	HSC 4 +1	Pied/Jude/Jumo/Quga	Sat	-0-
			Lithic Haplustalfs, c-sk, mont., mesic			Sat	-0-
		492 ¹³²	Vertic Haplustalfs, fine, mont., mesic	LSM 4 +1	Agsm/Bogr	Impaired	-0-
			Typic Argiustolls, c-sk, mont., mesic		Pifa/Jude/Qutu/Bogr		-0-
		495 ¹³³	Typic Haplustalfs, fine, mont., mesic	LSM 4	Pifa/Jude/	Sat	-0-

¹²⁷ Coconino TESU, no TESU 445 on Kaibab

¹²⁸ Coconino TESU, no TESU 453 on Kaibab

¹²⁹ Coconino TESU, no TESU 465 on Kaibab

¹³⁰ Coconino TESU, no TESU 473 on Kaibab

¹³¹ Coconino TESU, no TESU 490 on Kaibab

¹³² Coconino TESU, no TESU 492 on Kaibab

¹³³ Coconino 495

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
				+1	Qutu/Bogr		
		495 ¹³⁴	Typic Haplustalfs, fine, mont., mesic	HSC 40	Pied/Jumo	Sat	-0-
		514 ¹³⁵	Vertic Argiustolls, fine, mont., mesic Vertic Argiustolls, c-sk, mont., mesic	HSC 40	Pied/Jumo	Sat	-0-
		543 ¹³⁶	Vertic Haplustalfs, fine, mont., mesic Vertic Argiustolls, fine, mont., mesic	HSC 40	Pied/Jumo	Sat	-0-
		586 ¹³⁷	Typic Argiustolls, fine, mont., mesic Typic Argiustolls, c-sk, mont., mesic	HSC 40	Pied/Jumo	Sat	-0-
		587 ¹³⁸	Lithic Argiustolls, c-sk, mont., mesic Vertic Argiustolls, c-sk, mont., mesic	HSC 40	Pied/Jumo	Sat	-0-
		599 ¹³⁹	Typic Argiustolls, fine, mont., mesic Typic Argiustolls, fine-loamy, mixed, mesic	HSC 40	Bogr/Pied	Sat	-0-
47	15 to	261 ¹⁴⁰	Lithic Ustochrepts, calcareous, l-sk, carb.,	LSC 4	Pied/Quga/Ar	Unsat	4,970

¹³⁴ Kaibab 495

¹³⁵ Kaibab TESU, no TESU 514 on Coconino, this TESU was designed to account for overstory treatments in pinyon/juniper with basalt parent material.

¹³⁶ Kaibab TESU, no TESU 543 on Coconino

¹³⁷ Kaibab TESU, Coconino TESU 586 found in Strata 23

¹³⁸ Kaibab TESU, no TESU 587 on Coconino

¹³⁹ Kaibab TESU, no TESU 599 on Coconino

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
	120		mesic Rock Outcrop	+1	tr2/Stco4		
		274 ¹⁴¹	Typic Ustochrepts, calcareous, mesic Lithic Ustochrepts, calcareous,, mesic Typic HaplustalFs, mesic Rock Outcrop	LSC 4 0	Pied/Juos/ Artr/Stco	Unsat	7,688
		427 ¹⁴²	Typic Ustorthents, cindery, mesic	HSC 4 0	Pied/Jumo/ Fapa	Sat	-0-
		430 ¹⁴³	Typic HaplustalFs Lithic HaplustalFs Rock Outcrop	LSM 4 0	Juos	Inherently Unstable	-0-
		439 ¹⁴⁴	Typic HaplustalFs, fine, mont., mesic Typic HaplustalFs, c-sk, mont., mesic	HSC 4 0	Pied/Juos/ Jumo/Bogr	Impaired	-0-
		441 ¹⁴⁵	Vitrandid Ustochrepts, ashy-skeletal, mesic	HSC 4 0	Pied/Jude/ Jumo/Fapa	Sat	-0-
		449 ¹⁴⁶	Udic Ustochrepts, l-sk, mixed, mesic	HSC 4	Jumo	Inherently	-0-

¹⁴⁰ Kaibab TESU, no TESU 261 on Coconino

¹⁴¹ Kaibab TESU, no TESU 274 on Coconino

¹⁴² Coconino TESU, no TESU 427 on Kaibab

¹⁴³ Coconino TESU, no TESU 430 on Kaibab

¹⁴⁴ Coconino TESU, no TESU 439 on Kaibab

¹⁴⁵ Coconino TESU, no TESU 441 on Kaibab

¹⁴⁶ Coconino TESU, no TESU 449 on Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			Typic Ustochrepts, l-sk, mixed, mesic			Unstable	
		450 ¹⁴⁷	Typic Haplustalfs, l-sk, mixed, mesic	HSC 4	Jumo/Pipos	Sat	-0-
			Mollic Eutroboralfs, l-sk, mixed	LSC 5			
		455 ¹⁴⁸	Lithic Calciustolls, l-sk, carbonatic, mesic	HSC 4 0	Pied/Jumo/Come/Bogr	Inherently Unstable	-0-
			Calcic Ustochrepts, l-sk, mixed, mesic				
		470 ¹⁴⁹	Typic Argiustolls, c-sk, mont., mesic	LSM 4	Qutu/Cemo	Sat	-0-
			Rock Outcrop				
		471 ¹⁵⁰	Typic Ustochrepts, l-sk, mixed, mesic	LSM 4	Qutu/Arpu/Cemo	Unsuit.	-0-
			Typic Ustorthents, sandy-skeletal, mixed, mesic				
		476 ¹⁵¹	Typic Haplustalfs, mesic	HSC 4	Pied/Jumo	Unsat	1,271
			Lithic Haplustalfs, mesic				
		493 ¹⁵²	Lithic Haplustalfs, c-sk, mont., mesic	LSM 4 +1	Pifa/Jude/Qutu/Bogr	Sat	-0-

¹⁴⁷ Coconino TESU, no TESU 450 on Kaibab

¹⁴⁸ Coconino TESU, no TESU 455 on Kaibab

¹⁴⁹ Coconino TESU, no TESU 470 on Kaibab

¹⁵⁰ Coconino TESU, no TESU 471 on Kaibab

¹⁵¹ Kaibab TESU, no TESU 476 on Coconino

¹⁵² Coconino TESU, no TESU 493 on Kaibab

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			Typic Haplustalfs, fine, mont., mesic				
		496 ¹⁵³	Typic Haplustalfs, fine, mixed, mesic Lithic Haplustalfs, c-sk, mixed, mesic	HSC 40	Pied/Jumo	Unsat	15,484
		523 ¹⁵⁴	Lithic Argiustolls, mesic Typic Argiustolls, mesic Rock Outcrop	LSM 4+1	Pied/Jude/ Qutu/Arpu	Unsat	8,224
		541 ¹⁵⁵	Typic Ustorthents, mesic Lithic Ustorthents, mesic Rock Outcrop	LSM 4+1	Pied/Jude/ Qutu/Arpu	Unsuit.	-0-
		589 ¹⁵⁶	Typic Argiustolls, c-sk, mont., mesic Typic Argiustolls, fine, mont., mesic Rock Outcrop	HSC 40	Pied/Jumo	Unsat	15,453
48	15 to 80	302 ¹⁵⁷	Typic Dystrochrepts, l-sk, mixed, frigid	LSC 60	Abco/Psmeg/ Pipo/Quga	Sat	-0-
		312 ¹⁵⁸	Eutric Glossoboralfs Lithic Glossoboralfs Rock Outcrop	LSC 6	Psmeg Psmeg NA	Unsat	1,371
		322 ¹⁵⁹	Typic Dystrochrepts, frigid	LSC 6	Psmeg	Sat	-0-

¹⁵³ Kaibab TESU, no TESU 496 on Coconino

¹⁵⁴ Kaibab TESU, TESU 523 on Coconino found in Strata 39

¹⁵⁵ Kaibab TESU, no TESU 541 on Coconino

¹⁵⁶ Kaibab TESU, no TESU 589 on Coconino

¹⁵⁷ Kaibab TESU, no TESU 302 on Coconino

¹⁵⁸ Kaibab TESU, no TESU 312 on Coconino

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			Lithic Udorthents, frigid		Psmeg		
		614 ¹⁶⁰	Typic Dystrochrepts, l-sk, mixed, frigid	LSC 6 0	Abco/Psmeg/Pipo/Quga	Sat	-0-
		651 ¹⁶¹	Typic Paleboralfs, l-sk, mixed Typic Paleboralfs, fine, mixed	LSC 6 0	Abco/Psmeg/Pipo/Quga	Sat	-0-
		653 ¹⁶²	Eutric Glossoboralfs, fine, mixed	LSC 6 0	Abco/Psmeg/Pipo/Quga	Sat	-0-
		654 ¹⁶³	Eutric Glossoboralfs, l-sk, mixed	LSC 6 0	Abco/Psmeg/Pipo/Quga	Sat	-0-
49	40 to 120	540 ¹⁶⁴	Typic Eutrochrepts, frigid Udic Haploborolls	LSM 6 - 1	Psmeg/Pipo/Jude/Qutu	Unsat	2,668
		612 ¹⁶⁵	Typic Dystrochrepts, frigid	LSC 6	Psmeg	Sat	-0-
		613 ¹⁶⁶	Eutric Glossoboralfs, l-sk, mixed	LSC 6	Psmeg	Sat	-0-
		625 ¹⁶⁷	Eutric Glossoboralfs	LSC 6	Psmeg	Sat	-0-

¹⁵⁹ Kaibab TESU, no TESU 322 on Coconino

¹⁶⁰ Coconino TESU, no TESU 614 on Kaibab

¹⁶¹ Coconino TESU, no TESU 651 on Kaibab

¹⁶² Coconino TESU, no TESU 653 on Kaibab

¹⁶³ Coconino TESU, no TESU 654 on Kaibab

¹⁶⁴ Kaibab TESU, no TESU 540 on Coconino

¹⁶⁵ Coconino TESU, no TESU 612 on Kaibab

¹⁶⁶ Coconino TESU, no TESU 613 on Kaibab

¹⁶⁷ Kaibab TESU, no TESU 625 on Coconino

Stratum Number	Slope (%)	Final Strata Comb	Taxonomic Classification	Climate Class	PPC	Soil Condition	Acres of Unsatisfactory Soil Condition
			Rock Outcrop				
50	0 to 15	610 ¹⁶⁸	Udic Haploborolls, l-sk, mixed Pachic Udic Haploborolls, l-sk, mixed	LSC 6 - 1	Potr/Psmeg/ Pipo	Sat	-0-
		611 ¹⁶⁹	Udic Argiborolls, fine-loamy, mixed Udic Argiborolls, l-sk, mixed	LSC 6 - 1	Potr/Psmeg/ Pipo	Sat	-0-

¹⁶⁸ Coconino TESU, no TESU 610 on Kaibab

¹⁶⁹ Coconino TESU, no TESU 611 on Kaibab

Appendix C. Alternatives B, C, D, E 5th & 6th HUC Watersheds, Condition & Treatment Acres

Table 33. Alternative B, C, D, E 5th and 6th HUC Watersheds, Condition and Treatment Acres

5th Code Watershed Name	6th Code Watershed Name	6th Code Watershed Condition	Acres within Proposed Treatments-Alt B	Acres within Proposed Treatments-Alt C	Acres within Proposed Treatments-Alt D	Acres within Proposed Treatments-Alt E	Total 6th Code Acres	Percent of 6th Code Alt B	Percent of 6th Code Alt C	Percent of 6th Code Alt D	Percent of 6th Code Alt E
Ash Fork Draw-Jumbo Tank	Johnson Creek	Functioning at Risk	2,850	2,850	1,021	2,850	30,857	9.2%	9.2%	3.3%	9.2%
	Juan Tank Canyon	Functioning Properly	269	269	0	269	14,231	1.9%	1.9%	0.0%	1.9%
Beaver Creek	Bar M Canyon	Functioning Properly	15,506	16,573	1,545	15,506	17,551	88.3%	94.4%	8.8%	88.3%
	Double Cabin Park-Jacks Canyon	Functioning at Risk	1,720	1,756	100	1,720	21,660	7.9%	8.1%	0.5%	7.9%
	Jacks Canyon	Functioning at Risk	1	1	1	1	12,623	0.0%	0.0%	0.0%	0.0%
	Lower Woods Canyon	Functioning at Risk	9,594	9,750	4,663	9,594	26,131	36.7%	37.3%	17.8%	36.7%
	Rattlesnake Canyon	Functioning at Risk	2,997	3,072	640	2,997	17,023	17.6%	18.0%	3.8%	17.6%
	Upper Woods Canyon	Functioning at Risk	11,022	11,660	756	11,022	12,671	87.0%	92.0%	6.0%	87.0%
Bright Angel Creek-Colorado River	Hance Creek-Colorado River	Functioning at Risk*	36	36	36	36	22,311	0.2%	0.2%	0.2%	0.2%
Canyon Diablo	Anderson Canyon	Functioning at Risk	3,390	3,390	1,228	3,390	31,284	10.8%	10.8%	3.9%	10.8%
	Grapevine Canyon	Impaired Function	2,802	2,802	850	2,802	19,186	14.6%	14.6%	4.4%	14.6%
	Kinnikinick Canyon	Functioning at Risk	8,017	8,086	379	8,017	24,895	32.2%	32.5%	1.5%	32.2%
	Long Lake-Chavel Pass Ditch	Functioning at Risk	925	989	10	926	14,590	6.3%	6.8%	0.1%	6.3%
	Sawmill Wash	Functioning at Risk	6,170	6,350	268	6,170	12,385	49.8%	51.3%	2.2%	49.8%
	Yeager Draw	Functioning at Risk	100	100	0	100	24,465	0.4%	0.4%	0.0%	0.4%
Cataract Creek	Cataract Creek Headwaters	Functioning at Risk	2,872	2,872	1,155	2,872	16,699	17.2%	17.2%	6.9%	17.2%
	Dogtown Wash	Functioning at Risk	4,374	4,374	864	4,374	11,662	37.5%	37.5%	7.4%	37.5%

5th Code Watershed Name	6th Code Watershed Name	6th Code Watershed Condition	Acres within Proposed Treatments-Alt B	Acres within Proposed Treatments-Alt C	Acres within Proposed Treatments-Alt D	Acres within Proposed Treatments-Alt E	Total 6th Code Acres	Percent of 6th Code Alt B	Percent of 6th Code Alt C	Percent of 6th Code Alt D	Percent of 6th Code Alt E
	Smoot Lake	Functioning at Risk	1,676	1,676	377	1,676	21,535	7.8%	7.8%	1.8%	7.8%
	Upper Cataract Creek	Functioning at Risk	2,775	2,774	1,445	2,774	25,011	11.1%	11.1%	5.8%	11.1%
	Upper Red Lake Wash	Impaired Function	15,635	15,635	5,169	15,635	26,930	58.1%	58.1%	19.2%	58.1%
Deadman Wash	Bear Jaw Canyon	Functioning at Risk	3,715	3,715	1,099	3,715	11,135	33.4%	33.4%	9.9%	33.4%
	Lower Deadman Wash	Functioning at Risk	1,007	1,007	761	1,007	31,266	3.2%	3.2%	2.4%	3.2%
	Middle Deadman Wash	Functioning at Risk	4,884	4,884	4,144	4,884	22,888	21.3%	21.3%	18.1%	21.3%
	Upper Deadman Wash	Functioning at Risk	14,305	14,305	9,701	14,305	22,752	62.9%	62.9%	42.6%	62.9%
Grindstone Wash-Verde River	Government Canyon	Functioning at Risk	1,166	1,166	46	1,166	12,765	9.1%	9.1%	0.4%	9.1%
Heather Wash	Coconino Wash Headwaters	Functioning at Risk	27,198	27,198	6,530	27,198	51,193	53.1%	53.1%	12.8%	53.1%
	Rain Tank Wash	Functioning at Risk	4,639	4,639	1,430	4,639	38,483	12.1%	12.1%	3.7%	12.1%
Hell Canyon	Bear Canyon	Functioning at Risk	8,263	8,263	753	8,263	21,982	37.6%	37.6%	3.4%	37.6%
	Devil Dog Canyon	Functioning at Risk	798	798	245	798	11,196	7.1%	7.1%	2.2%	7.1%
	Grindstone Wash	Functioning at Risk	1,618	1,618	718	1,618	17,796	9.1%	9.1%	4.0%	9.1%
	MC Canyon	Impaired Function	2,584	2,584	1,000	2,584	21,686	11.9%	11.9%	4.6%	11.9%
	Meath Wash	Functioning Properly	453	453	346	453	37,538	1.2%	1.2%	0.9%	1.2%
	Rattlesnake Wash	Functioning at Risk	706	706	375	706	16,259	4.3%	4.3%	2.3%	4.3%
	Upper Hell Canyon	Impaired Function	4,675	4,675	1,004	4,675	29,249	16.0%	16.0%	3.4%	16.0%
Kana-a Wash-Little Colorado River	Cinder Basin	Functioning Properly	8,201	8,201	8,201	8,201	39,864	20.6%	20.6%	20.6%	20.6%
	Upper Kana-a Wash	Functioning Properly	10,520	10,520	10,304	10,520	38,801	27.1%	27.1%	26.6%	27.1%
Lee Canyon-Little Colorado	Upper Lee Canyon	Functioning at Risk	3,870	3,870	3,506	3,870	29,537	13.1%	13.1%	11.9%	13.1%

5th Code Watershed Name	6th Code Watershed Name	6th Code Watershed Condition	Acres within Proposed Treatments-Alt B	Acres within Proposed Treatments-Alt C	Acres within Proposed Treatments-Alt D	Acres within Proposed Treatments-Alt E	Total 6th Code Acres	Percent of 6th Code Alt B	Percent of 6th Code Alt C	Percent of 6th Code Alt D	Percent of 6th Code Alt E
River											
Miller Wash	Miller Wash Headwaters	Functioning at Risk	7,786	7,786	5,089	7,786	31,220	24.9%	24.9%	16.3%	24.9%
Oak Creek	Dry Creek	Impaired Function	0	0	0	0	34,398	0.0%	0.0%	0.0%	0.0%
	Fry Canyon	Functioning Properly	6,073	6,073	749	6,073	19,175	31.7%	31.7%	3.9%	31.7%
	Middle Oak Creek	Impaired Function	1,079	1,079	898	1,079	39,896	2.7%	2.7%	2.3%	2.7%
	Munds Canyon	Functioning Properly	31,418	32,085	2,137	31,418	41,179	76.3%	77.9%	5.2%	76.3%
	Pumphouse Wash	Functioning at Risk	14,185	14,585	965	14,185	31,546	45.0%	46.2%	3.1%	45.0%
	Secret Canyon	Functioning Properly	0	0	0	0	11,138	0.0%	0.0%	0.0%	0.0%
	Spring Creek	Functioning at Risk	0	0	0	0	30,830	0.0%	0.0%	0.0%	0.0%
	Upper Oak Creek	Functioning at Risk	9,634	9,634	865	9,634	17,900	53.8%	53.8%	4.8%	53.8%
	West Fork Oak Creek	Functioning Properly	9,451	9,458	276	9,451	27,339	34.6%	34.6%	1.0%	34.6%
Red Horse Wash	Curley Wallace Tank	Functioning at Risk	78	78	0	78	13,431	0.6%	0.6%	0.0%	0.6%
	Little Red Horse Wash	Functioning at Risk	835	835	418	835	27,465	3.0%	3.0%	1.5%	3.0%
	Red Horse Wash Headwaters	Functioning Properly	6,923	6,923	1,149	6,923	19,561	35.4%	35.4%	5.9%	35.4%
Rio de Flag	Doney Park	Impaired Function	13,871	13,879	12,943	13,871	42,133	32.9%	32.9%	30.7%	32.9%
	Lower Rio de Flag	Functioning Properly	6,195	6,195	4,206	6,195	35,308	17.5%	17.5%	11.9%	17.5%
	Sinclair Wash	Functioning Properly	160	160	64	160	6,766	2.4%	2.4%	0.9%	2.4%
	Upper Rio de Flag	Functioning at Risk	10,203	10,203	2,362	10,203	44,551	22.9%	22.9%	5.3%	22.9%
San Francisco Wash	Mormon Canyon	Functioning at Risk	1,061	1,061	417	1,061	19,252	5.5%	5.5%	2.2%	5.5%
	Upper Padre Canyon	Functioning at Risk	3,603	3,603	490	3,603	22,105	16.3%	16.3%	2.2%	16.3%
	Upper San Francisco Wash	Functioning at Risk	11,253	11,253	11,253	11,253	34,397	32.7%	32.7%	32.7%	32.7%

5th Code Watershed Name	6th Code Watershed Name	6th Code Watershed Condition	Acres within Proposed Treatments-Alt B	Acres within Proposed Treatments-Alt C	Acres within Proposed Treatments-Alt D	Acres within Proposed Treatments-Alt E	Total 6th Code Acres	Percent of 6th Code Alt B	Percent of 6th Code Alt C	Percent of 6th Code Alt D	Percent of 6th Code Alt E
Spring Valley Wash	Middle Spring Valley Wash	Functioning Properly	4,684	4,685	1,936	4,684	32,672	14.3%	14.3%	5.9%	14.3%
	Upper Spring Valley Wash	Impaired Function	23,223	23,245	4,592	23,223	38,305	60.6%	60.7%	12.0%	60.6%
Sycamore Creek	Big Spring Canyon	Impaired Function	15,275	14,304	1,591	14,304	31,697	48.2%	45.1%	5.0%	45.1%
	Cedar Creek	Functioning at Risk	999	999	136	999	8,888	11.2%	11.2%	1.5%	11.2%
	Garland Prairie	Impaired Function	16,166	16,568	8,496	16,166	25,054	64.5%	66.1%	33.9%	64.5%
	Government Prairie	Functioning at Risk	11,438	11,438	4,183	11,438	20,399	56.1%	56.1%	20.5%	56.1%
	Little LO Spring Canyon	Functioning Properly	7,392	7,565	1,477	7,392	12,260	60.3%	61.7%	12.0%	60.3%
	Lower Sycamore Creek	Functioning at Risk	145	145	13	145	30,677	0.5%	0.5%	0.0%	0.5%
	Middle Sycamore Creek	Functioning at Risk	7,661	6,928	770	6,839	18,335	41.8%	37.8%	4.2%	37.3%
	Pitman Valley-Scholz Lake	Impaired Function	16,572	16,572	4,835	16,572	28,459	58.2%	58.2%	17.0%	58.2%
	Sawmill Tank	Impaired Function	9,434	9,434	4,253	9,434	13,730	68.7%	68.7%	31.0%	68.7%
	Telephone Tank	Functioning Properly	4,873	4,873	536	4,873	14,934	32.6%	32.6%	3.6%	32.6%
	Tule Canyon	Impaired Function	19,199	19,180	3,924	19,180	29,866	64.3%	64.2%	13.1%	64.2%
	Upper Sycamore Creek	Impaired Function	6,835	6,835	586	6,835	14,916	45.8%	45.8%	3.9%	45.8%
	Volunteer Canyon	Functioning at Risk	5,978	6,060	887	5,978	24,506	24.4%	24.7%	3.6%	24.4%
	Volunteer Wash	Functioning at Risk	16,972	16,972	2,708	16,972	31,771	53.4%	53.4%	8.5%	53.4%
Upper Cedar Wash	Babbitt Lake	Impaired Function	15,377	15,377	5,901	15,377	28,413	54.1%	54.1%	20.8%	54.1%
	Dent and Sayer Tank	Functioning at Risk	10,873	10,964	5,754	10,873	37,216	29.2%	29.5%	15.5%	29.2%
	Klostermeyer Lake	Functioning at Risk	1,261	1,261	652	1,261	28,109	4.5%	4.5%	2.3%	4.5%
	Rabbit Canyon	Functioning at Risk	278	278	19	278	41,339	0.7%	0.7%	0.0%	0.7%
	Upper Cedar Wash (Local Drainage)	Functioning at Risk	9,383	9,383	4,076	9,383	23,476	40.0%	40.0%	17.4%	40.0%

5th Code Watershed Name	6th Code Watershed Name	6th Code Watershed Condition	Acres within Proposed Treatments-Alt B	Acres within Proposed Treatments-Alt C	Acres within Proposed Treatments-Alt D	Acres within Proposed Treatments-Alt E	Total 6th Code Acres	Percent of 6th Code Alt B	Percent of 6th Code Alt C	Percent of 6th Code Alt D	Percent of 6th Code Alt E
Walnut Creek	Cherry Canyon-Walnut Creek	Functioning at Risk	7,674	7,705	1,664	7,674	28,330	27.1%	27.2%	5.9%	27.1%
	Mormon Lake	Functioning Properly	12,933	13,288	922	12,934	25,968	49.8%	51.2%	3.6%	49.8%
	Porcupine Canyon-Walnut Creek	Functioning at Risk	0	0	0	0	16,622	0.0%	0.0%	0.0%	0.0%
	Walnut Creek-Lower Lake Mary	Functioning at Risk	7,920	8,088	1,244	7,920	18,920	41.9%	42.7%	6.6%	41.9%
	Walnut Creek-Upper Lake Mary	Impaired Function	25,645	25,547	2,331	25,146	34,473	74.4%	74.1%	6.8%	72.9%

Attachment 1. Soil Disturbance by Treatment Area, 6th HUC Watershed by Alternative for EIS and Cumulative Effects

The following tables summarize expected soil disturbance (acres and percent) by treatment area, 6th HUC watershed by action alternative based on the assumptions for ground disturbance acres disclosed above.

These acres do not display the actual treatment acres, only the expected acres of disturbance.

The second table by Alternative summarizes the expected ground disturbance from proposed activities and past present and reasonable foreseeable actions within the cumulative effects boundary.

Table 34. Alternative B Soil Disturbance Calculation by Treatment Area, 6th HUC Watershed and Cumulative Effects including Slide Fire

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL EIS	TOTAL EIS	TOTAL EIS
	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
6th CODE HUC NAME																				
Anderson Canyon	31,284	139	1,111	251	661	0	3,390	4	167	30	99	0	68	4	2	0.0	0	374	11.0%	1.2%
Babbitt Lake	28,413	140	5,604	1,880	1,631	122	15,377	4	841	226	245	18	308	54	73	0.1	0	1,768	11.5%	6.2%
Bar M Canyon	17,551	16	5,337	5,703	570	0	15,506	0	801	684	86	0	310	10	10	0.1	0	1,901	12.3%	10.8%
Bear Canyon	21,982	0	1,587	5,523	323	77	8,263	0	238	663	48	12	165	23	8	0.3	0	1,157	14.0%	5.3%
Bear Jaw Canyon	11,135	0	771	1,461	383	0	3,715	0	116	175	57	0	74	12	17	0.0	0	452	12.2%	4.1%
Big Spring Canyon	31,697	111	7,366	4,399	1,749	59	15,275	3	1,105	528	262	9	306	65	37	0.8	0	2,316	15.2%	7.3%
Cataract Creek Headwaters	16,699	516	929	39	233	1	2,872	15	139	5	35	0	57	6	11	0.1	0	269	9.4%	1.6%
Cedar Creek	8,888	144	416	180	123	0	999	4	62	22	18	0	20	2	0	0.0	0	129	12.9%	1.5%
Cherry Canyon-Walnut Creek	28,330	0	2,751	3,003	51	0	7,674	0	413	360	8	0	153	22	51	0.6	64	1,072	14.0%	3.8%
Cinder Basin	39,864	0	0	0	0	0	8,201	0	0	0	0	0	164	0	13	0.0	0	177	2.2%	0.4%
Coconino Wash Headwaters	51,193	0	2,006	18,661	0	0	27,234	0	301	2,239	0	0	545	24	14	3.4	6	3,132	11.5%	6.1%
Curley Wallace Tank	13,431	0	76	1	0	0	78	0	11	0	0	0	2	0	0	0.0	0	13	17.0%	0.1%
Dent and Sayer Tank	37,216	22	2,792	1,311	860	19	10,873	1	419	157	129	3	217	38	21	0.0	0	985	9.1%	2.6%
Devil Dog Canyon	11,196	39	466	0	48	0	798	1	70	0	7	0	16	5	0	0.1	0	100	12.5%	0.9%
Dogtown Wash	11,662	658	1,711	490	651	0	4,374	20	257	59	98	0	87	7	7	0.1	0	534	12.2%	4.6%
Doney Park	42,133	0	16	763	0	0	13,871	0	2	92	0	0	277	0	134	0.0	22	528	3.8%	1.3%

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL EIS	TOTAL EIS	TOTAL EIS
6th CODE HUC NAME	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
Double Cabin Park-Jacks Canyon	21,660	0	609	750	87	20	1,720	0	91	90	13	3	34	1	3	0.1	3	239	13.9%	1.1%
Dry Creek	34,398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Fry Canyon	19,175	59	3,789	552	811	2	6,073	2	568	66	122	0	121	5	11	0.1	26	922	15.2%	4.8%
Garland Prairie	25,054	487	2,510	2,773	1,892	8	16,166	15	377	333	284	1	323	9	25	0.8	0	1,367	8.5%	5.5%
Government Canyon	12,765	56	811	81	172	0	1,166	2	122	10	26	0	23	6	5	0.1	0	193	16.5%	1.5%
Government Prairie	20,399	217	4,194	1,224	1,574	48	11,438	6	629	147	236	7	229	9	23	0.0	0	1,286	11.2%	6.3%
Grapevine Canyon	19,186	41	1,337	171	403	0	2,802	1	201	21	60	0	56	3	1	0.0	0	343	12.2%	1.8%
Grindstone Wash	17,796	0	611	258	31	0	1,618	0	92	31	5	0	32	8	0	0.2	0	167	10.3%	0.9%
Johnson Creek	30,857	92	1,445	173	120	0	2,850	3	217	21	18	0	57	8	2	0.2	2	328	11.5%	1.1%
Juan Tank Canyon	14,231	0	269	0	0	0	269	0	40	0	0	0	5	4	0	0.0	0	49	18.3%	0.3%
Kinnikinick Canyon	24,895	10	4,317	1,118	1,514	0	8,017	0	648	134	227	0	160	9	9	0.2	0	1,188	14.8%	4.8%
Klostermeyer Lake	28,109	0	197	254	158	0	1,261	0	30	30	24	0	25	3	5	0.0	0	117	9.3%	0.4%
Little LO Spring Canyon	12,260	0	2,790	2,732	375	0	7,392	0	419	328	56	0	148	24	22	0.2	7	1,004	13.6%	8.2%
Little Red Horse Wash	27,465	0	7	410	0	0	835	0	1	49	0	0	17	0	0	0.0	0	67	8.0%	0.2%
Long Lake-Chavel Pass Ditch	14,590	0	208	238	19	0	925	0	31	29	3	0	18	0	0	0.0	0	81	8.8%	0.6%
Lower Deadman Wash	31,266	0	0	0	0	0	1,007	0	0	0	0	0	20	0	5	0.0	0	25	2.5%	0.1%
Lower Rio de Flag	35,308	0	956	856	176	0	6,195	0	143	103	26	0	124	4	56	0.3	0	457	7.4%	1.3%
Lower Sycamore Creek	30,677	16	34	66	15	0	145	0	5	8	2	0	3	2	0	0.0	0	20	14.1%	0.1%
Lower Woods Canyon	26,131	0	898	3,619	54	0	9,594	0	135	434	8	0	192	8	18	0.0	0	795	8.3%	3.0%
MC Canyon	21,686	0	908	456	218	3	2,584	0	136	55	33	0	52	3	7	0.3	0	287	11.1%	1.3%
Meath Wash	37,538	3	104	0	0	0	453	0	16	0	0	0	9	1	0	0.0	0	25	5.6%	0.1%
Middle Deadman Wash	22,888	0	404	320	17	0	4,884	0	61	38	3	0	98	11	51	0.0	0	261	5.3%	1.1%
Middle Oak Creek	39,896	0	49	132	0	0	1,079	0	7	16	0	0	22	0	2	0.0	0	47	4.3%	0.1%
Middle Spring Valley Wash	32,672	432	1,695	391	230	0	4,684	13	254	47	34	0	94	10	0	0.0	67	519	11.1%	1.6%
Middle Sycamore Creek	18,335	786	1,617	3,989	498	0	7,661	24	243	479	75	0	153	11	4	0.3	0	988	12.9%	5.4%

6th CODE HUC NAME	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL EIS	TOTAL EIS	TOTAL EIS
	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
Miller Wash Headwaters	31,220	14	410	2,107	134	32	7,786	0	62	253	20	5	156	21	0	0.0	0	517	6.6%	1.7%
Mormon Canyon	19,252	69	146	0	429	0	1,061	2	22	0	64	0	21	0	5	0.0	0	115	10.8%	0.6%
Mormon Lake	25,968	7	2,375	6,113	1,459	2	12,933	0	356	734	219	0	259	4	61	0.3	7	1,640	12.7%	6.3%
Munds Canyon	41,179	24	6,799	18,163	1,240	129	31,418	1	1,020	2,180	186	19	628	58	73	0.0	35	4,200	13.4%	10.2%
Pitman Valley-Scholz Lake	28,459	1,504	4,931	3,730	1,566	6	16,572	45	740	448	235	1	331	21	6	0.5	0	1,827	11.0%	6.4%
Porcupine Canyon-Walnut Creek	16,622	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Pumphouse Wash	31,546	1	4,168	6,472	717	0	14,185	0	625	777	108	0	284	12	93	0.3	58	1,957	13.8%	6.2%
Rabbit Canyon	41,339	199	60	0	0	0	278	6	9	0	0	0	6	3	0	0.0	0	24	8.5%	0.1%
Rain Tank Wash	38,483	0	887	2,322	0	0	4,639	0	133	279	0	0	93	0	22	0.6	0	527	11.4%	1.4%
Rattlesnake Canyon	17,023	0	320	836	99	0	2,997	0	48	100	15	0	60	0	0	0.0	0	223	7.4%	1.3%
Rattlesnake Wash	16,259	0	228	0	103	0	706	0	34	0	15	0	14	2	0	0.0	0	66	9.4%	0.4%
Red Horse Wash Headwaters	19,561	0	850	4,924	0	0	6,923	0	128	591	0	0	138	4	4	2.0	0	867	12.5%	4.4%
Sawmill Tank	13,730	219	3,384	822	747	8	9,434	7	508	99	112	1	189	18	3	0.1	0	936	9.9%	6.8%
Sawmill Wash	12,385	37	1,942	2,821	342	0	6,170	1	291	338	51	0	123	11	6	0.1	5	827	13.4%	6.7%
Secret Canyon	11,138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Sinclair Wash	6,766	0	96	0	0	0	160	0	14	0	0	0	3	0	5	0.0	0	23	14.2%	0.3%
Smoot Lake	21,535	204	916	35	143	0	1,676	6	137	4	22	0	34	8	0	0.0	0	210	12.5%	1.0%
Spring Creek	30,830	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Telephone Tank	14,934	13	1,239	2,609	466	10	4,873	0	186	313	70	2	97	4	32	0.0	0	705	14.5%	4.7%
Tule Canyon	29,866	1,147	5,209	6,698	2,171	49	19,199	34	781	804	326	7	384	68	24	1.3	15	2,444	12.7%	8.2%
Upper Cataract Creek	25,011	147	916	0	266	0	2,775	4	137	0	40	0	56	3	0	0.0	0	240	8.6%	1.0%
Upper Cedar Wash (Local Drainage)	23,476	12	2,440	888	1,938	28	9,383	0	366	107	291	4	188	28	47	0.0	0	1,031	11.0%	4.4%
Upper Deadman Wash	22,752	0	562	2,854	806	383	14,305	0	84	342	121	57	286	22	85	0.0	7	1,005	7.0%	4.4%
Upper Hell Canyon	29,249	67	1,374	1,977	241	11	4,675	2	206	237	36	2	93	11	10	0.4	0	597	12.8%	2.0%
Upper Kana-a Wash	38,801	0	0	0	0	0	10,520	0	0	0	0	0	210	0	11	0.0	0	221	2.1%	0.6%

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL EIS	TOTAL EIS	TOTAL EIS
	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
6th CODE HUC NAME																				
Upper Lee Canyon	29,537	0	82	282	0	0	3,870	0	12	34	0	0	77	0	3	0.0	0	127	3.3%	0.4%
Upper Oak Creek	17,900	0	1,049	7,337	101	0	9,634	0	157	880	15	0	193	10	34	0.0	0	1,289	13.4%	7.2%
Upper Padre Canyon	22,105	520	1,388	767	439	0	3,603	16	208	92	66	0	72	1	2	0.0	0	457	12.7%	2.1%
Upper Red Lake Wash	26,930	1,735	3,412	4,105	1,213	0	15,635	52	512	493	182	0	313	28	15	0.6	9	1,604	10.3%	6.0%
Upper Rio de Flag	44,551	0	2,229	4,884	457	20	10,203	0	334	586	69	3	204	6	90	0.1	6	1,298	12.7%	2.9%
Upper San Francisco Wash	34,397	0	0	0	0	0	11,253	0	0	0	0	0	225	0	32	0.0	0	257	2.3%	0.7%
Upper Spring Valley Wash	38,305	1,075	9,567	4,359	3,255	117	23,223	32	1,435	523	488	17	464	58	29	0.2	0	3,048	13.1%	8.0%
Upper Sycamore Creek	14,916	0	3,808	967	1,474	0	6,835	0	571	116	221	0	137	17	7	0.2	5	1,074	15.7%	7.2%
Upper Woods Canyon	12,671	0	2,687	3,998	803	3	11,022	0	403	480	120	1	220	3	13	0.2	0	1,240	11.3%	9.8%
Volunteer Canyon	24,506	0	3,304	939	493	1	5,978	0	496	113	74	0	120	18	1	0.0	16	837	14.0%	3.4%
Volunteer Wash	31,771	19	8,978	2,817	2,407	43	16,972	1	1,347	338	361	6	339	30	171	0.0	0	2,594	15.3%	8.2%
Walnut Creek-Lower Lake Mary	18,920	0	2,599	2,339	991	0	7,920	0	390	281	149	0	158	13	41	1.6	108	1,141	14.4%	6.0%
Walnut Creek-Upper Lake Mary	34,473	177	9,239	9,793	4,444	28	25,645	5	1,386	1,175	667	4	513	47	37	0.1	74	3,909	15.2%	11.3%
West Fork Oak Creek	27,339	13	3,094	4,476	813	0	9,451	0	464	537	122	0	189	15	33	0.2	20	1,381	14.6%	5.1%
Yeager Draw	24,465	0	59	41	0	0	100	0	9	5	0	0	2	0	0	0.0	0	16	15.9%	0.1%
TOTAL	2,032,080	11,185	153,446	174,704	45,405	1,227	583,329	336	23,017	20,964	6,811	184	11,667	954	1,645	17	561	66,155	11.3%	3.3%

Range of soil disturbance of any single given treatment type in any watershed = 0-9.4% or ranges from 0-18% for all treatment types by individual watershed. High intensity thinning is the highest disturbance type

Summary of Cumulative Effects by 6th Code Watersheds - Alternative B

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT	
		TOTAL EIS	TOTAL EIS	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
		Ground Disturb	6th code% Ground Disturb	(roads, private land, grazing) Ground Disturb	TREAT ACRES	Future/Fore Ground Disturb	TREAT ACRES	Ground Disturb	TOTAL CUM EFFECTS Ground Disturb	TOTAL CUM EFFECTS % Ground Disturb
Anderson Canyon	31,284	374	1.2%	93	229	34	2,608	391	893	2.9%
Babbitt Lake	28,413	1,768	6.2%	250	141	21	436	65	2,105	7.4%
Bar M Canyon	17,551	1,901	10.8%	164	125	19	3,026	454	2,538	14.5%
Bear Canyon	21,982	1,157	5.3%	165	488	73	85	13	1,408	6.4%
Bear Jaw Canyon	11,135	452	4.1%	70	36	5	247	37	564	5.1%
Big Spring Canyon	31,697	2,316	7.3%	395	8,757	1,314	2,746	412	4,436	14.0%
Cataract Creek Headwaters	16,699	269	1.6%	1,787	1,500	225	1,461	219	2,500	15.0%
Cedar Creek	8,888	129	1.5%	21	0	0	872	131	281	3.2%
Cherry Canyon-Walnut Creek	28,330	1,072	3.8%	437	10,903	1,635	9,359	1,404	4,548	16.1%
Cinder Basin	39,864	177	0.4%	124	256	38	0	0	339	0.9%
Coconino Wash Headwaters	51,193	3,132	6.1%	552	36	5	4,971	746	4,435	8.7%
Curley Wallace Tank	13,431	13	0.1%	78	0	0	5,541	831	923	6.9%
Dent and Sayer Tank	37,216	985	2.6%	247	16	2	8,386	1,258	2,492	6.7%
Devil Dog Canyon	11,196	100	0.9%	176	69	10	70	11	297	2.7%
Dogtown Wash	11,662	534	4.6%	380	5,861	879	865	130	1,923	16.5%
Doney Park	42,133	528	1.3%	3,584	1,377	207	948	142	4,461	10.6%
Double Cabin Park-Jacks Canyon	21,660	239	1.1%	299	9,958	1,494	2,871	431	2,463	11.4%
Dry Creek	34,398	0	0.0%	947	1,152	173	237	94	1,214	3.5%
Fry Canyon	19,175	922	4.8%	163	1,222	183	2,288	282	1,550	8.1%
Garland Prairie	25,054	1,367	5.5%	638	3,512	527	272	41	2,573	10.3%
Government Canyon	12,765	193	1.5%	68	0	0	142	21	283	2.2%
Government Prairie	20,399	1,286	6.3%	973	7,676	1,151	435	65	3,476	17.0%
Grapevine Canyon	19,186	343	1.8%	83	43	6	0	0	432	2.3%
Grindstone Wash	17,796	167	0.9%	169	0	0	1,235	185	522	2.9%
Johnson Creek	30,857	328	1.1%	537	789	118	1,455	218	1,202	3.9%
Juan Tank Canyon	14,231	49	0.3%	177	0	0	13	2	228	1.6%
Kinnikinick Canyon	24,895	1,188	4.8%	134	206	31	2,667	400	1,753	7.0%
Klostermeyer Lake	28,109	117	0.4%	127	0	0	0	0	244	0.9%
Little LO Spring Canyon	12,260	1,004	8.2%	71	408	61	0	0	1,136	9.3%
Little Red Horse Wash	27,465	67	0.2%	149	0	0	3,360	504	720	2.6%
Long Lake-Chavel Pass Ditch	14,590	81	0.6%	108	2,597	390	0	0	578	4.0%

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT	
		TOTAL EIS	TOTAL EIS	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL CUM	TOTAL CUM
		Ground Disturb	6th code% Ground Disturb	Ground Disturb	TREAT ACRES	Ground Disturb	TREAT ACRES	Ground Disturb	Ground Disturb	% Ground Disturb
Lower Deadman Wash	31,266	25	0.1%	148	200	30	0	0	204	0.7%
Lower Rio de Flag	35,308	457	1.3%	6,189	3,274	491	2,649	397	7,535	21.3%
Lower Sycamore Creek	30,677	20	0.1%	45	177	27	38	6	98	0.3%
Lower Woods Canyon	26,131	795	3.0%	143	0	0	272	41	978	3.7%
MC Canyon	21,686	287	1.3%	156	6,319	948	193	29	1,420	6.5%
Meath Wash	37,538	25	0.1%	265	157	24	127	19	333	0.9%
Middle Deadman Wash	22,888	261	1.1%	406	159	24	0	0	690	3.0%
Middle Oak Creek	39,896	47	0.1%	4,276	0	0	4	1	4,323	10.8%
Middle Spring Valley Wash	32,672	519	1.6%	119	7	1	0	0	639	2.0%
Middle Sycamore Creek	18,335	988	5.4%	104	998	150	0	0	1,242	6.8%
Miller Wash Headwaters	31,220	517	1.7%	252	23	3	5,936	890	1,663	5.3%
Mormon Canyon	19,252	115	0.6%	134	193	29	488	73	351	1.8%
Mormon Lake	25,968	1,640	6.3%	706	2,537	380	7,296	1,094	3,821	14.7%
Munds Canyon	41,179	4,200	10.2%	1,481	435	65	2,267	340	6,086	14.8%
Pitman Valley-Scholz Lake	28,459	1,827	6.4%	710	760	114	1,792	269	2,920	10.3%
Porcupine Canyon-Walnut Creek	16,622	0	0.0%	667	530	80	33	5	751	4.5%
Pumphouse Wash	31,546	1,957	6.2%	1,746	1,427	214	11,423	1,828	5,745	18.2%
Rabbit Canyon	41,339	24	0.1%	74	0	0	251	38	136	0.3%
Rain Tank Wash	38,483	527	1.4%	209	0	0	2,144	322	1,057	2.7%
Rattlesnake Canyon	17,023	223	1.3%	143	1,173	176	1,584	238	780	4.6%
Rattlesnake Wash	16,259	66	0.4%	87	0	0	313	47	200	1.2%
Red Horse Wash Headwaters	19,561	867	4.4%	141	9	1	897	135	1,144	5.8%
Sawmill Tank	13,730	936	6.8%	384	103	15	78	12	1,347	9.8%
Sawmill Wash	12,385	827	6.7%	90	190	29	0	0	946	7.6%
Secret Canyon	11,138	0	0.0%	53	3,684	553	0	0	605	5.4%
Sinclair Wash	6,766	23	0.3%	1,699	0	0	103	15	1,737	25.7%
Smoot Lake	21,535	210	1.0%	119	11	2	0	0	331	1.5%
Spring Creek	30,830	0	0.0%	258	1,361	204	0	0	463	1.5%
Telephone Tank	14,934	705	4.7%	497	6,074	911	1,813	272	2,385	16.0%
Tule Canyon	29,866	2,444	8.2%	293	7	1	7,064	1,060	3,798	12.7%
Upper Cataract Creek	25,011	240	1.0%	181	7	1	116	17	439	1.8%
Upper Cedar Wash (Local Drainage)	23,476	1,031	4.4%	229	7	1	0	0	1,260	5.4%
Upper Deadman Wash	22,752	1,005	4.4%	260	3,832	575	842	126	1,965	8.6%

		EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT	
6th CODE HUC NAME	6th code acres	TOTAL EIS	TOTAL EIS 6th code%	TOTAL BASELINE (roads, private land, grazing)	TOTAL	TOTAL Future/Fore	TOTAL	TOTAL Current	TOTAL CUM EFFECTS	TOTAL CUM EFFECTS
		Ground Disturb	Ground Disturb	Ground Disturb	TREAT ACRES	Ground Disturb	TREAT ACRES	Ground Disturb	Ground Disturb	% Ground Disturb
Upper Hell Canyon	29,249	597	2.0%	312	9,592	1,439	1,700	255	2,603	8.9%
Upper Kana-a Wash	38,801	221	0.6%	155	318	48	991	149	573	1.5%
Upper Lee Canyon	29,537	127	0.4%	159	1,156	173	1,765	265	724	2.5%
Upper Oak Creek	17,900	1,289	7.2%	284	1	0	4,362	2,105	3,679	20.6%
Upper Padre Canyon	22,105	457	2.1%	246	284	43	4,131	620	1,365	6.2%
Upper Red Lake Wash	26,930	1,604	6.0%	420	14	2	1	0	2,027	7.5%
Upper Rio de Flag	44,551	1,298	2.9%	3,990	12,354	1,853	4,152	623	7,764	17.4%
Upper San Francisco Wash	34,397	257	0.7%	942	1,355	203	687	103	1,506	4.4%
Upper Spring Valley Wash	38,305	3,048	8.0%	670	1,309	196	7,979	1,197	5,111	13.3%
Upper Sycamore Creek	14,916	1,074	7.2%	362	777	117	0	0	1,552	10.4%
Upper Woods Canyon	12,671	1,240	9.8%	151	382	57	1,575	236	1,685	13.3%
Volunteer Canyon	24,506	837	3.4%	173	10,623	1,593	3,323	499	3,102	12.7%
Volunteer Wash	31,771	2,594	8.2%	894	8,457	1,269	686	103	4,859	15.3%
Walnut Creek-Lower Lake Mary	18,920	1,141	6.0%	224	6,172	926	2,200	330	2,621	13.9%
Walnut Creek-Upper Lake Mary	34,473	3,909	11.3%	264	3,725	559	416	62	4,794	13.9%
West Fork Oak Creek	27,339	1,381	5.1%	258	10,070	1,510	16,432	5,074	8,223	30.1%
Yeager Draw	24,465	16	0.1%	102	173	26	0	0	144	0.6%
TOTAL	2,032,080	66,155	3.3%	45,041	157,772	23,666	154,720	27,380	162,241	8.0%

Table 35. Alternative C Soil Disturbance Calculation by Treatment Area, 6th HUC Watershed and Cumulative Effects

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS	TOTAL EIS
6th CODE HUC NAME	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
Anderson Canyon	31,284	1,270	1,111	251	661	0	3,390	140	167	30	99	0	68	4	2	0.0	0	510	15.0%	1.6%
Babbitt Lake	28,413	2,710	5,237	2,247	1,631	122	15,377	313	786	270	245	18	308	50	70	0.1	0	2,059	13.4%	7.2%
Bar M Canyon	17,551	796	5,337	5,713	570	0	16,573	94	801	686	86	0	331	10	9	0.1	0	2,017	12.2%	11.5%
Bear Canyon	21,982	105	1,587	5,523	323	77	8,263	13	238	663	48	12	165	23	8	0.3	0	1,170	14.2%	5.3%
Bear Jaw Canyon	11,135	0	771	1,461	383	0	3,715	0	116	175	57	0	74	12	14	0.0	0	449	12.1%	4.0%
Big Spring Canyon	31,697	830	7,124	3,766	1,710	59	14,304	90	1,069	452	256	9	286	65	38	0.8	0	2,265	15.8%	7.1%
Cataract Creek Headwaters	16,699	803	929	39	233	1	2,872	50	139	5	35	0	57	6	10	0.1	0	302	10.5%	1.8%
Cedar Creek	8,888	172	416	180	123	0	999	8	62	22	18	0	20	2	0	0.0	0	133	13.3%	1.5%
Cherry Canyon-Walnut Creek	28,330	351	2,751	3,003	51	0	7,705	42	413	360	8	0	154	22	50	0.6	64	1,114	14.5%	3.9%
Cinder Basin	39,864	426	0	0	0	0	8,201	51	0	0	0	0	164	0	12	0.0	0	227	2.8%	0.6%
Coconino Wash Headwaters	51,193	81	2,006	18,661	0	0	27,234	10	301	2,239	0	0	545	24	14	3.4	6	3,142	11.5%	6.1%
Curley Wallace Tank	13,431	0	76	1	0	0	78	0	11	0	0	0	2	0	0	0.0	0	13	17.0%	0.1%
Dent and Sayer Tank	37,216	559	2,326	1,777	860	19	10,964	65	349	213	129	3	219	38	21	0.0	0	1,037	9.5%	2.8%
Devil Dog Canyon	11,196	80	466	0	48	0	798	6	70	0	7	0	16	1	0	0.1	0	101	12.6%	0.9%
Dogtown Wash	11,662	762	1,711	490	651	0	4,374	32	257	59	98	0	87	7	7	0.1	0	547	12.5%	4.7%
Doney Park	42,133	1,220	16	763	0	0	13,879	146	2	92	0	0	278	0	127	0.0	22	667	4.8%	1.6%
Double Cabin Park-Jacks Canyon	21,660	33	609	750	87	20	1,756	4	91	90	13	3	35	1	3	0.1	3	244	13.9%	1.1%
Dry Creek	34,398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Fry Canyon	19,175	702	2,946	1,394	811	2	6,073	79	442	167	122	0	121	5	11	0.1	26	974	16.0%	5.1%
Garland Prairie	25,054	8,953	2,585	2,773	1,892	8	16,568	1,027	388	333	284	1	331	9	25	0.8	0	2,399	14.5%	9.6%
Government Canyon	12,765	56	811	81	172	0	1,166	2	122	10	26	0	23	6	4	0.1	0	193	16.5%	1.5%
Government Prairie	20,399	4,043	3,881	1,537	1,574	48	11,438	466	582	184	236	7	229	9	23	0.0	0	1,737	15.2%	8.5%
Grapevine Canyon	19,186	113	1,337	171	403	0	2,802	10	201	21	60	0	56	3	1	0.0	0	352	12.6%	1.8%
Grindstone Wash	17,796	0	611	258	31	0	1,618	0	92	31	5	0	32	7	0	0.2	0	167	10.3%	0.9%
Johnson Creek	30,857	134	1,445	173	120	0	2,850	8	217	21	18	0	57	7	2	0.2	2	332	11.7%	1.1%

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS	TOTAL EIS
6th CODE HUC NAME	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
Juan Tank Canyon	14,231	0	269	0	0	0	269	0	40	0	0	0	5	3	0	0.0	0	49	18.1%	0.3%
Kinnikinick Canyon	24,895	389	4,317	1,118	1,514	0	8,086	46	647	134	227	0	162	9	9	0.2	0	1,235	15.3%	5.0%
Klostermeyer Lake	28,109	7	197	254	158	0	1,261	1	30	30	24	0	25	3	5	0.0	0	118	9.4%	0.4%
Little LO Spring Canyon	12,260	102	2,574	2,948	375	0	7,565	12	386	354	56	0	151	24	22	0.2	7	1,013	13.4%	8.3%
Little Red Horse Wash	27,465	0	7	410	0	0	835	0	1	49	0	0	17	0	0	0.0	0	67	8.0%	0.2%
Long Lake-Chavel Pass Ditch	14,590	0	208	238	19	0	989	0	31	29	3	0	20	0	0	0.0	0	82	8.3%	0.6%
Lower Deadman Wash	31,266	0	0	0	0	0	1,007	0	0	0	0	0	20	0	5	0.0	0	25	2.5%	0.1%
Lower Rio de Flag	35,308	329	956	856	176	0	6,195	39	143	103	26	0	124	4	48	0.3	0	488	7.9%	1.4%
Lower Sycamore Creek	30,677	16	34	66	15	0	145	0	5	8	2	0	3	2	0	0.0	0	20	14.1%	0.1%
Lower Woods Canyon	26,131	99	898	3,619	54	0	9,750	12	135	434	8	0	195	8	15	0.0	0	807	8.3%	3.1%
MC Canyon	21,686	38	908	456	218	3	2,584	5	136	55	33	0	52	3	7	0.3	0	291	11.3%	1.3%
Meath Wash	37,538	190	104	0	0	0	453	22	16	0	0	0	9	1	0	0.0	0	47	10.4%	0.1%
Middle Deadman Wash	22,888	157	404	320	17	0	4,884	19	61	38	3	0	98	11	39	0.0	0	268	5.5%	1.2%
Middle Oak Creek	39,896	0	49	132	0	0	1,079	0	7	16	0	0	22	0	2	0.0	0	47	4.3%	0.1%
Middle Spring Valley Wash	32,672	517	1,695	391	230	0	4,685	23	254	47	34	0	94	10	0	0.0	64	526	11.2%	1.6%
Middle Sycamore Creek	18,335	841	1,428	3,464	498	0	6,928	30	214	416	75	0	139	11	4	0.3	0	889	12.8%	4.8%
Miller Wash Headwaters	31,220	649	410	2,107	134	32	7,786	77	62	253	20	5	156	21	0	0.0	0	593	7.6%	1.9%
Mormon Canyon	19,252	200	146	0	429	0	1,061	18	22	0	64	0	21	0	4	0.0	0	130	12.2%	0.7%
Mormon Lake	25,968	488	2,375	6,113	1,459	2	13,288	58	356	734	219	0	266	2	59	0.3	7	1,701	12.8%	6.6%
Munds Canyon	41,179	870	6,799	18,181	1,240	129	32,085	102	1,020	2,182	186	19	642	58	65	0.0	35	4,309	13.4%	10.5%
Pitman Valley-Scholz Lake	28,459	5,200	5,843	2,819	1,566	6	16,572	489	876	338	235	1	331	21	6	0.5	0	2,298	13.9%	8.1%
Porcupine Canyon-Walnut Creek	16,622	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Pumphouse Wash	31,546	200	4,168	6,472	717	0	14,585	24	625	777	108	0	292	12	80	0.3	58	1,976	13.5%	6.3%
Rabbit Canyon	41,339	199	60	0	0	0	278	6	9	0	0	0	6	1	0	0.0	0	22	7.7%	0.1%
Rain Tank Wash	38,483	0	887	2,322	0	0	4,639	0	133	279	0	0	93	0	22	0.6	0	527	11.4%	1.4%
Rattlesnake Canyon	17,023	14	320	836	99	0	3,072	2	48	100	15	0	61	0	0	0.0	0	227	7.4%	1.3%
Rattlesnake Wash	16,259	0	228	0	103	0	706	0	34	0	15	0	14	2	0	0.0	0	66	9.4%	0.4%
Red Horse Wash Headwaters	19,561	4	850	4,924	0	0	6,923	1	128	591	0	0	138	4	4	2.0	0	868	12.5%	4.4%

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS	TOTAL EIS
6th CODE HUC NAME	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
Sawmill Tank	13,730	4,364	3,384	822	747	8	9,434	504	508	99	112	1	189	18	3	0.1	0	1,433	15.2%	10.4%
Sawmill Wash	12,385	104	1,942	2,821	342	0	6,350	9	291	339	51	0	127	11	6	0.1	5	839	13.2%	6.8%
Secret Canyon	11,138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Sinclair Wash	6,766	64	96	0	0	0	160	8	14	0	0	0	3	0	5	0.0	0	31	19.2%	0.5%
Smoot Lake	21,535	204	916	35	143	0	1,676	6	137	4	22	0	34	8	0	0.0	0	210	12.5%	1.0%
Spring Creek	30,830	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Telephone Tank	14,934	329	1,239	2,609	466	10	4,873	38	186	313	70	2	97	4	31	0.0	0	741	15.2%	5.0%
Tule Canyon	29,866	1,746	5,190	6,698	2,171	49	19,180	106	778	804	326	7	384	68	24	1.3	15	2,513	13.1%	8.4%
Upper Cataract Creek	25,011	230	916	0	266	0	2,774	14	137	0	40	0	55	3	0	0.0	0	249	9.0%	1.0%
Upper Cedar Wash (Local Drainage)	23,476	1,886	2,440	888	1,938	28	9,383	225	366	107	291	4	188	25	45	0.0	0	1,250	13.3%	5.3%
Upper Deadman Wash	22,752	1,061	562	2,854	806	383	14,305	127	84	342	121	57	286	22	85	0.0	7	1,132	7.9%	5.0%
Upper Hell Canyon	29,249	97	1,374	1,977	241	11	4,675	6	206	237	36	2	93	11	9	0.4	0	601	12.9%	2.1%
Upper Kana-a Wash	38,801	534	0	0	0	0	10,520	64	0	0	0	0	210	0	11	0.0	0	285	2.7%	0.7%
Upper Lee Canyon	29,537	7	82	282	0	0	3,870	1	12	34	0	0	77	0	2	0.0	0	127	3.3%	0.4%
Upper Oak Creek	17,900	171	1,049	7,337	101	0	9,634	20	157	880	15	0	193	10	33	0.0	0	1,308	13.6%	7.3%
Upper Padre Canyon	22,105	796	1,388	767	439	0	3,603	49	208	92	66	0	72	1	2	0.0	0	490	13.6%	2.2%
Upper Red Lake Wash	26,930	2,978	3,412	4,105	1,213	0	15,635	201	512	493	182	0	313	28	15	0.6	9	1,753	11.2%	6.5%
Upper Rio de Flag	44,551	337	2,229	4,884	457	20	10,203	40	334	586	69	3	204	3	64	0.1	6	1,309	12.8%	2.9%
Upper San Francisco Wash	34,397	959	0	0	0	0	11,253	115	0	0	0	0	225	0	32	0.0	0	372	3.3%	1.1%
Upper Spring Valley Wash	38,305	3,133	8,857	5,069	3,255	117	23,245	279	1,329	608	488	17	465	58	28	0.2	0	3,273	14.1%	8.5%
Upper Sycamore Creek	14,916	410	3,431	1,344	1,474	0	6,835	49	515	161	221	0	137	17	7	0.2	5	1,111	16.3%	7.4%
Upper Woods Canyon	12,671	186	2,687	3,998	803	3	11,660	22	403	480	120	1	233	3	13	0.2	0	1,275	10.9%	10.1%
Volunteer Canyon	24,506	160	3,102	1,141	493	1	6,060	19	465	137	74	0	121	18	1	0.0	16	852	14.1%	3.5%
Volunteer Wash	31,771	1,501	7,907	3,888	2,407	43	16,972	178	1,186	467	361	6	339	30	171	0.0	0	2,739	16.1%	8.6%
Walnut Creek-Lower Lake Mary	18,920	1,244	2,599	2,339	991	0	8,088	149	390	281	149	0	162	13	39	1.6	108	1,291	16.0%	6.8%
Walnut Creek-Upper Lake Mary	34,473	2,054	9,169	8,941	4,145	28	25,547	231	1,375	1,073	622	4	511	47	36	0.1	74	3,974	15.6%	11.5%
West Fork Oak Creek	27,339	124	3,094	4,204	813	0	9,458	14	464	505	122	0	189	14	33	0.2	20	1,361	14.4%	5.0%
Yeager Draw	24,465	0	59	41	0	0	100	0	9	5	0	0	2	0	0	0.0	0	16	15.9%	0.1%

6th CODE HUC NAME	current EIS acres							current EIS-expected ground disturbance											
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS
	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb
TOTAL	2,032,080	59,390	149,351	176,103	45,065	1,228	586,199	6,117	22,403	21,132	6,760	184	11,724	931	1,545	17	558	71,371	12.2%
																		% Ground Disturb	TOTAL EIS

Range of soil disturbance of any given treatment type in a treatment area = 0-8.2% or ranges from 0-19% for all combined treatment types by individual watershed. High intensity thinning is the highest disturbance type

Summary of Cumulative Effects by 6th Code Watersheds Alternative C

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
		TOTAL	TOTAL EIS %	TOTAL BASELINE (roads, private land, grazing)	TOTAL	TOTAL Future/Fore	TOTAL	TOTAL Current	TOTAL CUM EFFECTS	TOTAL CUM EFFECTS
		Ground Disturb	Ground Disturb	Ground Disturb	TREAT ACRES	Ground Disturb	TREAT ACRES	Ground Disturb	Ground Disturb	% Ground Disturb
Anderson Canyon	31,284	510	1.6%	93	229	34	2,608	391	1,029	3.3%
Babbitt Lake	28,413	2,059	7.2%	250	141	21	436	65	2,396	8.4%
Bar M Canyon	17,551	2,017	11.5%	164	125	19	3,026	454	2,653	15.1%
Bear Canyon	21,982	1,170	5.3%	165	488	73	85	13	1,421	6.5%
Bear Jaw Canyon	11,135	449	4.0%	70	36	5	247	37	562	5.0%
Big Spring Canyon	31,697	2,265	7.1%	395	8,757	1,314	2,746	412	4,386	13.8%
Cataract Creek Headwaters	16,699	302	1.8%	1,787	1,500	225	1,461	219	2,533	15.2%
Cedar Creek	8,888	133	1.5%	21	0	0	872	131	285	3.2%
Cherry Canyon-Walnut Creek	28,330	1,114	3.9%	437	10,903	1,635	9,359	1,404	4,590	16.2%
Cinder Basin	39,864	227	0.6%	124	256	38	0	0	390	1.0%
Coconino Wash Headwaters	51,193	3,142	6.1%	552	36	5	4,971	746	4,445	8.7%
Curley Wallace Tank	13,431	13	0.1%	78	0	0	5,541	831	923	6.9%
Dent and Sayer Tank	37,216	1,037	2.8%	247	16	2	8,386	1,258	2,545	6.8%
Devil Dog Canyon	11,196	101	0.9%	176	69	10	70	11	298	2.7%
Dogtown Wash	11,662	547	4.7%	380	5,861	879	865	130	1,936	16.6%
Doney Park	42,133	667	1.6%	3,584	1,377	207	948	142	4,600	10.9%
Double Cabin Park-Jacks Canyon	21,660	244	1.1%	299	9,958	1,494	2,871	431	2,468	11.4%
Dry Creek	34,398	0	0.0%	947	1,152	173	237	94	1,214	3.5%
Fry Canyon	19,175	974	5.1%	163	1,222	183	2,288	282	1,602	8.4%
Garland Prairie	25,054	2,399	9.6%	638	3,512	527	272	41	3,605	14.4%
Government Canyon	12,765	193	1.5%	68	0	0	142	21	282	2.2%
Government Prairie	20,399	1,737	8.5%	973	7,676	1,151	435	65	3,926	19.2%
Grapevine Canyon	19,186	352	1.8%	83	43	6	0	0	441	2.3%
Grindstone Wash	17,796	167	0.9%	169	0	0	1,235	185	521	2.9%
Johnson Creek	30,857	332	1.1%	537	789	118	1,455	218	1,206	3.9%
Juan Tank Canyon	14,231	49	0.3%	177	0	0	13	2	227	1.6%
Kinnikinick Canyon	24,895	1,235	5.0%	134	206	31	2,667	400	1,800	7.2%
Klostermeyer Lake	28,109	118	0.4%	127	0	0	0	0	245	0.9%
Little LO Spring Canyon	12,260	1,013	8.3%	71	408	61	0	0	1,145	9.3%
Little Red Horse Wash	27,465	67	0.2%	149	0	0	3,360	504	720	2.6%
Long Lake-Chavel Pass Ditch	14,590	82	0.6%	108	2,597	390	0	0	580	4.0%
Lower Deadman Wash	31,266	25	0.1%	148	200	30	0	0	204	0.7%

		EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
	6th code	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
6th CODE HUC NAME	acres	Ground Disturb	EIS % Ground Disturb	(roads, private land, grazing) Ground Disturb	TREAT ACRES	Ground Disturb	TREAT ACRES	Ground Disturb	Ground Disturb	% Ground Disturb
Lower Rio de Flag	35,308	488	1.4%	6,189	3,274	491	2,649	397	7,566	21.4%
Lower Sycamore Creek	30,677	20	0.1%	45	177	27	38	6	98	0.3%
Lower Woods Canyon	26,131	807	3.1%	143	0	0	272	41	991	3.8%
MC Canyon	21,686	291	1.3%	156	6,319	948	193	29	1,425	6.6%
Meath Wash	37,538	47	0.1%	265	157	24	127	19	355	0.9%
Middle Deadman Wash	22,888	268	1.2%	406	159	24	0	0	697	3.0%
Middle Oak Creek	39,896	47	0.1%	4,276	0	0	4	1	4,323	10.8%
Middle Spring Valley Wash	32,672	526	1.6%	119	7	1	0	0	646	2.0%
Middle Sycamore Creek	18,335	889	4.8%	104	998	150	0	0	1,142	6.2%
Miller Wash Headwaters	31,220	593	1.9%	252	23	3	5,936	890	1,739	5.6%
Mormon Canyon	19,252	130	0.7%	134	193	29	488	73	365	1.9%
Mormon Lake	25,968	1,701	6.6%	706	2,537	380	7,296	1,094	3,882	14.9%
Munds Canyon	41,179	4,309	10.5%	1,481	435	65	2,267	340	6,195	15.0%
Pitman Valley-Scholz Lake	28,459	2,298	8.1%	710	760	114	1,792	269	3,392	11.9%
Porcupine Canyon-Walnut Creek	16,622	0	0.0%	667	530	80	33	5	751	4.5%
Pumphouse Wash	31,546	1,976	6.3%	1,746	1,427	214	11,423	1,828	5,764	18.3%
Rabbit Canyon	41,339	22	0.1%	74	0	0	251	38	134	0.3%
Rain Tank Wash	38,483	527	1.4%	209	0	0	2,144	322	1,057	2.7%
Rattlesnake Canyon	17,023	227	1.3%	143	1,173	176	1,584	238	783	4.6%
Rattlesnake Wash	16,259	66	0.4%	87	0	0	313	47	200	1.2%
Red Horse Wash Headwaters	19,561	868	4.4%	141	9	1	897	135	1,145	5.9%
Sawmill Tank	13,730	1,433	10.4%	384	103	15	78	12	1,845	13.4%
Sawmill Wash	12,385	839	6.8%	90	190	29	0	0	957	7.7%
Secret Canyon	11,138	0	0.0%	53	3,684	553	0	0	605	5.4%
Sinclair Wash	6,766	31	0.5%	1,699	0	0	103	15	1,745	25.8%
Smoot Lake	21,535	210	1.0%	119	11	2	0	0	331	1.5%
Spring Creek	30,830	0	0.0%	258	1,361	204	0	0	463	1.5%
Telephone Tank	14,934	741	5.0%	497	6,074	911	1,813	272	2,421	16.2%
Tule Canyon	29,866	2,513	8.4%	293	7	1	7,064	1,060	3,866	12.9%
Upper Cataract Creek	25,011	249	1.0%	181	7	1	116	17	449	1.8%
Upper Cedar Wash (Local Drainage)	23,476	1,250	5.3%	229	7	1	0	0	1,480	6.3%
Upper Deadman Wash	22,752	1,132	5.0%	260	3,832	575	842	126	2,092	9.2%
Upper Hell Canyon	29,249	601	2.1%	312	9,592	1,439	1,700	255	2,607	8.9%
Upper Kana-a Wash	38,801	285	0.7%	155	318	48	991	149	637	1.6%

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
		TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
		Ground Disturb	EIS % Ground Disturb	(roads, private land, grazing) Ground Disturb	TREAT ACRES	Ground Disturb	TREAT ACRES	Ground Disturb	Ground Disturb	% Ground Disturb
Upper Lee Canyon	29,537	127	0.4%	159	1,156	173	1,765	265	724	2.5%
Upper Oak Creek	17,900	1,308	7.3%	284	1	0	4,362	2,105	3,698	20.7%
Upper Padre Canyon	22,105	490	2.2%	246	284	43	4,131	620	1,398	6.3%
Upper Red Lake Wash	26,930	1,753	6.5%	420	14	2	1	0	2,175	8.1%
Upper Rio de Flag	44,551	1,309	2.9%	3,990	12,354	1,853	4,152	623	7,775	17.5%
Upper San Francisco Wash	34,397	372	1.1%	942	1,355	203	687	103	1,621	4.7%
Upper Spring Valley Wash	38,305	3,273	8.5%	670	1,309	196	7,979	1,197	5,336	13.9%
Upper Sycamore Creek	14,916	1,111	7.4%	362	777	117	0	0	1,589	10.7%
Upper Woods Canyon	12,671	1,275	10.1%	151	382	57	1,575	236	1,720	13.6%
Volunteer Canyon	24,506	852	3.5%	173	10,623	1,593	3,323	499	3,117	12.7%
Volunteer Wash	31,771	2,739	8.6%	894	8,457	1,269	686	103	5,005	15.8%
Walnut Creek-Lower Lake Mary	18,920	1,291	6.8%	224	6,172	926	2,200	330	2,772	14.6%
Walnut Creek-Upper Lake Mary	34,473	3,974	11.5%	264	3,725	559	416	62	4,859	14.1%
West Fork Oak Creek	27,339	1,361	5.0%	258	10,070	1,510	16,432	5,074	8,203	30.0%
Yeager Draw	24,465	16	0.1%	102	173	26	0	0	144	0.6%
TOTAL	2,032,080	71,371	4%	45,041	157,772	23,666	154,720	27,380	167,458	8.2%

Table 36. Alternative D. Soil Disturbance Calculation by Treatment Area, 6th HUC Watershed and Cumulative Effects

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS	TOTAL EIS

	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
6th CODE HUC NAME																					
Anderson Canyon	31,284	139	1,111	251	661	0	1,228	4	167	30	99	0	25	4	2	0.0	0	331	9.8%	1.1%	
Babbitt Lake	28,413	140	5,604	1,880	1,631	122	5,901	4	841	226	245	18	118	54	73	0.1	0	1,579	10.3%	5.6%	
Bar M Canyon	17,551	16	5,337	5,703	570	0	1,545	0	801	684	86	0	31	10	10	0.1	0	1,622	12.3%	9.2%	
Bear Canyon	21,982	0	1,587	5,523	323	77	753	0	238	663	48	12	15	23	8	0.3	0	1,007	12.2%	4.6%	
Bear Jaw Canyon	11,135	0	771	1,461	383	0	1,099	0	116	175	57	0	22	12	17	0.0	0	399	10.7%	3.6%	
Big Spring Canyon	31,697	111	7,366	4,399	1,749	59	1,591	3	1,105	528	262	9	32	65	37	0.8	0	2,042	13.4%	6.4%	
Cataract Creek Headwaters	16,699	516	929	39	233	1	1,155	15	139	5	35	0	23	6	11	0.1	0	234	8.2%	1.4%	
Cedar Creek	8,888	144	416	180	123	0	136	4	62	22	18	0	3	2	0	0.0	0	112	11.2%	1.3%	
Cherry Canyon-Walnut Creek	28,330	0	2,751	3,003	51	0	1,664	0	413	360	8	0	33	22	51	0.6	64	951	12.7%	3.4%	
Cinder Basin	39,864	0	0	0	0	0	8,201	0	0	0	0	0	164	0	13	0.0	0	177	2.2%	0.4%	
Coconino Wash Headwaters	51,193	0	2,006	18,661	0	0	6,566	0	301	2,239	0	0	131	24	14	3.4	6	2,719	10.0%	5.3%	
Curley Wallace Tank	13,431	0	76	1	0	0	0	0	11	0	0	0	0	0	0	0.0	0	12	15.0%	0.1%	
Dent and Sayer Tank	37,216	22	2,792	1,311	860	19	5,754	1	419	157	129	3	115	38	21	0.0	0	882	8.2%	2.4%	
Devil Dog Canyon	11,196	39	466	0	48	0	245	1	70	0	7	0	5	5	0	0.1	0	89	11.1%	0.8%	
Dogtown Wash	11,662	658	1,711	490	651	0	864	20	257	59	98	0	17	7	7	0.1	0	464	10.6%	4.0%	
Doney Park	42,133	0	16	763	0	0	12,943	0	2	92	0	0	259	0	134	0.0	22	509	3.7%	1.2%	
Double Cabin Park-Jacks Canyon	21,660	0	609	750	87	20	100	0	91	90	13	3	2	1	3	0.1	3	207	13.2%	1.0%	
Dry Creek	34,398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%	
Fry Canyon	19,175	59	3,789	552	811	2	749	2	568	66	122	0	15	5	11	0.1	26	816	13.7%	4.3%	
Garland Prairie	25,054	487	2,510	2,773	1,892	8	8,496	15	377	333	284	1	170	9	25	0.8	0	1,214	7.5%	4.8%	
Government Canyon	12,765	56	811	81	172	0	46	2	122	10	26	0	1	6	5	0.1	0	171	14.6%	1.3%	
Government Prairie	20,399	217	4,194	1,224	1,574	48	4,183	6	629	147	236	7	84	9	23	0.0	0	1,141	10.0%	5.6%	
Grapevine Canyon	19,186	41	1,337	171	403	0	850	1	201	21	60	0	17	3	1	0.0	0	304	10.8%	1.6%	
Grindstone Wash	17,796	0	611	258	31	0	718	0	92	31	5	0	14	8	0	0.2	0	149	9.2%	0.8%	
Johnson Creek	30,857	92	1,445	173	120	0	1,021	3	217	21	18	0	20	8	2	0.2	2	291	10.2%	0.9%	
Juan Tank Canyon	14,231	0	269	0	0	0	0	0	40	0	0	0	0	4	0	0.0	0	44	16.3%	0.3%	
Kinnikinick Canyon	24,895	10	4,317	1,118	1,514	0	379	0	648	134	227	0	8	9	9	0.2	0	1,035	14.1%	4.2%	
Klostermeyer Lake	28,109	0	197	254	158	0	652	0	30	30	24	0	13	3	5	0.0	0	105	8.3%	0.4%	
Little LO Spring Canyon	12,260	0	2,790	2,732	375	0	1,477	0	419	328	56	0	30	24	22	0.2	7	885	12.0%	7.2%	
Little Red Horse Wash	27,465	0	7	410	0	0	418	0	1	49	0	0	8	0	0	0.0	0	59	7.0%	0.2%	
Long Lake-Chavel Pass Ditch	14,590	0	208	238	19	0	10	0	31	29	3	0	0	0	0	0.0	0	63	13.2%	0.4%	
Lower Deadman Wash	31,266	0	0	0	0	0	761	0	0	0	0	0	15	0	5	0.0	0	21	2.7%	0.1%	
Lower Rio de Flag	35,308	0	956	856	176	0	4,206	0	143	103	26	0	84	4	56	0.3	0	418	6.7%	1.2%	
Lower Sycamore Creek	30,677	16	34	66	15	0	13	0	5	8	2	0	0	2	0	0.0	0	18	12.3%	0.1%	
Lower Woods Canyon	26,131	0	898	3,619	54	0	4,663	0	135	434	8	0	93	8	18	0.0	0	696	7.5%	2.7%	

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS	TOTAL EIS
6th CODE HUC NAME	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
MC Canyon	21,686	0	908	456	218	3	1,000	0	136	55	33	0	20	3	7	0.3	0	255	9.9%	1.2%
Meath Wash	37,538	3	104	0	0	0	346	0	16	0	0	0	7	1	0	0.0	0	23	5.1%	0.1%
Middle Deadman Wash	22,888	0	404	320	17	0	4,144	0	61	38	3	0	83	11	51	0.0	0	246	5.0%	1.1%
Middle Oak Creek	39,896	0	49	132	0	0	898	0	7	16	0	0	18	0	2	0.0	0	43	4.0%	0.1%
Middle Spring Valley Wash	32,672	432	1,695	391	230	0	1,936	13	254	47	34	0	39	10	0	0.0	67	464	9.9%	1.4%
Middle Sycamore Creek	18,335	786	1,617	3,989	498	0	770	24	243	479	75	0	15	11	4	0.3	0	850	11.1%	4.6%
Miller Wash Headwaters	31,220	14	410	2,107	134	32	5,089	0	62	253	20	5	102	21	0	0.0	0	463	5.9%	1.5%
Mormon Canyon	19,252	69	146	0	429	0	417	2	22	0	64	0	8	0	5	0.0	0	102	9.6%	0.5%
Mormon Lake	25,968	7	2,375	6,113	1,459	2	922	0	356	734	219	0	18	4	61	0.3	7	1,400	12.9%	5.4%
Munds Canyon	41,179	24	6,799	18,163	1,240	129	2,137	1	1,020	2,180	186	19	43	58	73	0.0	35	3,614	12.7%	8.8%
Pitman Valley-Scholz Lake	28,459	1,504	4,931	3,730	1,566	6	4,835	45	740	448	235	1	97	21	6	0.5	0	1,592	9.6%	5.6%
Porcupine Canyon-Walnut Creek	16,622	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Pumphouse Wash	31,546	1	4,168	6,472	717	0	965	0	625	777	108	0	19	12	93	0.3	58	1,693	13.7%	5.4%
Rabbit Canyon	41,339	199	60	0	0	0	19	6	9	0	0	0	0	3	0	0.0	0	18	6.6%	0.0%
Rain Tank Wash	38,483	0	887	2,322	0	0	1,430	0	133	279	0	0	29	0	22	0.6	0	463	10.0%	1.2%
Rattlesnake Canyon	17,023	0	320	836	99	0	640	0	48	100	15	0	13	0	0	0.0	0	176	9.3%	1.0%
Rattlesnake Wash	16,259	0	228	0	103	0	375	0	34	0	15	0	8	2	0	0.0	0	60	8.4%	0.4%
Red Horse Wash Headwaters	19,561	0	850	4,924	0	0	1,149	0	128	591	0	0	23	4	4	2.0	0	752	10.9%	3.8%
Sawmill Tank	13,730	219	3,384	822	747	8	4,253	7	508	99	112	1	85	18	3	0.1	0	832	8.8%	6.1%
Sawmill Wash	12,385	37	1,942	2,821	342	0	268	1	291	338	51	0	5	11	6	0.1	5	709	13.1%	5.7%
Secret Canyon	11,138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Sinclair Wash	6,766	0	96	0	0	0	64	0	14	0	0	0	1	0	5	0.0	0	21	13.0%	0.3%
Smoot Lake	21,535	204	916	35	143	0	377	6	137	4	22	0	8	8	0	0.0	0	184	11.0%	0.9%
Spring Creek	30,830	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Telephone Tank	14,934	13	1,239	2,609	466	10	536	0	186	313	70	2	11	4	32	0.0	0	618	12.7%	4.1%

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS	TOTAL EIS
6th CODE HUC NAME	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
Tule Canyon	29,866	1,147	5,209	6,698	2,171	49	3,924	34	781	804	326	7	78	68	24	1.3	15	2,139	11.1%	7.2%
Upper Cataract Creek	25,011	147	916	0	266	0	1,445	4	137	0	40	0	29	3	0	0.0	0	213	7.7%	0.9%
Upper Cedar Wash (Local Drainage)	23,476	12	2,440	888	1,938	28	4,076	0	366	107	291	4	82	28	47	0.0	0	924	9.9%	3.9%
Upper Deadman Wash	22,752	0	562	2,854	806	383	9,701	0	84	342	121	57	194	22	85	0.0	7	912	6.4%	4.0%
Upper Hell Canyon	29,249	67	1,374	1,977	241	11	1,004	2	206	237	36	2	20	11	10	0.4	0	524	11.2%	1.8%
Upper Kana-a Wash	38,801	0	0	0	0	0	10,304	0	0	0	0	0	206	0	11	0.0	0	217	2.1%	0.6%
Upper Lee Canyon	29,537	0	82	282	0	0	3,506	0	12	34	0	0	70	0	3	0.0	0	120	3.1%	0.4%
Upper Oak Creek	17,900	0	1,049	7,337	101	0	865	0	157	880	15	0	17	10	34	0.0	0	1,114	11.9%	6.2%
Upper Padre Canyon	22,105	520	1,388	767	439	0	490	16	208	92	66	0	10	1	2	0.0	0	395	10.9%	1.8%
Upper Red Lake Wash	26,930	1,735	3,412	4,105	1,213	0	5,169	52	512	493	182	0	103	28	15	0.6	9	1,395	8.9%	5.2%
Upper Rio de Flag	44,551	0	2,229	4,884	457	20	2,362	0	334	586	69	3	47	6	90	0.1	6	1,141	11.5%	2.6%
Upper San Francisco Wash	34,397	0	0	0	0	0	11,253	0	0	0	0	0	225	0	32	0.0	0	257	2.3%	0.7%
Upper Spring Valley Wash	38,305	1,075	9,567	4,359	3,255	117	4,592	32	1,435	523	488	17	92	58	29	0.2	0	2,675	11.6%	7.0%
Upper Sycamore Creek	14,916	0	3,808	967	1,474	0	586	0	571	116	221	0	12	17	7	0.2	5	949	13.9%	6.4%
Upper Woods Canyon	12,671	0	2,687	3,998	803	3	756	0	403	480	120	1	15	3	13	0.2	0	1,035	12.5%	8.2%
Volunteer Canyon	24,506	0	3,304	939	493	1	887	0	496	113	74	0	18	18	1	0.0	16	735	13.1%	3.0%
Volunteer Wash	31,771	19	8,978	2,817	2,407	43	2,708	1	1,347	338	361	6	54	30	171	0.0	0	2,308	13.6%	7.3%
Walnut Creek-Lower Lake Mary	18,920	0	2,599	2,339	991	0	1,244	0	390	281	149	0	25	13	41	1.6	108	1,008	14.0%	5.3%
Walnut Creek-Upper Lake Mary	34,473	177	9,239	9,061	4,444	28	2,331	5	1,386	1,087	667	4	47	47	37	0.1	74	3,354	13.3%	9.7%
West Fork Oak Creek	27,339	13	3,094	4,204	813	0	276	0	464	505	122	0	6	15	33	0.2	20	1,165	13.9%	4.3%
Yeager Draw	24,465	0	59	41	0	0	0	0	9	5	0	0	0	0	0	0.0	0	14	13.9%	0.1%
TOTAL	2,032,080	11,185	153,446	173,701	45,405	1,227	178,442	336	23,017	20,844	6,811	184	3,569	954	1,645	17	561	57,937	10.3%	2.9%

Range of soil disturbance of any given treatment type in a treatment area (about 7.2%) or ranges from 0-16% for all combined treatment types by watershed. High intensity thinning is the highest disturbance type

Summary of Cumulative Effects by 6th Code Watersheds - Alternative D

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
		TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
		Ground Disturb	EIS % Ground Disturb	BASELINE (roads, private land, grazing) Ground Disturb	TREAT ACRES	Future/Fore Ground Disturb	TREAT ACRES	Current Ground Disturb	CUM EFFECTS Ground Disturb	CUM EFFECTS % Ground Disturb
Anderson Canyon	31,284	331	1.1%	93	229	34	2,608	391	850	2.7%
Babbitt Lake	28,413	1,579	5.6%	250	141	21	436	65	1,916	6.7%
Bar M Canyon	17,551	1,622	9.2%	164	125	19	3,026	454	2,259	12.9%
Bear Canyon	21,982	1,007	4.6%	165	488	73	85	13	1,258	5.7%
Bear Jaw Canyon	11,135	399	3.6%	70	36	5	247	37	512	4.6%
Big Spring Canyon	31,697	2,042	6.4%	395	8,757	1,314	2,746	412	4,163	13.1%
Cataract Creek Headwaters	16,699	234	1.4%	1,787	1,500	225	1,461	219	2,465	14.8%
Cedar Creek	8,888	112	1.3%	21	0	0	872	131	264	3.0%
Cherry Canyon-Walnut Creek	28,330	951	3.4%	437	10,903	1,635	9,359	1,404	4,428	15.6%
Cinder Basin	39,864	177	0.4%	124	256	38	0	0	339	0.9%
Coconino Wash Headwaters	51,193	2,719	5.3%	552	36	5	4,971	746	4,021	7.9%
Curley Wallace Tank	13,431	12	0.1%	78	0	0	5,541	831	921	6.9%
Dent and Sayer Tank	37,216	882	2.4%	247	16	2	8,386	1,258	2,390	6.4%
Devil Dog Canyon	11,196	89	0.8%	176	69	10	70	11	286	2.6%
Dogtown Wash	11,662	464	4.0%	380	5,861	879	865	130	1,853	15.9%
Doney Park	42,133	509	1.2%	3,584	1,377	207	948	142	4,442	10.5%
Double Cabin Park-Jacks Canyon	21,660	207	1.0%	299	9,958	1,494	2,871	431	2,430	11.2%
Dry Creek	34,398	0	0.0%	947	1,152	173	237	94	1,214	3.5%
Fry Canyon	19,175	816	4.3%	163	1,222	183	2,288	282	1,444	7.5%
Garland Prairie	25,054	1,214	4.8%	638	3,512	527	272	41	2,420	9.7%
Government Canyon	12,765	171	1.3%	68	0	0	142	21	260	2.0%
Government Prairie	20,399	1,141	5.6%	973	7,676	1,151	435	65	3,331	16.3%
Grapevine Canyon	19,186	304	1.6%	83	43	6	0	0	393	2.0%
Grindstone Wash	17,796	149	0.8%	169	0	0	1,235	185	504	2.8%
Johnson Creek	30,857	291	0.9%	537	789	118	1,455	218	1,165	3.8%
Juan Tank Canyon	14,231	44	0.3%	177	0	0	13	2	222	1.6%
Kinnikinick Canyon	24,895	1,035	4.2%	134	206	31	2,667	400	1,600	6.4%
Klostermeyer Lake	28,109	105	0.4%	127	0	0	0	0	231	0.8%
Little LO Spring Canyon	12,260	885	7.2%	71	408	61	0	0	1,018	8.3%
Little Red Horse Wash	27,465	59	0.2%	149	0	0	3,360	504	712	2.6%
Long Lake-Chavel Pass Ditch	14,590	63	0.4%	108	2,597	390	0	0	560	3.8%
Lower Deadman Wash	31,266	21	0.1%	148	200	30	0	0	199	0.6%
Lower Rio de Flag	35,308	418	1.2%	6,189	3,274	491	2,649	397	7,495	21.2%

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
		TOTAL	TOTAL	TOTAL BASELINE (roads, private land, grazing) Ground Disturb	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
		Ground Disturb	EIS % Ground Disturb		TREAT ACRES	Future/Fore Ground Disturb	TREAT ACRES	Current Ground Disturb	CUM EFFECTS Ground Disturb	CUM EFFECTS % Ground Disturb
Lower Sycamore Creek	30,677	18	0.1%	45	177	27	38	6	95	0.3%
Lower Woods Canyon	26,131	696	2.7%	143	0	0	272	41	880	3.4%
MC Canyon	21,686	255	1.2%	156	6,319	948	193	29	1,388	6.4%
Meath Wash	37,538	23	0.1%	265	157	24	127	19	330	0.9%
Middle Deadman Wash	22,888	246	1.1%	406	159	24	0	0	675	3.0%
Middle Oak Creek	39,896	43	0.1%	4,276	0	0	4	1	4,319	10.8%
Middle Spring Valley Wash	32,672	464	1.4%	119	7	1	0	0	584	1.8%
Middle Sycamore Creek	18,335	850	4.6%	104	998	150	0	0	1,104	6.0%
Miller Wash Headwaters	31,220	463	1.5%	252	23	3	5,936	890	1,609	5.2%
Mormon Canyon	19,252	102	0.5%	134	193	29	488	73	338	1.8%
Mormon Lake	25,968	1,400	5.4%	706	2,537	380	7,296	1,094	3,581	13.8%
Munds Canyon	41,179	3,614	8.8%	1,481	435	65	2,267	340	5,501	13.4%
Pitman Valley-Scholz Lake	28,459	1,592	5.6%	710	760	114	1,792	269	2,685	9.4%
Porcupine Canyon-Walnut Creek	16,622	0	0.0%	667	530	80	33	5	751	4.5%
Pumphouse Wash	31,546	1,693	5.4%	1,746	1,427	214	11,423	1,828	5,481	17.4%
Rabbit Canyon	41,339	18	0.0%	74	0	0	251	38	130	0.3%
Rain Tank Wash	38,483	463	1.2%	209	0	0	2,144	322	993	2.6%
Rattlesnake Canyon	17,023	176	1.0%	143	1,173	176	1,584	238	733	4.3%
Rattlesnake Wash	16,259	60	0.4%	87	0	0	313	47	193	1.2%
Red Horse Wash Headwaters	19,561	752	3.8%	141	9	1	897	135	1,029	5.3%
Sawmill Tank	13,730	832	6.1%	384	103	15	78	12	1,244	9.1%
Sawmill Wash	12,385	709	5.7%	90	190	29	0	0	828	6.7%
Secret Canyon	11,138	0	0.0%	53	3,684	553	0	0	605	5.4%
Sinclair Wash	6,766	21	0.3%	1,699	0	0	103	15	1,735	25.6%
Smoot Lake	21,535	184	0.9%	119	11	2	0	0	305	1.4%
Spring Creek	30,830	0	0.0%	258	1,361	204	0	0	463	1.5%
Telephone Tank	14,934	618	4.1%	497	6,074	911	1,813	272	2,298	15.4%
Tule Canyon	29,866	2,139	7.2%	293	7	1	7,064	1,060	3,492	11.7%
Upper Cataract Creek	25,011	213	0.9%	181	7	1	116	17	413	1.7%
Upper Cedar Wash (Local Drainage)	23,476	924	3.9%	229	7	1	0	0	1,154	4.9%
Upper Deadman Wash	22,752	912	4.0%	260	3,832	575	842	126	1,873	8.2%
Upper Hell Canyon	29,249	524	1.8%	312	9,592	1,439	1,700	255	2,530	8.6%
Upper Kana-a Wash	38,801	217	0.6%	155	318	48	991	149	569	1.5%
Upper Lee Canyon	29,537	120	0.4%	159	1,156	173	1,765	265	717	2.4%

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
		TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
		Ground Disturb	EIS % Ground Disturb	BASELINE (roads, private land, grazing) Ground Disturb	TREAT ACRES	Future/Fore Ground Disturb	TREAT ACRES	Current Ground Disturb	CUM EFFECTS Ground Disturb	CUM EFFECTS % Ground Disturb
Upper Oak Creek	17,900	1,114	6.2%	284	1	0	4,362	2,105	3,503	19.6%
Upper Padre Canyon	22,105	395	1.8%	246	284	43	4,131	620	1,303	5.9%
Upper Red Lake Wash	26,930	1,395	5.2%	420	14	2	1	0	1,817	6.7%
Upper Rio de Flag	44,551	1,141	2.6%	3,990	12,354	1,853	4,152	623	7,607	17.1%
Upper San Francisco Wash	34,397	257	0.7%	942	1,355	203	687	103	1,506	4.4%
Upper Spring Valley Wash	38,305	2,675	7.0%	670	1,309	196	7,979	1,197	4,738	12.4%
Upper Sycamore Creek	14,916	949	6.4%	362	777	117	0	0	1,427	9.6%
Upper Woods Canyon	12,671	1,035	8.2%	151	382	57	1,575	236	1,480	11.7%
Volunteer Canyon	24,506	735	3.0%	173	10,623	1,593	3,323	499	3,000	12.2%
Volunteer Wash	31,771	2,308	7.3%	894	8,457	1,269	686	103	4,574	14.4%
Walnut Creek-Lower Lake Mary	18,920	1,008	5.3%	224	6,172	926	2,200	330	2,488	13.1%
Walnut Creek-Upper Lake Mary	34,473	3,354	9.7%	264	3,725	559	416	62	4,240	12.3%
West Fork Oak Creek	27,339	1,165	4.3%	258	10,070	1,510	16,432	5,074	8,007	29.3%
Yeager Draw	24,465	14	0.1%	102	173	26	0	0	142	0.6%
TOTAL	2,032,080	57,937	2.9%	45,041	157,772	23,666	154,720	27,380	154,023	7.6%

Table 36. Alternative E Soil Disturbance Calculation by Treatment Area, 6th HUC Watershed and Cumulative effects

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS	TOTAL EIS

	acres	acres	acres	acres	acres	acres	acres		acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
6th CODE HUC NAME																					
Anderson Canyon	31,284	1,131	1,113	251	0	0	3,390	34	167	30	0	0	68	4	2	0.0	0	305	9.0%	1.0%	
Babbitt Lake	28,413	2,570	6,335	2,247	0	122	15,377	77	950	270	0	18	308	54	73	0.1	0	1,750	11.4%	6.2%	
Bar M Canyon	17,551	781	5,726	5,713	0	0	15,506	23	859	686	0	0	310	10	10	0.1	0	1,898	12.2%	10.8%	
Bear Canyon	21,982	105	1,659	5,523	0	77	8,263	3	249	663	0	12	165	23	8	0.3	0	1,122	13.6%	5.1%	
Bear Jaw Canyon	11,135	0	1,154	1,461	0	0	3,715	0	173	175	0	0	74	12	17	0.0	0	452	12.2%	4.1%	
Big Spring Canyon	31,697	719	7,709	3,766	0	59	14,304	22	1,156	452	0	9	286	65	37	0.8	0	2,028	14.2%	6.4%	
Cataract Creek Headwaters	16,699	288	1,062	39	0	1	2,872	9	159	5	0	0	57	6	11	0.1	0	247	8.6%	1.5%	
Cedar Creek	8,888	28	574	180	0	0	999	1	86	22	0	0	20	2	0	0.0	0	131	13.1%	1.5%	
Cherry Canyon-Walnut Creek	28,330	351	2,777	3,003	0	0	7,674	11	417	360	0	0	153	22	51	0.6	64	1,078	14.1%	3.8%	
Cinder Basin	39,864	426	0	0	0	0	8,201	13	0	0	0	0	164	0	13	0.0	0	189	2.3%	0.5%	
Coconino Wash Headwaters	51,193	81	2,006	18,661	0	0	27,234	2	301	2,239	0	0	545	24	14	3.4	6	3,135	11.5%	6.1%	
Curley Wallace Tank	13,431	0	76	1	0	0	78	0	11	0	0	0	2	0	0	0.0	0	13	16.9%	0.1%	
Dent and Sayer Tank	37,216	537	2,893	1,777	0	19	10,873	16	434	213	0	3	217	38	21	0.0	0	942	8.7%	2.5%	
Devil Dog Canyon	11,196	41	473	0	0	0	798	1	71	0	0	0	16	5	0	0.1	0	94	11.7%	0.8%	
Dogtown Wash	11,662	105	2,110	490	0	0	4,374	3	317	59	0	0	87	7	7	0.1	0	480	11.0%	4.1%	
Doney Park	42,133	1,220	16	763	0	0	13,871	37	2	92	0	0	277	0	134	0.0	22	564	4.1%	1.3%	
Double Cabin Park-Jacks Canyon	21,660	33	646	750	0	20	1,720	1	97	90	0	3	34	1	3	0.1	3	233	13.5%	1.1%	
Dry Creek	34,398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%	
Fry Canyon	19,175	642	3,508	1,394	0	2	6,073	19	526	167	0	0	121	5	11	0.1	26	877	14.4%	4.6%	
Garland Prairie	25,054	8,141	4,324	2,773	0	8	16,166	244	649	333	0	1	323	9	25	0.8	0	1,585	9.8%	6.3%	
Government Canyon	12,765	0	846	81	0	0	1,166	0	127	10	0	0	23	6	5	0.1	0	171	14.6%	1.3%	
Government Prairie	20,399	3,827	5,283	1,537	0	48	11,438	115	792	184	0	7	229	9	23	0.0	0	1,360	11.9%	6.7%	
Grapevine Canyon	19,186	72	1,563	171	0	0	2,802	2	234	21	0	0	56	3	1	0.0	0	317	11.3%	1.7%	
Grindstone Wash	17,796	0	611	258	0	0	1,618	0	92	31	0	0	32	8	0	0.2	0	163	10.1%	0.9%	
Johnson Creek	30,857	42	1,470	173	0	0	2,850	1	221	21	0	0	57	8	2	0.2	2	312	11.0%	1.0%	
Juan Tank Canyon	14,231	0	269	0	0	0	269	0	40	0	0	0	5	4	0	0.0	0	49	18.4%	0.3%	
Kinnikinick Canyon	24,895	379	5,140	1,118	0	0	8,017	11	771	134	0	0	160	9	9	0.2	0	1,095	13.7%	4.4%	
Klostermeyer Lake	28,109	7	197	254	0	0	1,261	0	30	30	0	0	25	3	5	0.0	0	93	7.4%	0.3%	
Little LO Spring Canyon	12,260	102	2,940	2,948	0	0	7,392	3	441	354	0	0	148	24	22	0.2	7	999	13.5%	8.1%	
Little Red Horse Wash	27,465	0	7	410	0	0	835	0	1	49	0	0	17	0	0	0.0	0	67	8.0%	0.2%	
Long Lake-Chavel Pass Ditch	14,590	0	208	238	0	0	926	0	31	29	0	0	19	0	0	0.0	0	78	8.5%	0.5%	
Lower Deadman Wash	31,266	0	0	0	0	0	1,007	0	0	0	0	0	20	0	5	0.0	0	25	2.5%	0.1%	
Lower Rio de Flag	35,308	329	1,132	856	0	0	6,195	10	170	103	0	0	124	4	56	0.3	0	467	7.5%	1.3%	
Lower Sycamore Creek	30,677	0	51	66	0	0	145	0	8	8	0	0	3	2	0	0.0	0	20	13.9%	0.1%	
Lower Woods Canyon	26,131	99	952	3,619	0	0	9,594	3	143	434	0	0	192	8	18	0.0	0	798	8.3%	3.1%	

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS	TOTAL EIS
6th CODE HUC NAME	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
MC Canyon	21,686	38	956	456	0	3	2,584	1	143	55	0	0	52	3	7	0.3	0	262	10.1%	1.2%
Meath Wash	37,538	186	105	0	0	0	453	6	16	0	0	0	9	1	0	0.0	0	31	6.8%	0.1%
Middle Deadman Wash	22,888	157	404	320	0	0	4,884	5	61	38	0	0	98	11	51	0.0	0	263	5.4%	1.1%
Middle Oak Creek	39,896	0	49	132	0	0	1,079	0	7	16	0	0	22	0	2	0.0	0	47	4.3%	0.1%
Middle Spring Valley Wash	32,672	85	2,010	391	0	0	4,684	3	302	47	0	0	94	10	0	0.0	67	521	11.1%	1.6%
Middle Sycamore Creek	18,335	54	1,491	3,464	0	0	6,839	2	224	416	0	0	137	11	4	0.3	0	793	11.6%	4.3%
Miller Wash Headwaters	31,220	635	500	2,107	0	32	7,786	19	75	253	0	5	156	21	0	0.0	0	529	6.8%	1.7%
Mormon Canyon	19,252	131	364	0	0	0	1,061	4	55	0	0	0	21	0	5	0.0	0	85	8.0%	0.4%
Mormon Lake	25,968	481	3,456	6,113	0	2	12,934	14	518	734	0	0	259	4	61	0.3	7	1,598	12.4%	6.2%
Munds Canyon	41,179	846	7,986	18,181	0	129	31,418	25	1,198	2,182	0	19	628	58	73	0.0	35	4,219	13.4%	10.2%
Pitman Valley-Scholz Lake	28,459	3,696	7,102	2,819	0	6	16,572	111	1,065	338	0	1	331	21	6	0.5	0	1,874	11.3%	6.6%
Porcupine Canyon-Walnut Creek	16,622	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Pumphouse Wash	31,546	199	4,776	6,472	0	0	14,185	6	716	777	0	0	284	12	93	0.3	58	1,947	13.7%	6.2%
Rabbit Canyon	41,339	0	60	0	0	0	278	0	9	0	0	0	6	3	0	0.0	0	18	6.4%	0.0%
Rain Tank Wash	38,483	0	887	2,322	0	0	4,639	0	133	279	0	0	93	0	22	0.6	0	527	11.4%	1.4%
Rattlesnake Canyon	17,023	14	419	836	0	0	2,997	0	63	100	0	0	60	0	0	0.0	0	223	7.5%	1.3%
Rattlesnake Wash	16,259	0	304	0	0	0	706	0	46	0	0	0	14	2	0	0.0	0	62	8.8%	0.4%
Red Horse Wash Headwaters	19,561	4	850	4,924	0	0	6,923	0	128	591	0	0	138	4	4	2.0	0	867	12.5%	4.4%
Sawmill Tank	13,730	4,146	4,083	822	0	8	9,434	124	612	99	0	1	189	18	3	0.1	0	1,046	11.1%	7.6%
Sawmill Wash	12,385	68	2,096	2,821	0	0	6,170	2	314	339	0	0	123	11	6	0.1	5	800	13.0%	6.5%
Secret Canyon	11,138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Sinclair Wash	6,766	64	96	0	0	0	160	2	14	0	0	0	3	0	5	0.0	0	25	15.4%	0.4%
Smoot Lake	21,535	0	1,085	35	0	0	1,676	0	163	4	0	0	34	8	0	0.0	0	208	12.4%	1.0%
Spring Creek	30,830	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0%	0.0%
Telephone Tank	14,934	317	1,667	2,609	0	10	4,873	10	250	313	0	2	97	4	32	0.0	0	708	14.5%	4.7%

	current EIS acres							current EIS-expected ground disturbance												
	6th code	grassland	high intensity	low intensity	savanna	aspen	rx burn	grassland	high intensity	low intensity	savanna	aspen	rx burn	temp rd	decom rd	relocate rd	channel restore	TOTAL	TOTAL EIS	TOTAL EIS
6th CODE HUC NAME	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	acres	Ground Disturb	treatment % ground disturb	% Ground Disturb
Tule Canyon	29,866	598	6,219	6,698	0	49	19,180	18	933	804	0	7	384	68	24	1.3	15	2,253	11.7%	7.5%
Upper Cataract Creek	25,011	83	1,047	0	0	0	2,774	2	157	0	0	0	55	3	0	0.0	0	218	7.8%	0.9%
Upper Cedar Wash (Local Drainage)	23,476	1,874	3,803	888	0	28	9,383	56	570	107	0	4	188	28	47	0.0	0	1,000	10.7%	4.3%
Upper Deadman Wash	22,752	1,061	630	2,854	0	383	14,305	32	95	342	0	57	286	22	85	0.0	7	926	6.5%	4.1%
Upper Hell Canyon	29,249	30	1,416	1,977	0	11	4,675	1	212	237	0	2	93	11	10	0.4	0	566	12.1%	1.9%
Upper Kana-a Wash	38,801	534	0	0	0	0	10,520	16	0	0	0	0	210	0	11	0.0	0	238	2.3%	0.6%
Upper Lee Canyon	29,537	7	82	282	0	0	3,870	0	12	34	0	0	77	0	3	0.0	0	127	3.3%	0.4%
Upper Oak Creek	17,900	171	1,128	7,337	0	0	9,634	5	169	880	0	0	193	10	34	0.0	0	1,291	13.4%	7.2%
Upper Padre Canyon	22,105	276	1,545	767	0	0	3,603	8	232	92	0	0	72	1	2	0.0	0	407	11.3%	1.8%
Upper Red Lake Wash	26,930	1,243	4,183	4,105	0	0	15,635	37	627	493	0	0	313	28	15	0.6	9	1,523	9.7%	5.7%
Upper Rio de Flag	44,551	337	2,687	4,884	0	20	10,203	10	403	586	0	3	204	6	90	0.1	6	1,308	12.8%	2.9%
Upper San Francisco Wash	34,397	959	0	0	0	0	11,253	29	0	0	0	0	225	0	32	0.0	0	286	2.5%	0.8%
Upper Spring Valley Wash	38,305	2,058	10,832	5,069	0	117	23,223	62	1,625	608	0	17	464	58	29	0.2	0	2,864	12.3%	7.5%
Upper Sycamore Creek	14,916	410	4,695	1,344	0	0	6,835	12	704	161	0	0	137	17	7	0.2	5	1,043	15.3%	7.0%
Upper Woods Canyon	12,671	186	3,395	3,998	0	3	11,022	6	509	480	0	1	220	3	13	0.2	0	1,231	11.2%	9.7%
Volunteer Canyon	24,506	160	3,594	1,141	0	1	5,978	5	539	137	0	0	120	18	1	0.0	16	835	14.0%	3.4%
Volunteer Wash	31,771	1,482	9,953	3,888	0	43	16,972	44	1,493	467	0	6	339	30	171	0.0	0	2,551	15.0%	8.0%
Walnut Creek-Lower Lake Mary	18,920	1,244	3,199	2,339	0	0	7,920	37	480	281	0	0	158	13	41	1.6	108	1,120	14.1%	5.9%
Walnut Creek-Upper Lake Mary	34,473	1,878	10,110	8,941	0	28	25,146	56	1,517	1,073	0	4	503	47	37	0.1	74	3,311	13.2%	9.6%
West Fork Oak Creek	27,339	111	3,858	4,204	0	0	9,451	3	579	505	0	0	189	15	33	0.2	20	1,344	14.2%	4.9%
Yeager Draw	24,465	0	59	41	0	0	100	0	9	5	0	0	2	0	0	0.0	0	16	15.9%	0.1%
TOTAL	2,032,080	47,879	178,011	176,104	0	1,227	581,020	1,436	26,702	21,132	0	184	11,620	954	1,645	17	561	64,252	11.1%	3.2%

Range of soil disturbance of any given treatment type in a treatment area = 0-9.7% or ranges from 0-18% for all combined treatment types by watershed. High intensity thinning is the highest disturbance type.

Summary of Cumulative Effects by 6th Code Watersheds - Alternative E

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
		TOTAL	TOTAL EIS %	TOTAL BASELINE (roads, private land, grazing)	TOTAL	TOTAL Future/Fore	TOTAL	TOTAL Current	TOTAL CUM EFFECTS	TOTAL CUM EFFECTS
		Ground Disturb	Ground Disturb	Ground Disturb	TREAT ACRES	Ground Disturb	TREAT ACRES	Ground Disturb	Ground Disturb	% Ground Disturb
Anderson Canyon	31,284	305	1.0%	93	229	34	2,608	391	824	2.6%
Babbitt Lake	28,413	1,750	6.2%	250	141	21	436	65	2,087	7.3%
Bar M Canyon	17,551	1,898	10.8%	164	125	19	3,026	454	2,535	14.4%
Bear Canyon	21,982	1,122	5.1%	165	488	73	85	13	1,373	6.2%
Bear Jaw Canyon	11,135	452	4.1%	70	36	5	247	37	564	5.1%
Big Spring Canyon	31,697	2,028	6.4%	395	8,757	1,314	2,746	412	4,148	13.1%
Cataract Creek Headwaters	16,699	247	1.5%	1,787	1,500	225	1,461	219	2,478	14.8%
Cedar Creek	8,888	131	1.5%	21	0	0	872	131	283	3.2%
Cherry Canyon-Walnut Creek	28,330	1,078	3.8%	437	10,903	1,635	9,359	1,404	4,555	16.1%
Cinder Basin	39,864	189	0.5%	124	256	38	0	0	352	0.9%
Coconino Wash Headwaters	51,193	3,135	6.1%	552	36	5	4,971	746	4,437	8.7%
Curley Wallace Tank	13,431	13	0.1%	78	0	0	5,541	831	922	6.9%
Dent and Sayer Tank	37,216	942	2.5%	247	16	2	8,386	1,258	2,450	6.6%
Devil Dog Canyon	11,196	94	0.8%	176	69	10	70	11	291	2.6%
Dogtown Wash	11,662	480	4.1%	380	5,861	879	865	130	1,869	16.0%
Doney Park	42,133	564	1.3%	3,584	1,377	207	948	142	4,497	10.7%
Double Cabin Park-Jacks Canyon	21,660	233	1.1%	299	9,958	1,494	2,871	431	2,456	11.3%
Dry Creek	34,398	0	0.0%	947	1,152	173	237	94	1,214	3.5%
Fry Canyon	19,175	877	4.6%	163	1,222	183	2,288	282	1,505	7.8%
Garland Prairie	25,054	1,585	6.3%	638	3,512	527	272	41	2,791	11.1%
Government Canyon	12,765	171	1.3%	68	0	0	142	21	260	2.0%
Government Prairie	20,399	1,360	6.7%	973	7,676	1,151	435	65	3,549	17.4%
Grapevine Canyon	19,186	317	1.7%	83	43	6	0	0	407	2.1%
Grindstone Wash	17,796	163	0.9%	169	0	0	1,235	185	517	2.9%
Johnson Creek	30,857	312	1.0%	537	789	118	1,455	218	1,186	3.8%
Juan Tank Canyon	14,231	49	0.3%	177	0	0	13	2	228	1.6%
Kinnikinick Canyon	24,895	1,095	4.4%	134	206	31	2,667	400	1,660	6.7%
Klostermeyer Lake	28,109	93	0.3%	127	0	0	0	0	220	0.8%
Little LO Spring Canyon	12,260	999	8.1%	71	408	61	0	0	1,131	9.2%
Little Red Horse Wash	27,465	67	0.2%	149	0	0	3,360	504	720	2.6%
Long Lake-Chavel Pass Ditch	14,590	78	0.5%	108	2,597	390	0	0	576	3.9%
Lower Deadman Wash	31,266	25	0.1%	148	200	30	0	0	204	0.7%

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
		TOTAL	TOTAL	TOTAL BASELINE (roads, private land, grazing) Ground Disturb	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
		Ground Disturb	EIS % Ground Disturb		TREAT ACRES	Future/Fore Ground Disturb	TREAT ACRES	Current Ground Disturb	CUM EFFECTS Ground Disturb	CUM EFFECTS % Ground Disturb
Lower Rio de Flag	35,308	467	1.3%	6,189	3,274	491	2,649	397	7,545	21.4%
Lower Sycamore Creek	30,677	20	0.1%	45	177	27	38	6	98	0.3%
Lower Woods Canyon	26,131	798	3.1%	143	0	0	272	41	981	3.8%
MC Canyon	21,686	262	1.2%	156	6,319	948	193	29	1,395	6.4%
Meath Wash	37,538	31	0.1%	265	157	24	127	19	338	0.9%
Middle Deadman Wash	22,888	263	1.1%	406	159	24	0	0	692	3.0%
Middle Oak Creek	39,896	47	0.1%	4,276	0	0	4	1	4,323	10.8%
Middle Spring Valley Wash	32,672	521	1.6%	119	7	1	0	0	642	2.0%
Middle Sycamore Creek	18,335	793	4.3%	104	998	150	0	0	1,046	5.7%
Miller Wash Headwaters	31,220	529	1.7%	252	23	3	5,936	890	1,675	5.4%
Mormon Canyon	19,252	85	0.4%	134	193	29	488	73	321	1.7%
Mormon Lake	25,968	1,598	6.2%	706	2,537	380	7,296	1,094	3,778	14.5%
Munds Canyon	41,179	4,219	10.2%	1,481	435	65	2,267	340	6,105	14.8%
Pitman Valley-Scholz Lake	28,459	1,874	6.6%	710	760	114	1,792	269	2,967	10.4%
Porcupine Canyon-Walnut Creek	16,622	0	0.0%	667	530	80	33	5	751	4.5%
Pumphouse Wash	31,546	1,947	6.2%	1,746	1,427	214	11,423	1,828	5,735	18.2%
Rabbit Canyon	41,339	18	0.0%	74	0	0	251	38	130	0.3%
Rain Tank Wash	38,483	527	1.4%	209	0	0	2,144	322	1,057	2.7%
Rattlesnake Canyon	17,023	223	1.3%	143	1,173	176	1,584	238	780	4.6%
Rattlesnake Wash	16,259	62	0.4%	87	0	0	313	47	196	1.2%
Red Horse Wash Headwaters	19,561	867	4.4%	141	9	1	897	135	1,144	5.9%
Sawmill Tank	13,730	1,046	7.6%	384	103	15	78	12	1,458	10.6%
Sawmill Wash	12,385	800	6.5%	90	190	29	0	0	918	7.4%
Secret Canyon	11,138	0	0.0%	53	3,684	553	0	0	605	5.4%
Sinclair Wash	6,766	25	0.4%	1,699	0	0	103	15	1,739	25.7%
Smoot Lake	21,535	208	1.0%	119	11	2	0	0	329	1.5%
Spring Creek	30,830	0	0.0%	258	1,361	204	0	0	463	1.5%
Telephone Tank	14,934	708	4.7%	497	6,074	911	1,813	272	2,388	16.0%
Tule Canyon	29,866	2,253	7.5%	293	7	1	7,064	1,060	3,607	12.1%
Upper Cataract Creek	25,011	218	0.9%	181	7	1	116	17	417	1.7%
Upper Cedar Wash (Local Drainage)	23,476	1,000	4.3%	229	7	1	0	0	1,230	5.2%
Upper Deadman Wash	22,752	926	4.1%	260	3,832	575	842	126	1,886	8.3%
Upper Hell Canyon	29,249	566	1.9%	312	9,592	1,439	1,700	255	2,572	8.8%
Upper Kana-a Wash	38,801	238	0.6%	155	318	48	991	149	589	1.5%

6th CODE HUC NAME	6th code acres	EIS		Baseline	Future Foreseeable		Current/Ongoing		PROJECT TOTAL	
		TOTAL	TOTAL	TOTAL BASELINE (roads, private land, grazing) Ground Disturb	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
		Ground Disturb	EIS % Ground Disturb		TREAT ACRES	Future/Fore Ground Disturb	TREAT ACRES	Ground Disturb	CUM EFFECTS Ground Disturb	CUM EFFECTS % Ground Disturb
Upper Lee Canyon	29,537	127	0.4%	159	1,156	173	1,765	265	724	2.5%
Upper Oak Creek	17,900	1,291	7.2%	284	1	0	4,362	2,105	3,680	20.6%
Upper Padre Canyon	22,105	407	1.8%	246	284	43	4,131	620	1,315	6.0%
Upper Red Lake Wash	26,930	1,523	5.7%	420	14	2	1	0	1,945	7.2%
Upper Rio de Flag	44,551	1,308	2.9%	3,990	12,354	1,853	4,152	623	7,774	17.4%
Upper San Francisco Wash	34,397	286	0.8%	942	1,355	203	687	103	1,535	4.5%
Upper Spring Valley Wash	38,305	2,864	7.5%	670	1,309	196	7,979	1,197	4,927	12.9%
Upper Sycamore Creek	14,916	1,043	7.0%	362	777	117	0	0	1,521	10.2%
Upper Woods Canyon	12,671	1,231	9.7%	151	382	57	1,575	236	1,676	13.2%
Volunteer Canyon	24,506	835	3.4%	173	10,623	1,593	3,323	499	3,101	12.7%
Volunteer Wash	31,771	2,551	8.0%	894	8,457	1,269	686	103	4,817	15.2%
Walnut Creek-Lower Lake Mary	18,920	1,120	5.9%	224	6,172	926	2,200	330	2,600	13.7%
Walnut Creek-Upper Lake Mary	34,473	3,311	9.6%	264	3,725	559	416	62	4,197	12.2%
West Fork Oak Creek	27,339	1,344	4.9%	258	10,070	1,510	16,432	5,074	8,186	29.9%
Yeager Draw	24,465	16	0.1%	102	173	26	0	0	143	0.6%
TOTAL	2,032,080	64,252	3.2%	45,041	157,772	23,666	154,720	27,380	160,338	7.9%

Attachment 2. Disturbed WEPP Interface for 4-FRI Project (12/19/2011)

Disturbed WEPP Results

User inputs

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	high severity fire	15	50	0	20
		7			
Lower	high severity fire	7	75	0	20
		0			
Description	0-15% high burn severity				

Mean annual averages for 10 years

24.28 in.	precipitation from	Total in 10 years
0.63 in.	runoff from rainfall from	840 storms
0.02 in.	runoff from snowmelt or winter rainstorm from	22 events
0.423 t ac ⁻¹	upland erosion rate (0.095 kg m ⁻²)	1 events
0.401 t ac ⁻¹	sediment leaving profile (3.421 kg m ⁻¹ width)	

Figure 1. 0-15 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests

Return period analysis based on 10 years of climate				
Return Period	Precipitation (in.)	Runoff (in.)	Erosion (t ac ⁻¹)	Sediment (t ac ⁻¹)
10 year	31.52	1.87	1.23	1.1787
5 year	29.22	1.33	0.81	0.7756
2 year	25.42	0.49	0.32	0.2997
1 year	14.81	0.00	0.00	0.0000
Average	24.28	0.64	0.42	0.4005
Probabilities of occurrence first year following disturbance based on 10 years of climate				
Probability there is runoff	90 %			
Probability there is erosion	90 %			
Probability there is sediment delivery	90 %			

Figure 2. 0-15 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests

User inputs

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	high severity fire	40	50	0	50
		27			
Lower	high severity fire	27	75	0	30
		15			
Description					

Mean annual averages for 10 years

		Total in 10 years
24.28 in.	precipitation from	840 storms
1.10 in.	runoff from rainfall from	38 events
0.01 in.	runoff from snowmelt or winter rainstorm from	2 events
2.683 t ac ⁻¹	upland erosion rate (0.603 kg m ⁻²)	
2.683 t ac ⁻¹	sediment leaving profile (22.98 kg m ⁻¹ width)	

Figure 3. 15-40 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests

Return period analysis based on 10 years of climate				
Return Period	Precipitation (in.)	Runoff (in.)	Erosion (t ac ⁻¹)	Sediment (t ac ⁻¹)
10 year	31.52	2.99	6.89	6.8930
5 year	29.22	1.73	4.20	4.1964
2 year	25.42	0.97	2.51	2.5060
1 year	14.81	0.00	0.00	0.0000
Average	24.28	1.10	2.68	2.6834

Probabilities of occurrence first year following disturbance based on 10 years of climate		
Probability there is runoff	90 %	
Probability there is erosion	90 %	
Probability there is sediment delivery	90 %	

Figure 4. 15-40 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests

User inputs

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	high severity fire	80	100	0	50
		60			
Lower	high severity fire	60	100	0	50
		40			
Description					

Mean annual averages for 10 years

		Total in 10 years
24.28 in.	precipitation from	840 storms
1.14 in.	runoff from rainfall from	36 events
0.01 in.	runoff from snowmelt or winter rainstorm from	1 events
6.226 t ac ⁻¹	upland erosion rate (1.399 kg m ⁻²)	
6.226 t ac ⁻¹	sediment leaving profile (85.315 kg m ⁻¹ width)	

Figure 5. 40-120 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests

Return period analysis based on 10 years of climate				
Return Period	Precipitation (in.)	Runoff (in.)	Erosion (t ac ⁻¹)	Sediment (t ac ⁻¹)
10 year	31.52	3.10	15.89	15.8904
5 year	29.22	1.77	9.57	9.5673
2 year	25.42	1.03	5.91	5.9155
1 year	14.81	0.00	0.00	0.0000
Average	24.28	1.15	6.23	6.2256

Probabilities of occurrence first year following disturbance based on 10 years of climate		
Probability there is runoff	90 %	
Probability there is erosion	90 %	
Probability there is sediment delivery	90 %	

Figure 6. 40-120 Percent Slopes, High Burn Severity, Loam Soils on Ponderosa Pine/MC Forests

0-15 percent Slopes, Low Burn Severity (Prescribed and Managed Fires): Up to 10 percent moderate, Up to 5 percent high and 85percent low severity. Loam Soils on Ponderosa Pine/MC Forests. Assuming a reduction of vegetative ground cover of 10 percent below prefire (current veg ground cover conditions). Existing veg ground cover = 65percent and reduced to 50 percent with fire.

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	low severity fire	15	50	50	20
		7			
Lower	low severity fire	7	75	50	20
		0			
Description					

Mean annual averages for 10 years

		Total in 10 years
24.28 in.	precipitation from	840 storms
0.06 in.	runoff from rainfall from	11 events
0.03 in.	runoff from snowmelt or winter rainstorm from	1 events
0.004 t ac ⁻¹	upland erosion rate (0.001 kg m ⁻²)	
0.004 t ac ⁻¹	sediment leaving profile (0.039 kg m ⁻¹ width)	

Figure 7. 0-15 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires)

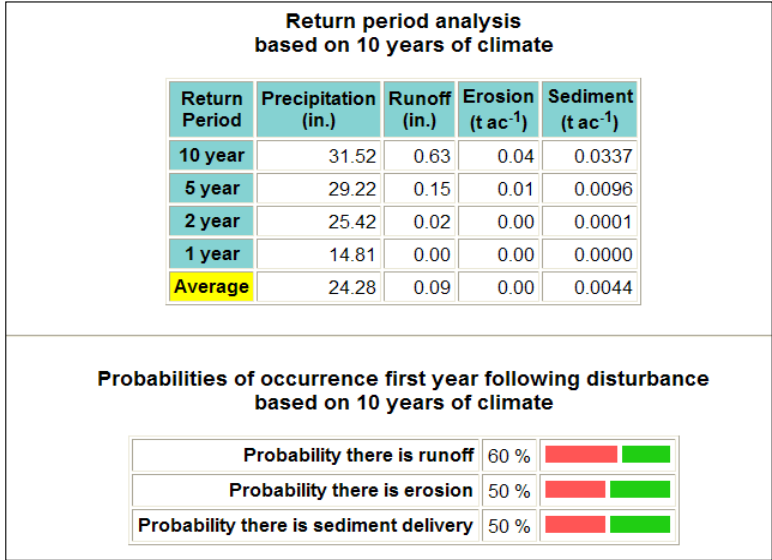


Figure 8. 0-15 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires)

15-40 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires), 15 percent Moderate and High burn severity, 85percent low, current VGC = 65percent and reduced to 50 percent from fire, loam soils.

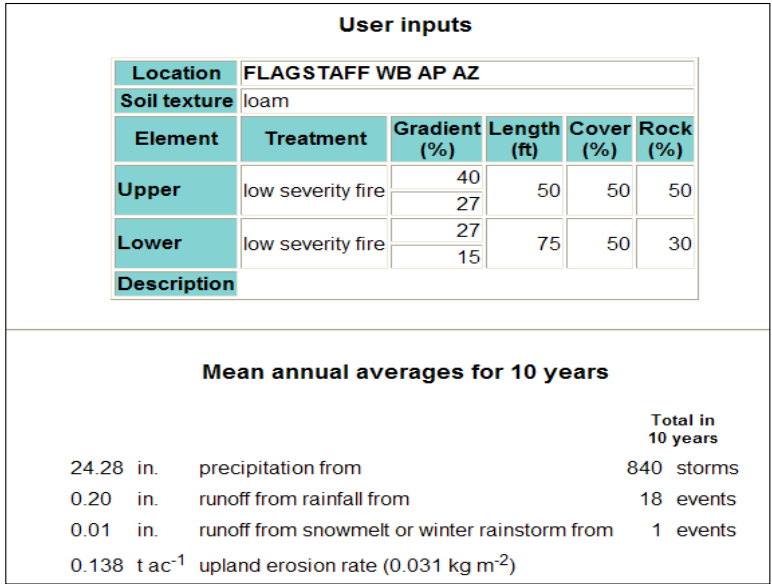


Figure 9. 15-40 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires)

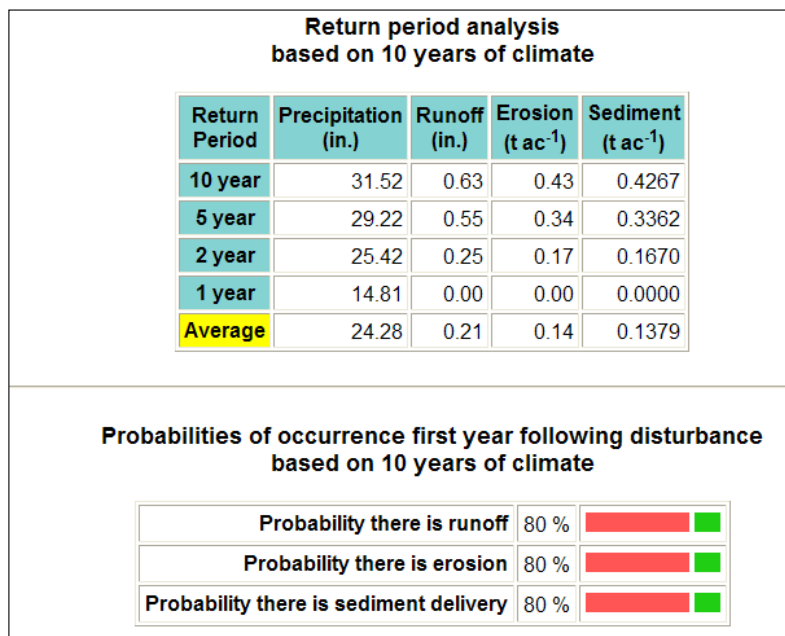


Figure 10. 15-40 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires)

40-120 percent Slopes, Low Burn Severity (Prescribed & Managed Fires), 15percent Moderate and High burn severity, 85percent low, current VGC = 70 percent and reduced to 55 percent from fire, loam soils.

User inputs

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	low severity fire	80	100	55	50
		60			
Lower	low severity fire	60	100	55	50
		40			
Description					

Mean annual averages for 10 years

		Total in 10 years
24.28 in.	precipitation from	840 storms
0.22 in.	runoff from rainfall from	18 events
0.00 in.	runoff from snowmelt or winter rainstorm from	0 events
0.365 t ac ⁻¹	upland erosion rate (0.082 kg m ⁻²)	

Figure 11. 40-120 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires)

Return period analysis based on 10 years of climate				
Return Period	Precipitation (in.)	Runoff (in.)	Erosion (t ac ⁻¹)	Sediment (t ac ⁻¹)
10 year	31.52	0.67	1.08	1.0751
5 year	29.22	0.54	0.83	0.8272
2 year	25.42	0.27	0.40	0.4033
1 year	14.81	0.00	0.00	0.0000
Average	24.28	0.22	0.36	0.3649

Probabilities of occurrence first year following disturbance based on 10 years of climate		
Probability there is runoff	80 %	
Probability there is erosion	80 %	
Probability there is sediment delivery	80 %	

Figure 12. 40-120 Percent Slopes, Low Burn Severity (Prescribed and Managed Fires)

0-15 percent Slopes, Loam Soils on Ponderosa Pine Mature Forests. Current veg ground cover = 65 percent and no reduction in veg ground cover because no treatments or ground disturbance planned.

User inputs

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	mature forest	15	50	65	20
		7			
Lower	mature forest	7	75	65	20
		0			
Description					

Mean annual averages for 10 years

			Total in 10 years
24.28 in.	precipitation from		840 storms
0.00 in.	runoff from rainfall from		0 events
0.03 in.	runoff from snowmelt or winter rainstorm from		1 events
0.000 t ac ⁻¹	upland erosion rate (0 kg m ⁻²)		
0.000 t ac ⁻¹	sediment leaving profile (0 kg m ⁻¹ width)		

Figure 13. 0-15 percent slopes, loam soils on ponderosa pine mature forests

Return period analysis based on 10 years of climate				
Return Period	Precipitation (in.)	Runoff (in.)	Erosion (t ac ⁻¹)	Sediment (t ac ⁻¹)
10 year	31.52	0.30	0.00	0.0000
5 year	29.22	0.00	0.00	0.0000
2 year	25.42	0.00	0.00	0.0000
1 year	14.81	0.00	0.00	0.0000
Average	24.28	0.03	0.00	0.0000

Probabilities of occurrence first year following disturbance based on 10 years of climate			
Probability there is runoff	10 %		
Probability there is erosion	0 %		
Probability there is sediment delivery	0 %		

Figure 14. 0-15 percent slopes, loam soils on ponderosa pine mature forests

15-40 percent Slopes, Loam Soils on Ponderosa Pine Mature Forests. Current veg ground cover = 65 percent and no reduction in veg ground cover because no treatments or ground disturbance planned.

User inputs

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	mature forest	40	50	65	50
		27			
Lower	mature forest	27	75	65	30
		15			
Description					

Mean annual averages for 10 years

		Total in 10 years
24.28 in.	precipitation from	840 storms
0.00 in.	runoff from rainfall from	1 events
0.01 in.	runoff from snowmelt or winter rainstorm from	1 events
0.000 t ac ⁻¹	upland erosion rate (0 kg m ⁻²)	
0.000 t ac ⁻¹	sediment leaving profile (0 kg m ⁻¹ width)	

Figure 15. 15 to 40 percent slopes, loam soils on ponderosa pine mature forests

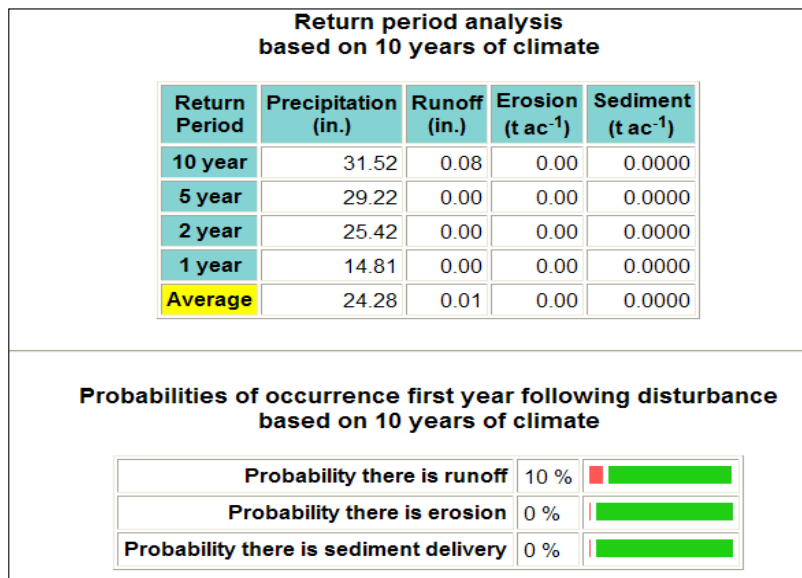


Figure 16. 15 to 40 percent slopes, loam soils on ponderosa pine mature forests
40-120 percent slopes, loam soils on ponderosa pine mature forests. Current veg ground cover = 70 percent and no reduction in veg ground cover because no treatments or ground disturbance planned.

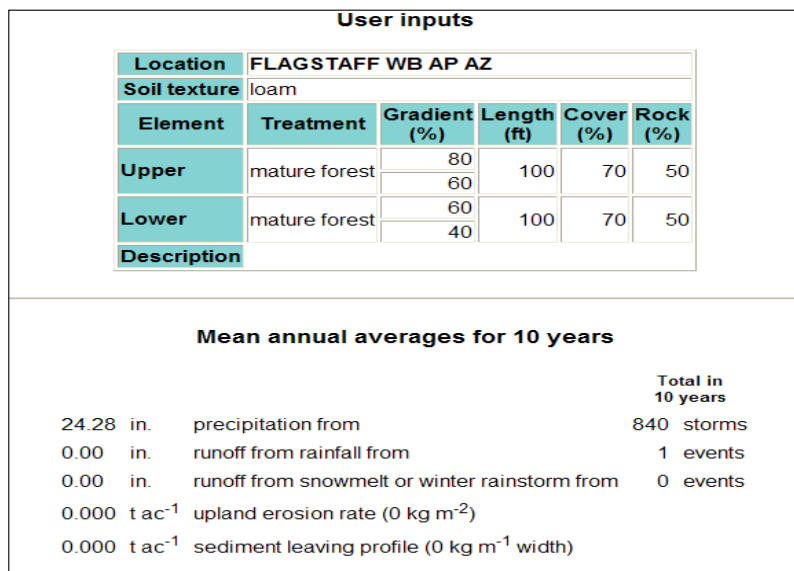


Figure 17. 40-120 percent slopes, loam soils on ponderosa pine mature forests

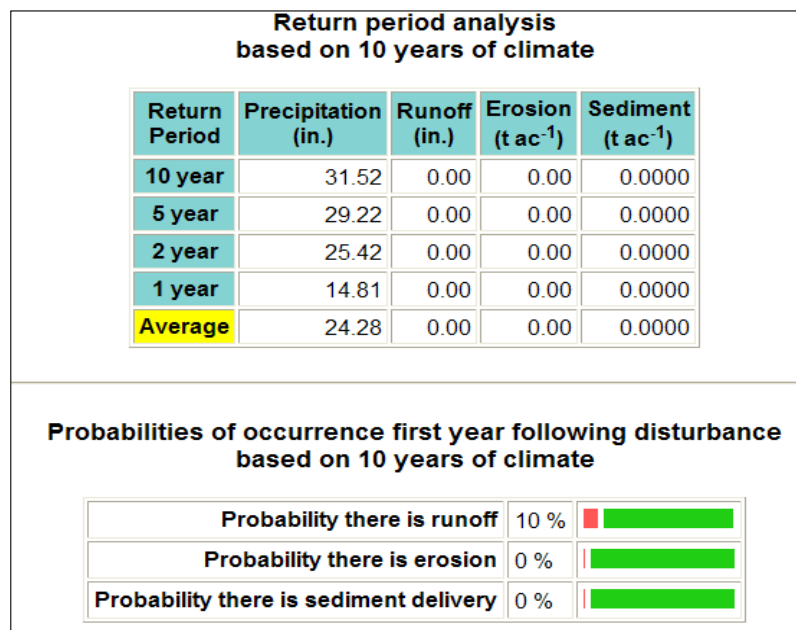


Figure 18. 40-120 percent slopes, loam soils on ponderosa pine mature forests

0-15 percent slopes, loam soils on ponderosa pine thinned, young forests. Best management practice monitoring on the Mogollon Rim Ranger District (Jagow 1994, Fleishman 1996 and Fleishman 2005) has shown that ground disturbance (skidded to mineral soil) and compaction may occur on the approximately 10-15 percent of the thinning area when mechanized skidding and harvesting occur when designated ski trails are utilized. 15percent reduction in current veg ground cover used for Thinning Treatments. Current veg ground cover = 65percent and reduced by 15 percent to 50 percent

User inputs					
Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	thin or young forest	15	50	50	20
		7			
Lower	thin or young forest	7	75	50	20
		0			
Description					

Mean annual averages for 10 years		
		Total in 10 years
24.28 in.	precipitation from	840 storms
0.00 in.	runoff from rainfall from	0 events
0.02 in.	runoff from snowmelt or winter rainstorm from	1 events
0.000 t ac ⁻¹	upland erosion rate (0 kg m ⁻²)	
0.000 t ac ⁻¹	sediment leaving profile (0 kg m ⁻¹ width)	

Figure 19. 0-15 percent slopes, loam soils on ponderosa pine thinned, young forests

Return Period	Precipitation (in.)	Runoff (in.)	Erosion (t ac ⁻¹)	Sediment (t ac ⁻¹)
10 year	31.52	0.22	0.00	0.0000
5 year	29.22	0.00	0.00	0.0000
2 year	25.42	0.00	0.00	0.0000
1 year	14.81	0.00	0.00	0.0000
Average	24.28	0.02	0.00	0.0000

Probabilities of occurrence first year following disturbance based on 10 years of climate		
Probability there is runoff	10 %	
Probability there is erosion	0 %	
Probability there is sediment delivery	0 %	

Figure 20. 0-15 percent slopes, loam soils on ponderosa pine thinned, young forests

15-40 percent Slopes, Loam Soils on Ponderosa Pine Thinned, Young Forests. Ground disturbance (skidded to mineral soil) and compaction may occur on the approximately 10-15 percent of the thinning area when mechanized skidding and harvesting occur when designated ski trails are utilized. 15 percent Reduction in current veg ground cover used for Thinning Treatments. Current veg ground cover = 65 percent and reduced by 15 percent to 50 percent.

User inputs

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	thin or young forest	40	50	50	50
		27			
Lower	thin or young forest	27	75	50	30
		15			
Description					

Mean annual averages for 10 years

		Total in 10 years
24.28 in.	precipitation from	840 storms
0.02 in.	runoff from rainfall from	6 events
0.00 in.	runoff from snowmelt or winter rainstorm from	1 events
0.004 t ac ⁻¹	upland erosion rate (0.001 kg m ⁻²)	
0.004 t ac ⁻¹	sediment leaving profile (0.041 kg m ⁻¹ width)	

Figure 21. 15-40 percent slopes, loam soils on ponderosa pine thinned, young forests

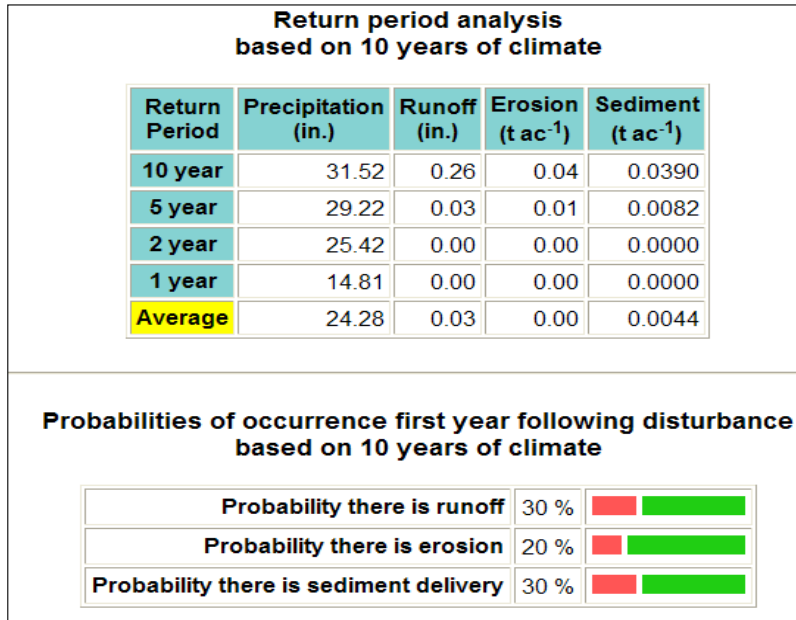


Figure 22. 15-40 percent slopes, loam soils on ponderosa pine thinned, young forests

40-120 percent Slopes, Loam Soils on Ponderosa Pine Thinned, Young Forests. No ground disturbing mechanical harvest so overall no ground disturbance from machinery. Hand felling may disturb up to 10 percent of soil surface. 10 percent Reduction in current veg ground cover used for Thinning Treatments. Current veg ground cover = 70 percent and reduced by 10 percent to 60 percent

User inputs

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	thin or young forest	80	100	60	50
		60			
Lower	thin or young forest	60	100	60	50
		40			
Description					

Mean annual averages for 10 years

		Total in 10 years
24.28 in.	precipitation from	840 storms
0.03 in.	runoff from rainfall from	6 events
0.00 in.	runoff from snowmelt or winter rainstorm from	0 events
0.009 t ac ⁻¹	upland erosion rate (0.002 kg m ⁻²)	
0.009 t ac ⁻¹	sediment leaving profile (0.14 kg m ⁻¹ width)	

Figure 23. 40-120 percent slopes, loam soils on ponderosa pine thinned, young forests

Return period analysis based on 10 years of climate				
Return Period	Precipitation (in.)	Runoff (in.)	Erosion (t ac ⁻¹)	Sediment (t ac ⁻¹)
10 year	31.52	0.24	0.08	0.0835
5 year	29.22	0.03	0.02	0.0187
2 year	25.42	0.00	0.00	0.0000
1 year	14.81	0.00	0.00	0.0000
Average	24.28	0.03	0.01	0.0089

Probabilities of occurrence first year following disturbance based on 10 years of climate		
Probability there is runoff	40 %	
Probability there is erosion	20 %	
Probability there is sediment delivery	20 %	

Figure 24. 40-120 percent slopes, loam soils on ponderosa pine thinned, young forests

15-40 percent Slopes, Loam Soils on Ponderosa Pine Thinned, Young Forests. Complete removal of veg ground cover to 0 percent. Current veg ground cover = 65 percent and reduced by 15 percent to 50 percent.

User inputs

Location	FLAGSTAFF WB AP AZ				
Soil texture	loam				
Element	Treatment	Gradient (%)	Length (ft)	Cover (%)	Rock (%)
Upper	thin or young forest	40	50	0	50
		27			
Lower	thin or young forest	27	75	0	50
		15			
Description	15-40% slopes. No Cover. 4-FRI				

Mean annual averages for 10 years

		Total in 10 years
24.28 in.	precipitation from	840 storms
0.24 in.	runoff from rainfall from	8 events
0.00 in.	runoff from snowmelt or winter rainstorm from	0 events
0.160 t ac ⁻¹	upland erosion rate (0.036 kg m ⁻²)	
0.160 t ac ⁻¹	sediment leaving profile (1.356 kg m ⁻¹ width)	

Figure 25. 15-40 percent slopes, loam soils on ponderosa pine thinned, young forests

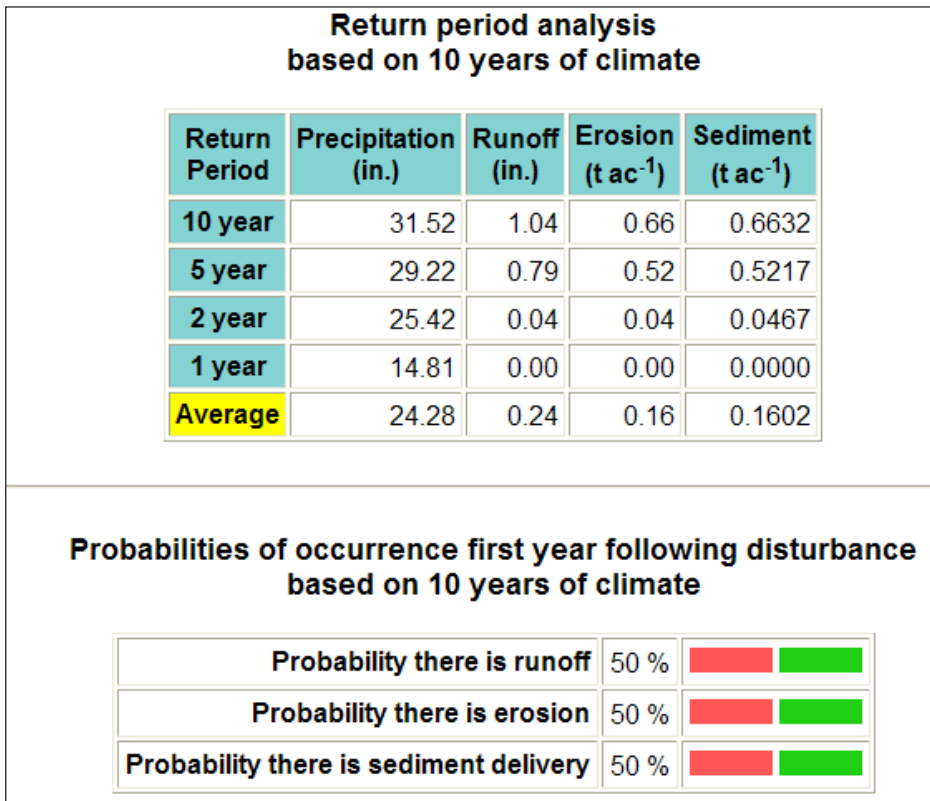


Figure 26. 15-40 percent slopes, loam soils on ponderosa pine thinned, young forests

Treatment Area (Alt A) Potential Soil Loss from High Severity Fire

Slopes	Acres	Modeled for 10 Year Return Period	Threshold in tons/acre/year	Soil Loss in Tons (10 yr Storm)	% of Slope Class & Forest With Erosion Above Threshold	Assuming 40% of Areas Burn at High Burn Severity. % Above T
0-15%	457491	1.2	2 - 4	548989	0	0
>40%	32284	15.9	2 - 4	513310	5	2
15-40%	104809	6.9	1 - 3	723180	18	7
Grand Total	595707			1785479	24	9

Attachment 3. Soil Interpretations by Watershed, Strata and TESU

Table 37. Alt. B. Soil Interpretations by Watershed, Strata and TESU

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
Anderson Canyon	Grassland Restoration	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	6
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	74
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	0
			0586_COCONINO	Moderate	Slight	0-15%	Sat	0
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	59
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	6
		009	0050_COCONINO	NA	Slight	0-5%	Sat	8
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	442
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	23
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	107
			0586_COCONINO	Moderate	Slight	0-15%	Sat	213
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	14
			0584_COCONINO	Severe	Severe	15-40%	Sat	50
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	256
		046	0453_COCONINO	NA	Mod	0-15%	Unsat	1
	Lower Intensity Mechanical	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	75
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	18
			0586_COCONINO	Moderate	Slight	0-15%	Sat	116
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	30
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	1
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	58
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	13

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0586_COCONINO	Moderate	Slight	0-15%	Sat	27
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	32
		009	0050_COCONINO	NA	Slight	0-5%	Sat	31
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	24
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	600
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	7
			0586_COCONINO	Moderate	Slight	0-15%	Sat	14
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	12
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	362
		046	0453_COCONINO	NA	Mod	0-15%	Unsat	49
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	3
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	85
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	90
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	15
			0586_COCONINO	Moderate	Slight	0-15%	Sat	2
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	464
Babbitt Lake	Aspen Treatment	023	0586_COCONINO	Moderate	Slight	0-15%	Sat	53
		027	0582a_COCONINO	Moderate	Slight	0-15%	Sat	55
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	13
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	1
	Grassland Restoration	003	0595_COCONINO	NA	Slight	0-15%	Sat	2
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	111
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	1
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	26
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	4

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
							sat	
		003	0595_COCONINO	NA	Slight	0-15%	Sat	18
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	90
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	1,502
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	18
			0557a_COCONINO	Severe	Slight	0-15%	Sat	283
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	2,139
		039	0505_COCONINO	Moderate	Slight	0-15%	Sat	129
			0517_COCONINO	Moderate	Slight	0-15%	Sat	3
			0523_COCONINO	Severe	Slight	0-15%	Sat	1,309
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	13
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	27
		046	0440_COCONINO	NA	Slight	0-15%	Sat	43
		047	0450_COCONINO	NA	Mod	15 to 120%	Sat	26
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	1
	Lower Intensity Mechanical	003	0595_COCONINO	NA	Slight	0-15%	Sat	1
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	16
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	288
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	258
			0557a_COCONINO	Severe	Slight	0-15%	Sat	29
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	974
		039	0505_COCONINO	Moderate	Slight	0-15%	Sat	0
			0517_COCONINO	Moderate	Slight	0-15%	Sat	49
			0523_COCONINO	Severe	Slight	0-15%	Sat	47
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	98
		046	0440_COCONINO	NA	Slight	0-15%	Sat	23

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		047	0449_COCONINO	NA	Severe	15 to 120%	Unsuit	7
			0450_COCONINO	NA	Mod	15 to 120%	Sat	39
		049	0612_COCONINO	Severe	Severe	40 to 120%	Sat	50
	Prescribed Fire Only	006	0507_KAIBAB	NA	Slight	0-15%	Sat	13
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	41
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	182
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	56
			0557a_COCONINO	Severe	Slight	0-15%	Sat	236
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	114
		039	0505_COCONINO	Moderate	Slight	0-15%	Sat	18
			0517_COCONINO	Moderate	Slight	0-15%	Sat	885
			0523_COCONINO	Severe	Slight	0-15%	Sat	671
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	33
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	420
		047	0449_COCONINO	NA	Severe	15 to 120%	Unsuit	706
			0450_COCONINO	NA	Mod	15 to 120%	Sat	9
		049	0612_COCONINO	Severe	Severe	40 to 120%	Sat	0
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	76
		003	0595_COCONINO	NA	Slight	0-15%	Sat	297
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	5

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	1,406
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	107
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	3
			0557a_COCONINO	Severe	Slight	0-15%	Sat	19
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	134
		039	0505_COCONINO	Moderate	Slight	0-15%	Sat	7
			0517_COCONINO	Moderate	Slight	0-15%	Sat	3
			0523_COCONINO	Severe	Slight	0-15%	Sat	549
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	6
		047	0450_COCONINO	NA	Mod	15 to 120%	Sat	4
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	5
		003	0595_COCONINO	NA	Slight	0-15%	Sat	28
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	59
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	352
		027	0557a_COCONINO	Severe	Slight	0-15%	Sat	1
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	684
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	22
		039	0505_COCONINO	Moderate	Slight	0-15%	Sat	0
			0523_COCONINO	Severe	Slight	0-15%	Sat	478
		046	0440_COCONINO	NA	Slight	0-15%	Sat	3
Bar M Canyon	Grassland Restoration	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	11
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	0
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	4
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	58

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1,201
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	223
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	80
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	2,010
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1,059
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	23
			0584_COCONINO	Severe	Severe	15-40%	Sat	727
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	11
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	47
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	877
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	548
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	124
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	2,812
			0586_COCONINO	Moderate	Slight	0-15%	Sat	163
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	7
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	378
			0584_COCONINO	Severe	Severe	15-40%	Sat	661
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	31
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	19
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	197
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	166
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	15
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	1,128
			0586_COCONINO	Moderate	Slight	0-15%	Sat	219
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	26

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0584_COCONINO	Severe	Severe	15-40%	Sat	1,006
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	50
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	550
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	94
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	82
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	98
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	125
			0586_COCONINO	Moderate	Slight	0-15%	Sat	47
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	7
			0584_COCONINO	Severe	Severe	15-40%	Sat	35
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	15
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	23
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	250
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	2
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	125
			0586_COCONINO	Moderate	Slight	0-15%	Sat	81
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	19
			0584_COCONINO	Severe	Severe	15-40%	Sat	70
Bear Canyon	Aspen Treatment	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	0
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	8
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	11
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	13
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	3

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	7
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	35
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	3
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	10
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	377
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	115
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	2
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	73
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	148
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	155
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	13
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	65
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	523
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	9
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	84
		046	0543_KAIBAB	NA	Slight	0-15%	Sat	6
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	4
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	11
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	7
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	931
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	84
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	170
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	526
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	1,393
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	403

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	376
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1,003
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	329
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	130
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	160
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	1
			0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	0
	Prescribed Fire Only	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	1
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	125
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	19
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	3
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	30
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	5
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	15
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	39
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	28
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	85
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	187
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	17
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	18
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	21
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	18
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	8

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	17
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	82
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	3
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	33
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	31
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	21
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	85
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	59
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	40
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	19
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	25
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	41
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	3
Bear Jaw Canyon	Higher Intensity Mechanical	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	548
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	33
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	106
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	49
		046	0445_COCONINO	NA	Slight	0-15%	Sat	2
			0473_COCONINO	NA	Slight	0-15%	Sat	0
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	1
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	31
	Lower Intensity Mechanical	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	355
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	4
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	559
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	372

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	48
		046	0445_COCONINO	NA	Slight	0 û15%	Sat	5
			0473_COCONINO	NA	Slight	0 û15%	Sat	10
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	7
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	102
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	88
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	119
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	124
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	21
		046	0473_COCONINO	NA	Slight	0 û15%	Sat	27
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	11
	Prescribed Fire Only - Operational	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	57
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	3
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	139
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	95
		046	0445_COCONINO	NA	Slight	0 û15%	Sat	97
			0473_COCONINO	NA	Slight	0 û15%	Sat	321
	Savanna	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	308
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	2
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	73
Big Spring Canyon	Aspen Treatment	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	14
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	23
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	12
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	1
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	10

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	86
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	1
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	10
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	12
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	1
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	2
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	102
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	4
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	0
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	3,989
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	670
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	1,828
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	108
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	152
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	510
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	0
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	4
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	17
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	1,075
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	38
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	839
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	674
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	95
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	732
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	908

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	12
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	7
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	2
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	221
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	34
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	93
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	20
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	1
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	300
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	19
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	366
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	50
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	17
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	62
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	8
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	129
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	180
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	19
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	37
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	32
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	108

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	23
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	774
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	285
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	347
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	122
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	33
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	55
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	2
Cataract Creek Headwaters	Aspen Treatment	009	0020_KAIBAB	NA	Slight	0-5%	Sat	1
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
	Grassland Restoration	006	0507_KAIBAB	NA	Slight	0-15%	Sat	441
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	6
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	4
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	3
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	20
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	2
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	6
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	25
		046	0514_KAIBAB	NA	Slight	0-15%	Sat	10
	Higher Intensity Mechanical	006	0507_KAIBAB	NA	Slight	0-15%	Sat	26
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	6
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	8
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	68
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	2
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	425

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	49
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	41
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	0
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	15
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	181
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	106
		046	0514_KAIBAB	NA	Slight	0-15%	Sat	1
	Lower Intensity Mechanical	006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	1
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	4
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	11
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	18
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	1
	Prescribed Fire Only	006	0507_KAIBAB	NA	Slight	0-15%	Sat	91
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	8
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	7
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	5
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	8
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
		046	0514_KAIBAB	NA	Slight	0-15%	Sat	1
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1
		006	0036_KAIBAB	NA	Slight	0-15%	Sat	0
			0507_KAIBAB	NA	Slight	0-15%	Sat	398
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	80
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	53

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	53
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	179
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	30
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	6
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	1
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	60
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	11
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	23
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	32
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	40
		046	0514_KAIBAB	NA	Slight	0-15%	Sat	54
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	16
	Savanna	006	0507_KAIBAB	NA	Slight	0-15%	Sat	24
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	21
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	55
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	12
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	20
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	2
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	1
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	82
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	15
Cedar Creek	Grassland Restoration	014	0565_KAIBAB	Severe	Slight	0-15%	Sat	1
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	18
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	117
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	7

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		047	0589_KAIBAB	NA	Mod	15 to 120%	Unsat	2
	Higher Intensity Mechanical	014	0565_KAIBAB	Severe	Slight	0-15%	Sat	37
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	1
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	18
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	115
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	22
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	196
		046	0543_KAIBAB	NA	Slight	0-15%	Sat	20
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	5
			0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	1
	Lower Intensity Mechanical	014	0565_KAIBAB	Severe	Slight	0-15%	Sat	8
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	10
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	15
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	82
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	41
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	13
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	9
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	2
	Prescribed Fire Only	032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	21
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	14
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	9
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	3
		047	0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	1

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Prescribed Fire Only - Operational	014	0565_KAIBAB	Severe	Slight	0-15%	Sat	7
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	4
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	2
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	16
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	3
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	35
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	21
			0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	1
	Savanna	014	0565_KAIBAB	Severe	Slight	0-15%	Sat	13
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	17
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	5
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	1
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	7
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	59
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	9
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	11
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	1
			0523_KAIBAB	NA	Severe	15 to 120%	Unsat	1
Cherry Canyon-Walnut Creek	Higher Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	60
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	11
		022	0527_COCONINO	Moderate	Mod	15-40%	Sat	111
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	1
		025	0567_COCONINO	Severe	Slight	0-15%	Sat	104

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	1,086
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	45
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	1,107
		039	0500_COCONINO	Severe	Slight	0-15%	Sat	2
			0523_COCONINO	Severe	Slight	0-15%	Sat	12
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	68
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	11
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	117
		047	0455_COCONINO	NA	Severe	15 to 120%	Unsuit	14
		City_Coconino	City_COCONINO	(blank)	(blank)	(blank)	(blank)	2
	Lower Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	13
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	19
		022	0527_COCONINO	Moderate	Mod	15-40%	Sat	425
		025	0567_COCONINO	Severe	Slight	0-15%	Sat	639
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	193
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	323
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	157
		039	0500_COCONINO	Severe	Slight	0-15%	Sat	987
			0523_COCONINO	Severe	Slight	0-15%	Sat	0
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	10
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	69
		046	0490_COCONINO	NA	Slight	0 to 15%	Sat	3
		047	0439_COCONINO	NA	Mod	15 to	Sat	5

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
			0455_COCONINO	NA	Severe	15 to 120%	Unsuit	160
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only	001	0053_COCONINO	NA	Slight	0-5%	Sat	9
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	41
		022	0527_COCONINO	Moderate	Mod	15-40%	Sat	40
		025	0567_COCONINO	Severe	Slight	0-15%	Sat	11
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	187
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	31
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	243
		039	0500_COCONINO	Severe	Slight	0-15%	Sat	137
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	0
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	34
		047	0455_COCONINO	NA	Severe	15 to 120%	Unsuit	103
	Prescribed Fire Only - Operational	001	0053_COCONINO	NA	Slight	0-5%	Sat	123
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	9
		022	0527_COCONINO	Moderate	Mod	15-40%	Sat	133
		025	0567_COCONINO	Severe	Slight	0-15%	Sat	8
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	124
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	83
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	95
		039	0500_COCONINO	Severe	Slight	0-15%	Sat	22

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0523_COCONINO	Severe	Slight	0-15%	Sat	13
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	92
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	22
		047	0439_COCONINO	NA	Mod	15 to 120%	Sat	230
			0455_COCONINO	NA	Severe	15 to 120%	Unsuit	79
	Savanna	022	0527_COCONINO	Moderate	Mod	15-40%	Sat	23
		025	0567_COCONINO	Severe	Slight	0-15%	Sat	14
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	6
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	7
		039	0500_COCONINO	Severe	Slight	0-15%	Sat	2
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	0
Cinder Basin	Prescribed Fire Only	021	0015_COCONINO	Slight	Slight	15-40%	NA/Sat	56
			0511_COCONINO	Moderate	Mod	15-40%	Sat	200
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	635
		030	0559_COCONINO	Slight	Slight	0-15%	Sat	2,287
		031	0561_COCONINO	Moderate	Mod	15-40%	Sat	1,115
		040	0510_COCONINO	Slight	Slight	0-15%	Sat	1,563
			0512_COCONINO	Slight	Slight	0-15%	Sat	207
		046	0426_COCONINO	NA	Slight	0-15%	Sat	50
			0433_COCONINO	NA	Slight	0-15%	Sat	0
			0443_COCONINO	NA	Slight	0-15%	Sat	65
		047	0427_COCONINO	NA	Mod	15 to 120%	Sat	13
			0441_COCONINO	NA	Mod	15 to 120%	Sat	149
	Prescribed Fire Only -	021	0015_COCONINO	Slight	Slight	15-40%	NA/Sat	236

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Operational							
			0511_COCONINO	Moderate	Mod	15-40%	Sat	106
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	380
		030	0559_COCONINO	Slight	Slight	0-15%	Sat	82
		031	0561_COCONINO	Moderate	Mod	15-40%	Sat	295
		040	0510_COCONINO	Slight	Slight	0-15%	Sat	177
			0512_COCONINO	Slight	Slight	0-15%	Sat	0
		046	0426_COCONINO	NA	Slight	0 û15%	Sat	6
			0433_COCONINO	NA	Slight	0 û15%	Sat	129
		047	0427_COCONINO	NA	Mod	15 to 120%	Sat	58
			0441_COCONINO	NA	Mod	15 to 120%	Sat	393
Coconino Wash Headwaters	Higher Intensity Mechanical	001	0009_KAIBAB	NA	Slight	0-5%	Sat	72
		011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	1,036
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	117
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	0
		017	0266_KAIBAB	Moderate	Severe	15-40%	Unsat	52
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	554
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	9
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	22
	Lower Intensity Mechanical	001	0009_KAIBAB	NA	Slight	0-5%	Sat	317
			0011_KAIBAB	NA	Slight	0-5%	Sat	9
		011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	7,044
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	1,806
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	33
		017	0266_KAIBAB	Moderate	Severe	15-40%	Unsat	869
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	5,077

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0293_KAIBAB	Moderate	Slight	0-15%	Sat	21
		032	0294_KAIBAB	Moderate	Severe	15-40%	Sat	17
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	358
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	74
	Pine Sage	001	0009_KAIBAB	NA	Slight	0-5%	Sat	1
			0011_KAIBAB	NA	Slight	0-5%	Sat	14
		011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	76
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	2,246
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	120
		017	0266_KAIBAB	Moderate	Severe	15-40%	Unsat	0
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	125
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	418
	Prescribed Fire Only	001	0009_KAIBAB	NA	Slight	0-5%	Sat	254
			0011_KAIBAB	NA	Slight	0-5%	Sat	6
		011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	1,832
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	956
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	40
		017	0266_KAIBAB	Moderate	Severe	15-40%	Unsat	181
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	1,940
			0293_KAIBAB	Moderate	Slight	0-15%	Sat	23
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	132
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	257
	Prescribed Fire Only - Operational	001	0009_KAIBAB	NA	Slight	0-5%	Sat	37
			0011_KAIBAB	NA	Slight	0-5%	Sat	5
		011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	11
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	774
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	22

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		017	0266_KAIBAB	Moderate	Severe	15-40%	Unsat	20
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	34
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	43
	WUI PJ Trt	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	134
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	1
		046	0260_KAIBAB	NA	Mod	0-15%	Sat	8
Curley Wallace Tank	Higher Intensity Mechanical	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	76
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	0
	Lower Intensity Mechanical	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	1
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	0
Dent and Sayer Tank	Aspen Treatment	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	1
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	1
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	11
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	0
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	2
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	4
	Grassland Restoration	019	0515_COCONINO	NA	Mod	15-40%	Unsat	20
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	2
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Higher Intensity Mechanical	006	0507_KAIBAB	NA	Slight	0-15%	Sat	37
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	184
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	30
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	10
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	21

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	139
			0551_COCONINO	Moderate	Slight	0-15%	Sat	29
			0557a_COCONINO	Severe	Slight	0-15%	Sat	2
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	1,294
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	2
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	62
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	58
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	1
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	20
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	23
			0523_COCONINO	Severe	Slight	0-15%	Sat	531
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	297
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	23
			0564_KAIBAB	Severe	Severe	15-40%	Unsat	2
		046	0599_KAIBAB	NA	Slight	0 to 15%	Sat	0
		048	0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	1
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	26
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Lower Intensity Mechanical	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	87
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	300
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	149
			0551_COCONINO	Moderate	Slight	0-15%	Sat	240
			0557a_COCONINO	Severe	Slight	0-15%	Sat	0
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	205
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	8

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	23
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	155
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	97
			0523_COCONINO	Severe	Slight	0-15%	Sat	16
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	8
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	0
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	1
			0614_COCONINO	Severe	Severe	0 to 80%	Sat	21
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only	001	0006_KAIBAB	NA	Slight	0-5%	Sat	0
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	6
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	455
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	9
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	60
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	8
			0515_COCONINO	NA	Mod	15-40%	Unsat	0
		027	0304_KAIBAB	Moderate	Slight	0-15%	Sat	319
			0324_KAIBAB	Moderate	Slight	0-15%	Sat	336
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	36
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	182
			0551_COCONINO	Moderate	Slight	0-15%	Sat	211
			0557a_COCONINO	Severe	Slight	0-15%	Sat	21
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	404
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	387

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	1
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	11
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	0
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	231
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	785
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	58
			0405_KAIBAB	Moderate	Slight	0-15%	Sat	49
			0523_COCONINO	Severe	Slight	0-15%	Sat	1
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	413
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	92
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	23
		046	0599_KAIBAB	NA	Slight	0 to 15%	Sat	149
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	155
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	543
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	1
			0614_COCONINO	Severe	Severe	0 to 80%	Sat	3
		049	0612_COCONINO	Severe	Severe	40 to 120%	Sat	0
			0613_COCONINO	Severe	Severe	40 to 120%	Sat	23
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	23

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	6
		006	0036_KAIBAB	NA	Slight	0-15%	Sat	0
			0507_KAIBAB	NA	Slight	0-15%	Sat	69
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	26
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	15
			0515_COCONINO	NA	Mod	15-40%	Unsat	345
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	11
			0557a_COCONINO	Severe	Slight	0-15%	Sat	3
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	4
		036	0310a_KAIBAB	Moderate	Mod	15-40%	Sat	27
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	11
			0405_KAIBAB	Moderate	Slight	0-15%	Sat	18
			0523_COCONINO	Severe	Slight	0-15%	Sat	13
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	203
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	0
			0564_KAIBAB	Severe	Severe	15-40%	Unsat	17
		046	0599_KAIBAB	NA	Slight	0 to 15%	Sat	101
		048	0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	2
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Savanna	006	0507_KAIBAB	NA	Slight	0-15%	Sat	6
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	2
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	190
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	32
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	23
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	98
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	130

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	94
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	7
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	22
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	5
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	1
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	7
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	219
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	10
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	14
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
Devil Dog Canyon	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	6
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	32
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	1
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	0
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	0
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	2
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	128
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	106
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	0
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	26
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	16
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	188
		042	0539_KAIBAB	Severe	Severe	40-	Unsuit	0

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	0
	Prescribed Fire Only	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	14
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
	Prescribed Fire Only - Operational	006	0507_KAIBAB	NA	Slight	0-15%	Sat	10
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	32
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	27
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	162
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	0
		046	0514_KAIBAB	NA	Slight	0-15%	Sat	0
	Savanna	006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	26
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	22
Dogtown Wash	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	14
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	27
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	517
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	5
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	14
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	48
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	13
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	15

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	4
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	2
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	8
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	32
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	87
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	51
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	311
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	650
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	1
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	120
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	50
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	118
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	186
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	77
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	16
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	2
	Lower Intensity Mechanical	006	0507_KAIBAB	NA	Slight	0-15%	Sat	27
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	1
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	102
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	133
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	24
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	19
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	149

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	16
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	20
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only	006	0507_KAIBAB	NA	Slight	0-15%	Sat	2
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	62
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	14
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	110
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	16
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	11
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	59
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	7
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	14
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	1
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	13
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	8
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	223
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	63
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	3
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	30
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	26
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	44
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	16

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	142
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	0
	Savanna	003	0513_KAIBAB	NA	Slight	0-15%	Sat	13
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	65
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	73
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	192
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	105
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	70
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	89
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	45
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	0
Doney Park	Higher Intensity Mechanical	027	0551_COCONINO	Moderate	Slight	0-15%	Sat	16
	Lower Intensity Mechanical	027	0551_COCONINO	Moderate	Slight	0-15%	Sat	491
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	67
		042	0596_COCONINO	Severe	Severe	40-120%	Sat	2
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	182
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	21
	Prescribed Fire Only	006	0566_COCONINO	NA	Slight	0-15%	Sat	123
		021	0011_COCONINO	Slight	Slight	15-40%	NA/Sat	16
			0014_COCONINO	Slight	Slight	15-40%	NA/Sat	187

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0015_COCONINO	Slight	Slight	15-40%	NA/Sat	87
			0511_COCONINO	Moderate	Mod	15-40%	Sat	237
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	648
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	749
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	232
		030	0558_COCONINO	Slight	Slight	0-15%	Sat	2,213
			0559_COCONINO	Slight	Slight	0-15%	Sat	3,437
		031	0561_COCONINO	Moderate	Mod	15-40%	Sat	747
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	121
		040	0512_COCONINO	Slight	Slight	0-15%	Sat	425
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	549
			0596_COCONINO	Severe	Severe	40-120%	Sat	279
		047	0441_COCONINO	NA	Mod	15 to 120%	Sat	302
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	29
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	152
	Prescribed Fire Only - Operational	006	0566_COCONINO	NA	Slight	0-15%	Sat	312
		021	0011_COCONINO	Slight	Slight	15-40%	NA/Sat	9
			0014_COCONINO	Slight	Slight	15-40%	NA/Sat	669
			0015_COCONINO	Slight	Slight	15-40%	NA/Sat	228
			0511_COCONINO	Moderate	Mod	15-40%	Sat	93
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	89
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	231
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	2
		030	0558_COCONINO	Slight	Slight	0-15%	Sat	38

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0559_COCONINO	Slight	Slight	0-15%	Sat	218
		031	0561_COCONINO	Moderate	Mod	15-40%	Sat	68
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	20
		040	0512_COCONINO	Slight	Slight	0-15%	Sat	34
		042	0596_COCONINO	Severe	Severe	40-120%	Sat	40
		047	0441_COCONINO	NA	Mod	15 to 120%	Sat	489
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	17
Double Cabin Park-Jacks Canyon	Aspen Treatment	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	1
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	16
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	2
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	0
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	26
		009	0050_COCONINO	NA	Slight	0-5%	Sat	7
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	202
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	308
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	42
			0584_COCONINO	Severe	Severe	15-40%	Sat	24
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	2
		009	0050_COCONINO	NA	Slight	0-5%	Sat	1
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	156
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	222
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	351
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	14

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0654_COCONINO	Moderate	Mod	0-80%	Sat	3
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	10
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	59
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	119
			0584_COCONINO	Severe	Severe	15-40%	Sat	6
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	1
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	39
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	6
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	11
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	4
			0654_COCONINO	Moderate	Mod	0-80%	Sat	0
	Savanna	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	57
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	5
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	2
			0584_COCONINO	Severe	Severe	15-40%	Sat	22
Fry Canyon	Aspen Treatment	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	2
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	0
	Grassland Restoration	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	37
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	14
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	9
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	121
		010	0060_COCONINO	NA	Slight	0-5%	Sat	0
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	507
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	2,082
			0586_COCONINO	Moderate	Slight	0-15%	Sat	404

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	468
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	192
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	16
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	3
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	48
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	317
			0586_COCONINO	Moderate	Slight	0-15%	Sat	17
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	12
			0584_COCONINO	Severe	Severe	15-40%	Sat	138
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	7
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	8
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	2
	Prescribed Fire Only	010	0060_COCONINO	NA	Slight	0-5%	Sat	35
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	103
			0586_COCONINO	Moderate	Slight	0-15%	Sat	2
		024	0546_COCONINO	Severe	Slight	0-15%	Sat	2
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	10
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	20
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	35
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	10
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	500
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	115
			0586_COCONINO	Moderate	Slight	0-15%	Sat	4
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	22
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	0
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	38
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	29
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	447
			0586_COCONINO	Moderate	Slight	0-15%	Sat	50
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	172
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	8
			0584_COCONINO	Severe	Severe	15-40%	Sat	68
Garland Prairie	Aspen Treatment	004	0440_KAIBAB	NA	Slight	15-40%	Unsat	0
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	0
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	3
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	2
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	0
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	1
	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	11
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	270
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	1
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	40
			0630_KAIBAB	NA	Slight	0-15%	Sat	51
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	22
			0631_KAIBAB	Moderate	Slight	0-15%	Sat	43
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	23

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	20
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	6
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	7
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	32
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	0
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	22
			0630_KAIBAB	NA	Slight	0-15%	Sat	2
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	537
			0631_KAIBAB	Moderate	Slight	0-15%	Sat	114
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	541
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	211
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	424
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	311
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	10
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	222
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	23
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	34
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	15
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	2
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	3
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	19
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	121
			0631_KAIBAB	Moderate	Slight	0-15%	Sat	304

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	1,068
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	34
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	332
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	3
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	65
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	767
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	13
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	46
	Prescribed Fire Only	001	0006_KAIBAB	NA	Slight	0-5%	Sat	3
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	1
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	2
			0630_KAIBAB	NA	Slight	0-15%	Sat	12
		011	0631_KAIBAB	Moderate	Slight	0-15%	Sat	64
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	7
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	163
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	16
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	0
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	8
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	9
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	2
		048	0322_KAIBAB	Severe	Severe	0 to 80%	Sat	10
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	521
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	4,655
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	91
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	1,750

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0630_KAIBAB	NA	Slight	0-15%	Sat	977
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	88
			0631_KAIBAB	Moderate	Slight	0-15%	Sat	24
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	35
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	45
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	10
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	0
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	2
		9999_Kaiba b_tes	9999_KAIBAB	(blank)	(blank)	(blank)	(blank)	0
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	19
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	71
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	1
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	50
			0630_KAIBAB	NA	Slight	0-15%	Sat	13
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	362
			0631_KAIBAB	Moderate	Slight	0-15%	Sat	109
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	10
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	247
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	118
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	321
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	479
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	92
Government	Grassland Restoration	039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
Canyon								
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	44
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	2
		047	0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	8
	Higher Intensity Mechanical	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	29
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	119
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	272
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	56
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	0
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	250
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	2
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	65
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	0
			0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	17
			0589_KAIBAB	NA	Mod	15 to 120%	Unsat	1
	Lower Intensity Mechanical	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	8
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	6
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	66
	Prescribed Fire Only - Operational	014	0565_KAIBAB	Severe	Slight	0-15%	Sat	20
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	3
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	20
		047	0541_KAIBAB	NA	Severe	15 to	Unsuit	3

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
	Savanna	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	13
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	55
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	15
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	38
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	14
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	11
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	22
		047	0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	4
Government Prairie	Aspen Treatment	003	0595_COCONINO	NA	Slight	0-15%	Sat	0
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	0
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	3
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	7
			0557a_COCONINO	Severe	Slight	0-15%	Sat	18
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	10
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	0
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	9
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	1
	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	12
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	110
			0595_COCONINO	NA	Slight	0-15%	Sat	33
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	27
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	1

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	19
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	6
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	10
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	4
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	13
			0595_COCONINO	NA	Slight	0-15%	Sat	17
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	3
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	53
			0585_COCONINO	Moderate	Slight	0-15%	Sat	13
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	25
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	197
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	1,588
			0557a_COCONINO	Severe	Slight	0-15%	Sat	54
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	1,945
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	83
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	60
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	28
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	44
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	51
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	12
		9999_Kaiba b_tes	9999_KAIBAB	(blank)	(blank)	(blank)	(blank)	2
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		)						
	Lower Intensity Mechanical	003	0513_KAIBAB	NA	Slight	0-15%	Sat	0
			0595_COCONINO	NA	Slight	0-15%	Sat	6
		007	0594_COCONINO	NA	Slight	0-15%	Sat	0
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	27
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	9
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	35
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	246
			0557a_COCONINO	Severe	Slight	0-15%	Sat	16
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	577
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	98
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	110
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	99
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only	003	0513_KAIBAB	NA	Slight	0-15%	Sat	1
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	2
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	6
			0585_COCONINO	Moderate	Slight	0-15%	Sat	0
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	58
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	10
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	23
			0557a_COCONINO	Severe	Slight	0-15%	Sat	0
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	3
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	65
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	24
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	132

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	5
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	14
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	12
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	2,628
			0595_COCONINO	NA	Slight	0-15%	Sat	501
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	257
		007	0594_COCONINO	NA	Slight	0-15%	Sat	126
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	25
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	8
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	110
			0557a_COCONINO	Severe	Slight	0-15%	Sat	1
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	80
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	2
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	5
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	80
		9999_Kaiba b_tes	9999_KAIBAB	(blank)	(blank)	(blank)	(blank)	4
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Savanna	003	0513_KAIBAB	NA	Slight	0-15%	Sat	10
			0595_COCONINO	NA	Slight	0-15%	Sat	45
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	2
		007	0594_COCONINO	NA	Slight	0-15%	Sat	0

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	50
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	172
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	258
			0557a_COCONINO	Severe	Slight	0-15%	Sat	29
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	926
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	47
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	34
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
Grapevine Canyon	Grassland Restoration	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	0
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	30
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	10
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	5
		009	0050_COCONINO	NA	Slight	0-5%	Sat	1
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	476
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	40
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	12
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	162
			0586_COCONINO	Moderate	Slight	0-15%	Sat	403
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	59
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	1
			0584_COCONINO	Severe	Severe	15-40%	Sat	64
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	37
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	87
	Lower Intensity Mechanical	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	2
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	124

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	0
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	10
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	12
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	11
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	85
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	12
			0586_COCONINO	Moderate	Slight	0-15%	Sat	0
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	81
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	184
			0584_COCONINO	Severe	Severe	15-40%	Sat	50
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	1
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	25
		009	0050_COCONINO	NA	Slight	0-5%	Sat	22
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	8
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	39
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	282
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	12
			0586_COCONINO	Moderate	Slight	0-15%	Sat	14
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	18
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	16
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	0
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	4
		009	0050_COCONINO	NA	Slight	0-5%	Sat	1
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	53
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	11

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	2
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	63
			0586_COCONINO	Moderate	Slight	0-15%	Sat	117
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	23
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	36
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	93
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	0
Grindstone Wash	Higher Intensity Mechanical	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	16
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	141
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	14
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	237
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	3
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	51
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	24
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	123
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	0
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	0
	Lower Intensity Mechanical	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	0
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	99
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	62
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	25
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	18
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	54
	Prescribed Fire Only	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	4
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	139

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	0
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	10
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	63
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	1
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	1
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	0
	Prescribed Fire Only - Operational	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	1
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	189
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	35
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	26
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	9
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	101
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	24
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	116
	Savanna	019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	1
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	6
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	15
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	8
Hance Creek-Colorado River	Lower Intensity Mechanical	011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	1
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	35
Jacks Canyon	Prescribed Fire Only	046	0495_COCONINO	NA	Slight	0-15%	Sat	1
Johnson Creek	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	22
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	35
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	13

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	15
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	1
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	3
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	3
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	10
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	19
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	4
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	55
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	100
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	11
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	382
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	324
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	7
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	85
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	82
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	333
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	33
		046	0495_KAIBAB	NA	Slight	0-15%	Sat	0
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	0
			0523_KAIBAB	NA	Severe	15 to 120%	Unsat	0
		049	0625_KAIBAB	Severe	Severe	40 to 120%	Sat	1
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	0
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	15
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	79

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	9
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	33
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
		049	0625_KAIBAB	Severe	Severe	40 to 120%	Sat	37
	Prescribed Fire Only	001	0006_KAIBAB	NA	Slight	0-5%	Sat	4
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	73
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	1
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	146
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	18
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	41
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	4
		049	0625_KAIBAB	Severe	Severe	40 to 120%	Sat	0
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	24
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	10
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	353
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	6
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	104
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	14
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	26
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	6
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	2
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	159
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	30
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	3

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	25
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	23
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	15
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	10
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	43
		046	0495_KAIBAB	NA	Slight	0-15%	Sat	0
			0514_KAIBAB	NA	Slight	0-15%	Sat	0
		049	0625_KAIBAB	Severe	Severe	40 to 120%	Sat	0
Juan Tank Canyon	Higher Intensity Mechanical	006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	31
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	9
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	54
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	20
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	64
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	89
		046	0495_KAIBAB	NA	Slight	0-15%	Sat	0
			0514_KAIBAB	NA	Slight	0-15%	Sat	0
			0587_KAIBAB	NA	Slight	0-15%	Sat	0
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	0
	Lower Intensity Mechanical	023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
Kinnikinick Canyon	Grassland Restoration	019	0515_COCONINO	NA	Mod	15-40%	Unsat	7
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	3
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	22
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1,628

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	31
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	46
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	442
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1,375
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	38
			0584_COCONINO	Severe	Severe	15-40%	Sat	199
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	450
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	0
		046	0453_COCONINO	NA	Mod	0 û15%	Unsat	10
			0465_COCONINO	NA	Slight	0 û15%	Sat/Unsat	58
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	16
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	3
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	442
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	27
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	67
			0586_COCONINO	Moderate	Slight	0-15%	Sat	526
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	36
			0584_COCONINO	Severe	Severe	15-40%	Sat	17
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	0
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	168
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	72
			0586_COCONINO	Moderate	Slight	0-15%	Sat	47
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	94
			0584_COCONINO	Severe	Severe	15-40%	Sat	74
		042	0575_COCONINO	Severe	Severe	40-	Unsuit	11

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	63
			0654_COCONINO	Moderate	Mod	0-80%	Sat	87
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	124
		009	0050_COCONINO	NA	Slight	0-5%	Sat	13
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	22
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	90
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	43
			0586_COCONINO	Moderate	Slight	0-15%	Sat	24
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	50
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	39
		046	0465_COCONINO	NA	Slight	0 to 15%	Sat/Unsat	23
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	11
			0654_COCONINO	Moderate	Mod	0-80%	Sat	3
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	17
		009	0050_COCONINO	NA	Slight	0-5%	Sat	3
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	561
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	0
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	254
			0586_COCONINO	Moderate	Slight	0-15%	Sat	647
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	4
			0584_COCONINO	Severe	Severe	15-40%	Sat	27
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	1
Klostermeyer Lake	Higher Intensity Mechanical	027	0582a_COCONINO	Moderate	Slight	0-15%	Sat	11

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	185
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	1
	Lower Intensity Mechanical	028	0560_COCONINO	Slight	Slight	0-15%	Sat	243
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	12
	Prescribed Fire Only	028	0560_COCONINO	Slight	Slight	0-15%	Sat	164
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	481
	Prescribed Fire Only - Operational	028	0560_COCONINO	Slight	Slight	0-15%	Sat	3
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	4
	Savanna	027	0582a_COCONINO	Moderate	Slight	0-15%	Sat	76
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	7
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	1
		039	0505_COCONINO	Moderate	Slight	0-15%	Sat	4
			0523_COCONINO	Severe	Slight	0-15%	Sat	66
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	5
Little LO Spring Canyon	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	22
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	714
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	108
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	946
			0586_COCONINO	Moderate	Slight	0-15%	Sat	430
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	35
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	22
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	94
			0584_COCONINO	Severe	Severe	15-40%	Sat	419

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	0
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	302
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	353
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	182
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	211
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	350
			0586_COCONINO	Moderate	Slight	0-15%	Sat	199
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	503
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	496
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	85
		047	0430_COCONINO	NA	Mod	15 to 120%	Unsuit	40
			0470_COCONINO	NA	Severe	15 to 120%	Sat	9
			0493_COCONINO	NA	Mod	15 to 120%	Sat	3
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	91
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	518
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	176
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	139
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	36
			0586_COCONINO	Moderate	Slight	0-15%	Sat	13
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	241
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	20
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	103

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		047	0430_COCONINO	NA	Mod	15 to 120%	Unsuit	34
			0470_COCONINO	NA	Severe	15 to 120%	Sat	6
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	59
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	12
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	3
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	8
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	10
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	3
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	10
		046	0495_COCONINO	NA	Slight	0-15%	Sat	5
		047	0493_COCONINO	NA	Mod	15 to 120%	Sat	5
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	3
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	76
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	15
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	96
			0586_COCONINO	Moderate	Slight	0-15%	Sat	27
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	6
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	147
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	5
Little Red Horse Wash	Higher Intensity Mechanical	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	3
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	4

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Lower Intensity Mechanical	011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	9
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	47
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	3
	Pine Sage	011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	4
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	340
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	7
	Prescribed Fire Only	011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	9
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	376
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	14
		046	0260_KAIBAB	NA	Mod	0-15%	Sat	1
	Prescribed Fire Only - Operational	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	19
Long Lake-Chavel Pass Ditch	Grassland Restoration	019	0515_COCONINO	NA	Mod	15-40%	Unsat	0
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	0
	Higher Intensity Mechanical	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	119
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	15
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	3
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	16
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	7
			0584_COCONINO	Severe	Severe	15-40%	Sat	0
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	43
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	4
	Lower Intensity Mechanical	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	92
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	87
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	7
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	12
			0584_COCONINO	Severe	Severe	15-40%	Sat	39

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	210
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	3
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	45
			0584_COCONINO	Severe	Severe	15-40%	Sat	0
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	21
			0654_COCONINO	Moderate	Mod	0-80%	Sat	156
	Prescribed Fire Only - Operational	019	0515_COCONINO	NA	Mod	15-40%	Unsat	10
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	1
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	1
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	6
			0654_COCONINO	Moderate	Mod	0-80%	Sat	7
	Savanna	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	19
Lower Deadman Wash	Prescribed Fire Only	021	0513_COCONINO	Moderate	Mod	15-40%	Unsat	30
		030	0559_COCONINO	Slight	Slight	0-15%	Sat	9
		031	0561_COCONINO	Moderate	Mod	15-40%	Sat	37
		040	0512_COCONINO	Slight	Slight	0-15%	Sat	406
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	309
		046	0443_COCONINO	NA	Slight	0-15%	Sat	9
			0445_COCONINO	NA	Slight	0-15%	Sat	7
		047	0439_COCONINO	NA	Mod	15 to 120%	Sat	3
	Prescribed Fire Only - Operational	030	0559_COCONINO	Slight	Slight	0-15%	Sat	0
		040	0512_COCONINO	Slight	Slight	0-15%	Sat	60
		042	0562_COCONINO	Severe	Severe	40-	Sat	43

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
		046	0445_COCONINO	NA	Slight	0 û15%	Sat	75
		047	0439_COCONINO	NA	Mod	15 to 120%	Sat	18
Lower Rio de Flag	Higher Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	4
		025	0567_COCONINO	Severe	Slight	0-15%	Sat	140
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	616
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	44
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	130
		City_Coconino	City_COCONINO	(blank)	(blank)	(blank)	(blank)	22
	Lower Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	23
		025	0567_COCONINO	Severe	Slight	0-15%	Sat	430
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	35
			0551_COCONINO	Moderate	Slight	0-15%	Sat	182
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	159
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	25
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	1
	Prescribed Fire Only	001	0053_COCONINO	NA	Slight	0-5%	Sat	9
		006	0566_COCONINO	NA	Slight	0-15%	Sat	22
		021	0014_COCONINO	Slight	Slight	15-40%	NA/Sat	3
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	66
		025	0567_COCONINO	Severe	Slight	0-15%	Sat	238
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	38
			0551_COCONINO	Moderate	Slight	0-15%	Sat	40
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	210
		030	0558_COCONINO	Slight	Slight	0-15%	Sat	234
			0559_COCONINO	Slight	Slight	0-15%	Sat	469

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	100
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	170
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	9
		042	0596_COCONINO	Severe	Severe	40-120%	Sat	505
		046	0443_COCONINO	NA	Slight	0 û15%	Sat	3
			0444_COCONINO	NA	Slight	0 û15%	Sat	12
			0473_COCONINO	NA	Slight	0 û15%	Sat	45
		047	0441_COCONINO	NA	Mod	15 to 120%	Sat	0
			0450_COCONINO	NA	Mod	15 to 120%	Sat	100
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	14
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	343
	Prescribed Fire Only - Operational	001	0053_COCONINO	NA	Slight	0-5%	Sat	22
		006	0566_COCONINO	NA	Slight	0-15%	Sat	183
		021	0014_COCONINO	Slight	Slight	15-40%	NA/Sat	1
			0015_COCONINO	Slight	Slight	15-40%	NA/Sat	37
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	46
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	102
			0551_COCONINO	Moderate	Slight	0-15%	Sat	94
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	58
		030	0559_COCONINO	Slight	Slight	0-15%	Sat	15
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	15
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	27
		039	0500_COCONINO	Severe	Slight	0-15%	Sat	12
			0505_COCONINO	Moderate	Slight	0-15%	Sat	31

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0506_COCONINO	Moderate	Slight	0-15%	Sat	105
		040	0512_COCONINO	Slight	Slight	0-15%	Sat	3
		046	0443_COCONINO	NA	Slight	0 û15%	Sat	302
			0444_COCONINO	NA	Slight	0 û15%	Sat	48
			0473_COCONINO	NA	Slight	0 û15%	Sat	50
		047	0441_COCONINO	NA	Mod	15 to 120%	Sat	41
			0450_COCONINO	NA	Mod	15 to 120%	Sat	381
		City_Coconino	City_COCONINO	(blank)	(blank)	(blank)	(blank)	1
	Savanna	001	0053_COCONINO	NA	Slight	0-5%	Sat	4
		025	0567_COCONINO	Severe	Slight	0-15%	Sat	95
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	11
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	41
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	25
		City_Coconino	City_COCONINO	(blank)	(blank)	(blank)	(blank)	1
Lower Sycamore Creek	Grassland Restoration	039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	1
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	14
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	1
	Higher Intensity Mechanical	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	15
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	6
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	2
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	12
	Lower Intensity Mechanical	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	30

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	8
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	3
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	25
	Prescribed Fire Only	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	13
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
	Savanna	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	8
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	8
Lower Woods Canyon	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	43
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	114
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	25
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	13
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	59
			0586_COCONINO	Moderate	Slight	0-15%	Sat	403
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	20
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	204
		046	0495_COCONINO	NA	Slight	0-15%	Sat	13
		047	0493_COCONINO	NA	Mod	15 to 120%	Sat	5
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	9
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	296
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	646
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	105
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	3
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	618
			0586_COCONINO	Moderate	Slight	0-15%	Sat	606

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	688
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	14
			0584_COCONINO	Severe	Severe	15-40%	Sat	585
		046	0495_COCONINO	NA	Slight	0 û15%	Sat	43
		047	0493_COCONINO	NA	Mod	15 to 120%	Sat	5
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	17
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	166
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	755
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	1,950
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	81
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	19
			0586_COCONINO	Moderate	Slight	0-15%	Sat	32
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	761
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	232
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	64
		046	0495_COCONINO	NA	Slight	0 û15%	Sat	150
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	0
			0493_COCONINO	NA	Mod	15 to 120%	Sat	6
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	48
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	12
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	181
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	435
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0586_COCONINO	Moderate	Slight	0-15%	Sat	4
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	20
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	0
		046	0495_COCONINO	NA	Slight	0-15%	Sat	87
		047	0493_COCONINO	NA	Mod	15 to 120%	Sat	0
	Savanna	012	0579_COCONINO	Moderate	Slight	0-15%	Sat	1
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	9
			0586_COCONINO	Moderate	Slight	0-15%	Sat	27
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	16
MC Canyon	Aspen Treatment	026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	0
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	3
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	4
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	94
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	21
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	19
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	152
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	218
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	91
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	17
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	15
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	110
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	32
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	128
		043	0648_KAIBAB	Severe	Severe	40-120%	Unsuit	3

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	2
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	1
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	24
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	11
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	1
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	260
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	14
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	2
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	22
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	93
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	9
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	13
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	6
	Prescribed Fire Only	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	29
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	1
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	7
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	14
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	135
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	57
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	80
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	40
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	136
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	38
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	7

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	168
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	37
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	119
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	14
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	11
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	85
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	23
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	2
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	2
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	21
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	48
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	48
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	27
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	3
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	44
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	5
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	8
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	11
Meath Wash	Grassland Restoration	006	0507_KAIBAB	NA	Slight	0-15%	Sat	3
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	4
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	6
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	3
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	56
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	28
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	5
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	2
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	52
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	273
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	14
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	0
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	5
Middle Deadman Wash	Higher Intensity Mechanical	023	0586_COCONINO	Moderate	Slight	0-15%	Sat	204
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	141
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	6
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	2
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	7
		046	0445_COCONINO	NA	Slight	0-15%	Sat	36
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	9
	Lower Intensity Mechanical	023	0586_COCONINO	Moderate	Slight	0-15%	Sat	6
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	209
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	67
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	6

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	15
		046	0445_COCONINO	NA	Slight	0-15%	Sat	10
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	6
	Prescribed Fire Only	006	0566_COCONINO	NA	Slight	0-15%	Sat	7
		021	0513_COCONINO	Moderate	Mod	15-40%	Unsat	520
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	2
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	730
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	111
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	137
		040	0512_COCONINO	Slight	Slight	0-15%	Sat	518
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	31
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	422
		046	0445_COCONINO	NA	Slight	0-15%	Sat	2
			0473_COCONINO	NA	Slight	0-15%	Sat	257
		047	0439_COCONINO	NA	Mod	15 to 120%	Sat	1
			0441_COCONINO	NA	Mod	15 to 120%	Sat	232
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	37
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	93
	Prescribed Fire Only - Operational	006	0566_COCONINO	NA	Slight	0-15%	Sat	18
		021	0513_COCONINO	Moderate	Mod	15-40%	Unsat	90
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	9
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	82
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	107
			0523_COCONINO	Severe	Slight	0-15%	Sat	97
		040	0512_COCONINO	Slight	Slight	0-15%	Sat	136
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	113
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	50
		046	0438_COCONINO	NA	Slight	0-15%	Sat	4
			0445_COCONINO	NA	Slight	0-15%	Sat	118
			0473_COCONINO	NA	Slight	0-15%	Sat	57
		047	0439_COCONINO	NA	Mod	15 to 120%	Sat	19
			0441_COCONINO	NA	Mod	15 to 120%	Sat	143
	Savanna	039	0506_COCONINO	Moderate	Slight	0-15%	Sat	8
			0523_COCONINO	Severe	Slight	0-15%	Sat	9
Middle Oak Creek	Higher Intensity Mechanical	015	0520_COCONINO	Severe	Slight	0-15%	Sat	29
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	21
	Lower Intensity Mechanical	015	0520_COCONINO	Severe	Slight	0-15%	Sat	100
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	32
	Prescribed Fire Only	015	0520_COCONINO	Severe	Slight	0-15%	Sat	636
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	63
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	42
		046	0495_COCONINO	NA	Slight	0-15%	Sat	112
		047	0470_COCONINO	NA	Severe	15 to 120%	Sat	0
	Prescribed Fire Only - Operational	015	0520_COCONINO	Severe	Slight	0-15%	Sat	15
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	1

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		046	0495_COCONINO	NA	Slight	0 û15%	Sat	29
Middle Spring Valley Wash	Grassland Restoration	006	0507_KAIBAB	NA	Slight	0-15%	Sat	295
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	5
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	34
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	93
		046	0495_KAIBAB	NA	Slight	0 û15%	Sat	5
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1
		006	0036_KAIBAB	NA	Slight	0-15%	Sat	0
			0507_KAIBAB	NA	Slight	0-15%	Sat	12
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	316
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	80
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	170
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	14
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	6
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	581
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	313
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	0
			0564_KAIBAB	Severe	Severe	15-40%	Unsat	116
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	56
		046	0495_KAIBAB	NA	Slight	0 û15%	Sat	8
			0514_KAIBAB	NA	Slight	0 û15%	Sat	0
			0586_KAIBAB	NA	Slight	0 û15%	Sat	9
		047	0476_KAIBAB	NA	Severe	15 to 120%	Unsat	0
			0496_KAIBAB	NA	Mod	15 to 120%	Unsat	61

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		048	0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	3
	Lower Intensity Mechanical	019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	22
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	13
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	2
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	57
		033	0310_KAIBAB	Moderate	Mod	15-40%	Sat	75
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	112
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	5
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	25
			0564_KAIBAB	Severe	Severe	15-40%	Unsat	2
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	11
		046	0514_KAIBAB	NA	Slight	0 û15%	Sat	2
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	3
		048	0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	9
	Prescribed Fire Only	001	0006_KAIBAB	NA	Slight	0-5%	Sat	0
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	2
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	109
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	23
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	197
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	78
		033	0310_KAIBAB	Moderate	Mod	15-40%	Sat	34
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	5
			0405_KAIBAB	Moderate	Slight	0-15%	Sat	213
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	22
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	3
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	4
		048	0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	55
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	11
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	160
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	175
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	11
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	12
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	54
		033	0310_KAIBAB	Moderate	Mod	15-40%	Sat	24
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	27
			0405_KAIBAB	Moderate	Slight	0-15%	Sat	180
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	105
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	36
			0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	30
		046	0495_KAIBAB	NA	Slight	0 to 15%	Sat	126
		047	0476_KAIBAB	NA	Severe	15 to 120%	Unsat	25
			0496_KAIBAB	NA	Mod	15 to 120%	Unsat	172
		048	0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	39
	Savanna	006	0507_KAIBAB	NA	Slight	0-15%	Sat	5

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	30
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	11
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	69
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	63
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	22
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	30
Middle Sycamore Creek	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	41
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	459
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	66
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	13
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	63
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	35
		046	0514_KAIBAB	NA	Slight	0-15%	Sat	41
			0587_KAIBAB	NA	Slight	0-15%	Sat	21
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	27
			0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	19
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	2
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	75
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	76
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	335
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	958

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	106
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	1
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	55
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	7
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	24
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	13
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	611
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	185
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	207
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	60
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	442
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	1,081
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	353
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	153
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	360
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	257
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	54
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	94
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	0
		046	0514_KAIBAB	NA	Slight	0-15%	Sat	0
			0587_KAIBAB	NA	Slight	0-15%	Sat	33
		047	0470_COCONINO	NA	Severe	15 to 120%	Sat	4
			0523_KAIBAB	NA	Severe	15 to	Unsat	18

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
			0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	27
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	13
	Prescribed Fire Only	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	0
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	43
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	98
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	11
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	42
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	31
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	4
		039	0649_KAIBAB	Moderate	Mod	0-15%	Sat	0
		047	0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	0
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	20
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	173
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	52
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	108
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	7
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	18
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	3
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	25
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	19
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		046	0587_KAIBAB	NA	Slight	0 û15%	Sat	30
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	7
			0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	73
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	4
	Savanna	011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	209
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	32
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	13
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	171
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	46
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	26
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	1
Miller Wash Headwaters	Aspen Treatment	027	0304_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	0
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	2
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	0
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	3
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	15
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	1
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	5
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	6
	Grassland Restoration	010	0037_KAIBAB	NA	Slight	0-5%	Sat	11
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	1
	Higher Intensity Mechanical	006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	2
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	52
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	129
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	147
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	0
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	27
		036	0310a_KAIBAB	Moderate	Mod	15-40%	Sat	4
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0405_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	43
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	2
		048	0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	0
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	0
		027	0304_KAIBAB	Moderate	Slight	0-15%	Sat	313
			0324_KAIBAB	Moderate	Slight	0-15%	Sat	367
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	41
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	36
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	724
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	8
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	110
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	165
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	128
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	12

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	182
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	4
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	9
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	6
	Prescribed Fire Only	019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	17
		027	0304_KAIBAB	Moderate	Slight	0-15%	Sat	333
			0324_KAIBAB	Moderate	Slight	0-15%	Sat	808
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	14
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	14
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	345
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	26
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	170
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	969
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	654
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	616
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	58
		046	0599_KAIBAB	NA	Slight	0 to 15%	Sat	26
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	43
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	133
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	1
	Prescribed Fire Only -	001	0006_KAIBAB	NA	Slight	0-5%	Sat	47

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Operational							
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	14
		027	0304_KAIBAB	Moderate	Slight	0-15%	Sat	3
			0324_KAIBAB	Moderate	Slight	0-15%	Sat	192
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	13
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	10
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	59
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	0
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	47
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	20
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	20
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	81
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	1
		046	0599_KAIBAB	NA	Slight	0-15%	Sat	353
	Savanna	010	0037_KAIBAB	NA	Slight	0-5%	Sat	0
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	1
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	64
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	2
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	63
		036	0310a_KAIBAB	Moderate	Mod	15-40%	Sat	2
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0405_KAIBAB	Moderate	Slight	0-15%	Sat	2
		048	0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	0
Mormon Canyon	Grassland Restoration	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	1
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	39

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	7
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	22
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	0
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	4
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	131
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	11
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	35
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	38
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	14
			0586_COCONINO	Moderate	Slight	0-15%	Sat	93
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	105
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	58
		009	0050_COCONINO	NA	Slight	0-5%	Sat	20
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	39
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	0
			0586_COCONINO	Moderate	Slight	0-15%	Sat	12
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	2
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	3
		009	0050_COCONINO	NA	Slight	0-5%	Sat	0
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	31
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	25
			0586_COCONINO	Moderate	Slight	0-15%	Sat	257
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	114
Mormon Lake	Aspen Treatment	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	0

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1
	Grassland Restoration	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	2
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	3
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	1
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	51
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	886
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	0
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	677
			0586_COCONINO	Moderate	Slight	0-15%	Sat	466
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	87
			0584_COCONINO	Severe	Severe	15-40%	Sat	225
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	63
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	1
			0654_COCONINO	Moderate	Mod	0-80%	Sat	1
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	7
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	112
		009	0050_COCONINO	NA	Slight	0-5%	Sat	4
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	2,093
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	56
		023	0557_COCONINO	Severe	Slight	0-15%	Sat	359
			0582_COCONINO	Moderate	Slight	0-15%	Sat	383
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1,358
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	370

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0584_COCONINO	Severe	Severe	15-40%	Sat	1,022
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	117
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	33
			0654_COCONINO	Moderate	Mod	0-80%	Sat	90
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	26
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	1
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	14
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	209
		023	0557_COCONINO	Severe	Slight	0-15%	Sat	87
			0582_COCONINO	Moderate	Slight	0-15%	Sat	291
			0586_COCONINO	Moderate	Slight	0-15%	Sat	225
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	448
			0584_COCONINO	Severe	Severe	15-40%	Sat	532
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	144
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	222
			0654_COCONINO	Moderate	Mod	0-80%	Sat	201
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	90
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	272
		009	0050_COCONINO	NA	Slight	0-5%	Sat	2
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	60

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	62
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	83
			0586_COCONINO	Moderate	Slight	0-15%	Sat	14
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	2
			0584_COCONINO	Severe	Severe	15-40%	Sat	19
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	1
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	0
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	20
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	553
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	8
		023	0557_COCONINO	Severe	Slight	0-15%	Sat	6
			0582_COCONINO	Moderate	Slight	0-15%	Sat	135
			0586_COCONINO	Moderate	Slight	0-15%	Sat	278
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	48
			0584_COCONINO	Severe	Severe	15-40%	Sat	402
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	4
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	1
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	3
Munds Canyon	Aspen Treatment	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	10
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	23
			0586_COCONINO	Moderate	Slight	0-15%	Sat	12
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	6
			0584_COCONINO	Severe	Severe	15-40%	Sat	78

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Grassland Restoration	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	13
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	11
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	106
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1,796
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	547
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	127
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	29
		023	0557_COCONINO	Severe	Slight	0-15%	Sat	1
			0582_COCONINO	Moderate	Slight	0-15%	Sat	1,842
			0586_COCONINO	Moderate	Slight	0-15%	Sat	869
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	145
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	1
			0584_COCONINO	Severe	Severe	15-40%	Sat	1,318
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	17
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	0
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	1
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	91
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	3,310
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	4,555
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	1,255
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	120

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0557_COCONINO	Severe	Slight	0-15%	Sat	77
			0582_COCONINO	Moderate	Slight	0-15%	Sat	2,018
			0586_COCONINO	Moderate	Slight	0-15%	Sat	2,020
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	528
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	293
			0584_COCONINO	Severe	Severe	15-40%	Sat	3,620
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	154
		046	0492_COCONINO	NA	Mod	0 û15%	Sat	6
			0495_COCONINO	NA	Slight	0 û15%	Sat	2
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	10
			0654_COCONINO	Moderate	Mod	0-80%	Sat	90
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	13
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	8
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	299
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	1,162
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	117
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	43
		023	0557_COCONINO	Severe	Slight	0-15%	Sat	76
			0582_COCONINO	Moderate	Slight	0-15%	Sat	559
			0586_COCONINO	Moderate	Slight	0-15%	Sat	86
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	18

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	1,419
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	74
		046	0495_COCONINO	NA	Slight	0 to 15%	Sat	3
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	83
			0654_COCONINO	Moderate	Mod	0-80%	Sat	135
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	7
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	655
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	63
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	51
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	20
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	4
		023	0557_COCONINO	Severe	Slight	0-15%	Sat	6
			0582_COCONINO	Moderate	Slight	0-15%	Sat	99
			0586_COCONINO	Moderate	Slight	0-15%	Sat	9
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	8
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	14
			0584_COCONINO	Severe	Severe	15-40%	Sat	22
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	14
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	2
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	6
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	24

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	299
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	96
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	0
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	447
			0586_COCONINO	Moderate	Slight	0-15%	Sat	187
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	19
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	4
			0584_COCONINO	Severe	Severe	15-40%	Sat	166
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	0
Pitman Valley-Scholz Lake	Aspen Treatment	032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	2
		034	0300_KAIBAB	Moderate	Mod	15-40%	Sat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	2
		048	0322_KAIBAB	Severe	Severe	0 to 80%	Sat	1
	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	22
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	978
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	149
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	29
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	1
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	55
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	18
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	19
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	10
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	13

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	164
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	1
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	4
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	2
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	11
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	26
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	21
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	55
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	13
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	0
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	4
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	0
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	372
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	152
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	14
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	263
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	2,581
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	58
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	249
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	38
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	320
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	42
		034	0300_KAIBAB	Moderate	Mod	15-40%	Sat	235
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	93
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	341

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	32
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	26
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	22
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	30
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	14
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	1
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	6
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	34
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	106
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	43
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	75
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	185
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	1,275
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	10
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	1,271
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	303
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	23
		034	0300_KAIBAB	Moderate	Mod	15-40%	Sat	328
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	11
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	1
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	5
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	7
			0322_KAIBAB	Severe	Severe	0 to	Sat	1

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						80%		
	Prescribed Fire Only	001	0006_KAIBAB	NA	Slight	0-5%	Sat	12
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	2
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	23
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	3
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	28
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	7
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	68
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	350
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	136
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	11
		034	0300_KAIBAB	Moderate	Mod	15-40%	Sat	95
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	0
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	16
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	704
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	1,986
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	54
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	282
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	119
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	105
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	291
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	13
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	84
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	9

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	9
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	189
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	13
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	16
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	50
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	20
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	57
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	28
		043	0431_KAIBAB	Severe	Severe	40- 120%	Unsuit	55
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	7
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	63
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	8
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	2
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	1
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	3
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	186
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	47
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	96
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	759
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	28
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	42
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	6
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	83
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	26
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	58
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	123

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	27
Pumphouse Wash	Grassland Restoration	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	1
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	0
	Higher Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	12
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	34
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	196
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	65
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	2,064
		024	0546_COCONINO	Severe	Slight	0-15%	Sat	72
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	82
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	328
			0570_COCONINO	Moderate	Slight	0-15%	Sat	512
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	112
			0584_COCONINO	Severe	Severe	15-40%	Sat	627
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	56
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	9
	Lower Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	1
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	34
		010	0060_COCONINO	NA	Slight	0-5%	Sat	6
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1,065
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	174
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	2,897
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		024	0546_COCONINO	Severe	Slight	0-15%	Sat	673
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	289
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	52
			0570_COCONINO	Moderate	Slight	0-15%	Sat	141
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	98
			0584_COCONINO	Severe	Severe	15-40%	Sat	786
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	3
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	235
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	17
	Prescribed Fire Only	001	0053_COCONINO	NA	Slight	0-5%	Sat	9
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	14
		010	0060_COCONINO	NA	Slight	0-5%	Sat	18
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	204
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	502
		024	0546_COCONINO	Severe	Slight	0-15%	Sat	550
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	66
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	55
			0570_COCONINO	Moderate	Slight	0-15%	Sat	60
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	89
			0584_COCONINO	Severe	Severe	15-40%	Sat	328
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	703
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	28
	Prescribed Fire Only - Operational	001	0053_COCONINO	NA	Slight	0-5%	Sat	34

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	76
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	0
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	1
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	52
		024	0546_COCONINO	Severe	Slight	0-15%	Sat	24
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	2
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	8
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	2
	Savanna	001	0053_COCONINO	NA	Slight	0-5%	Sat	2
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	1
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	48
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	467
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	63
			0570_COCONINO	Moderate	Slight	0-15%	Sat	25
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	1
			0584_COCONINO	Severe	Severe	15-40%	Sat	108
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	2
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	1
Rabbit Canyon	Grassland Restoration	006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	166
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	33
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Higher Intensity Mechanical	019	0515_COCONINO	NA	Mod	15-40%	Unsat	1
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	59

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Prescribed Fire Only	006	0507_KAIBAB	NA	Slight	0-15%	Sat	2
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	0
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	10
	Prescribed Fire Only - Operational	006	0507_KAIBAB	NA	Slight	0-15%	Sat	7
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	0
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
Rain Tank Wash	Higher Intensity Mechanical	011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	2
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	398
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	20
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	72
		046	0260_KAIBAB	NA	Mod	0-15%	Sat	3
	Lower Intensity Mechanical	011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	10
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	234
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	176
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	347
	Pine Sage	011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	45
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	706
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	12
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	161
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	624
		046	0260_KAIBAB	NA	Mod	0-15%	Sat	7
	Prescribed Fire Only	001	0011_KAIBAB	NA	Slight	0-5%	Sat	0
		011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	44
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	527
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	6
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	102

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	679
	Prescribed Fire Only - Operational	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	46
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	26
	WUI PJ Trt	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	237
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	12
		046	0260_KAIBAB	NA	Mod	0-15%	Sat	143
Rattlesnake Canyon	Higher Intensity Mechanical	012	0579_COCONINO	Moderate	Slight	0-15%	Sat	65
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	13
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	184
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	0
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	1
			0584_COCONINO	Severe	Severe	15-40%	Sat	58
	Lower Intensity Mechanical	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	25
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	54
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	130
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	57
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	18
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	15
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	175
			0584_COCONINO	Severe	Severe	15-40%	Sat	201
		046	0495_COCONINO	NA	Slight	0-15%	Sat	106
		047	0430_COCONINO	NA	Mod	15 to 120%	Unsuit	53
			0493_COCONINO	NA	Mod	15 to 120%	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	55
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	640
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	130
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	218
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	94
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	163
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	175
		046	0495_COCONINO	NA	Slight	0-15%	Sat	71
	Prescribed Fire Only - Operational	012	0579_COCONINO	Moderate	Slight	0-15%	Sat	11
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	5
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	0
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	1
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	7
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	2
			0584_COCONINO	Severe	Severe	15-40%	Sat	78
		046	0495_COCONINO	NA	Slight	0-15%	Sat	91
	Savanna	023	0582_COCONINO	Moderate	Slight	0-15%	Sat	64
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	30
			0584_COCONINO	Severe	Severe	15-40%	Sat	5
Rattlesnake Wash	Higher Intensity Mechanical	014	0565_KAIBAB	Severe	Slight	0-15%	Sat	0
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	42
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	104
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	56
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	27
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	0
	Prescribed Fire Only	019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	0

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	42
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	2
	Prescribed Fire Only - Operational	014	0565_KAIBAB	Severe	Slight	0-15%	Sat	23
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	129
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	122
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	47
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	10
	Savanna	006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	2
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	12
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	88
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	0
Red Horse Wash Headwaters	Higher Intensity Mechanical	001	0009_KAIBAB	NA	Slight	0-5%	Sat	5
		011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	14
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	48
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	443
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	194
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	134
		038	0284_KAIBAB	Moderate	Severe	15-40%	Unsat	34
		042	0681_KAIBAB	Severe	Severe	40-120%	Sat	2
	Lower Intensity Mechanical	001	0009_KAIBAB	NA	Slight	0-5%	Sat	9
		011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	35
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	114
		017	0266_KAIBAB	Moderate	Severe	15-40%	Unsat	27
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	3,040

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	1,191
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	89
		038	0284_KAIBAB	Moderate	Severe	15-40%	Unsat	40
		042	0681_KAIBAB	Severe	Severe	40-120%	Sat	0
	Pine Sage	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	118
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	49
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	14
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	172
		038	0284_KAIBAB	Moderate	Severe	15-40%	Unsat	1
	Prescribed Fire Only	001	0009_KAIBAB	NA	Slight	0-5%	Sat	37
		011	0265_KAIBAB	Moderate	Mod	0-15%	Sat	1
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	15
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	498
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	160
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	4
		042	0681_KAIBAB	Severe	Severe	40-120%	Sat	0
	Prescribed Fire Only - Operational	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	97
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	83
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	10
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	211
		038	0284_KAIBAB	Moderate	Severe	15-40%	Unsat	32
Sawmill Tank	Aspen Treatment	027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	5
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	0
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	2
	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	8

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	166
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	18
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	11
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	11
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	3
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	21
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	25
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	5
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	7
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	245
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	1,084
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	902
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	298
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	30
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	540
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	48
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	0
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	227
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	14
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	6
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	23
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	31
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	269
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	164

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	2
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	94
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	141
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	26
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	5
	Prescribed Fire Only	023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	31
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	6
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	103
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	3,696
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	96
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	17
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	35
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	11
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	50
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	49
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	41
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	31
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	28
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	59
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	31
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	19
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	8
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	60
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	362

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	85
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	76
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	7
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	33
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	22
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	41
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	2
Sawmill Wash	Grassland Restoration	019	0515_COCONINO	NA	Mod	15-40%	Unsat	21
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	2
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	13
	Higher Intensity Mechanical	009	0050_COCONINO	NA	Slight	0-5%	Sat	7
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	550
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	67
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	16
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	494
			0586_COCONINO	Moderate	Slight	0-15%	Sat	262
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	69
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	146
			0584_COCONINO	Severe	Severe	15-40%	Sat	208
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	105
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	1
			0654_COCONINO	Moderate	Mod	0-80%	Sat	18
	Lower Intensity Mechanical	009	0050_COCONINO	NA	Slight	0-5%	Sat	15
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	799
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	561
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	11

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	240
			0586_COCONINO	Moderate	Slight	0-15%	Sat	35
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	432
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	166
			0584_COCONINO	Severe	Severe	15-40%	Sat	200
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	219
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	109
			0654_COCONINO	Moderate	Mod	0-80%	Sat	32
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	197
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	84
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	107
			0586_COCONINO	Moderate	Slight	0-15%	Sat	0
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	2
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	91
			0584_COCONINO	Severe	Severe	15-40%	Sat	20
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	5
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	160
			0654_COCONINO	Moderate	Mod	0-80%	Sat	229
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	8
	Prescribed Fire Only - Operational	009	0050_COCONINO	NA	Slight	0-5%	Sat	26
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	7
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	20
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	36
			0586_COCONINO	Moderate	Slight	0-15%	Sat	6
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	6

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	0
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	19
			0654_COCONINO	Moderate	Mod	0-80%	Sat	5
	Savanna	009	0050_COCONINO	NA	Slight	0-5%	Sat	1
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	110
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	4
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	88
			0586_COCONINO	Moderate	Slight	0-15%	Sat	95
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	4
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	34
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	7
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	0
Sinclair Wash	Higher Intensity Mechanical	027	0536_COCONINO	Severe	Slight	0-15%	Sat	96
	Prescribed Fire Only - Operational	027	0536_COCONINO	Severe	Slight	0-15%	Sat	64
Smoot Lake	Grassland Restoration	006	0507_KAIBAB	NA	Slight	0-15%	Sat	172
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	31
	Higher Intensity Mechanical	006	0507_KAIBAB	NA	Slight	0-15%	Sat	22
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	101
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	1
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	37
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	197
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	537
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	12
		043	0431_KAIBAB	Severe	Severe	40-	Unsuit	10

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
	Lower Intensity Mechanical	019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	28
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	6
		047	0476_KAIBAB	NA	Severe	15 to 120%	Unsat	1
	Prescribed Fire Only	019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	8
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	24
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	58
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	75
	Prescribed Fire Only - Operational	006	0507_KAIBAB	NA	Slight	0-15%	Sat	87
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	40
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	4
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	8
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	65
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	7
		047	0476_KAIBAB	NA	Severe	15 to 120%	Unsat	0
	Savanna	006	0507_KAIBAB	NA	Slight	0-15%	Sat	11
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	5
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	1
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	125
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	1
Telephone Tank	Aspen Treatment	023	0582_COCONINO	Moderate	Slight	0-15%	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		027	0570_COCONINO	Moderate	Slight	0-15%	Sat	3
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	5
	Grassland Restoration	003	0595_COCONINO	NA	Slight	0-15%	Sat	11
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	2
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	2
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	0
			0595_COCONINO	NA	Slight	0-15%	Sat	8
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	471
		027	0537a_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0557a_COCONINO	Severe	Slight	0-15%	Sat	68
			0570_COCONINO	Moderate	Slight	0-15%	Sat	257
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	58
			0584a_COCONINO	Severe	Severe	15-40%	Sat	375
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	7
		003	0595_COCONINO	NA	Slight	0-15%	Sat	1
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	137
		027	0557a_COCONINO	Severe	Slight	0-15%	Sat	110
			0570_COCONINO	Moderate	Slight	0-15%	Sat	2,100
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	38
			0584a_COCONINO	Severe	Severe	15-40%	Sat	216
	Prescribed Fire Only	027	0557a_COCONINO	Severe	Slight	0-15%	Sat	9
			0570_COCONINO	Moderate	Slight	0-15%	Sat	124
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	16
		042	0562_COCONINO	Severe	Severe	40- 120%	Sat	54

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	100
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	11
			0595_COCONINO	NA	Slight	0-15%	Sat	126
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	21
		027	0557a_COCONINO	Severe	Slight	0-15%	Sat	43
			0570_COCONINO	Moderate	Slight	0-15%	Sat	21
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	11
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	1
		003	0595_COCONINO	NA	Slight	0-15%	Sat	4
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	200
		027	0557a_COCONINO	Severe	Slight	0-15%	Sat	41
			0570_COCONINO	Moderate	Slight	0-15%	Sat	83
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	138
Tule Canyon	Aspen Treatment	023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	11
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	1
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	11
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	10
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	13
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	3
	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	14
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	482
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	26
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	66

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	1
		032	0525_KAIBAB	Moderate	Severe	15-40%	Unsat	80
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	170
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	240
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	4
		046	0543_KAIBAB	NA	Slight	0-15%	Sat	20
			0587_KAIBAB	NA	Slight	0-15%	Sat	26
		047	0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	19
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	15
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	13
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	1,094
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	30
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	308
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	2,630
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	419
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	55
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	329
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	268
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	7
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	17
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	17
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	3

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	0
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	4
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	1
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	17
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	31
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	968
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	87
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	65
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	153
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	2,218
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	508
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	434
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	1,462
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	406
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	34
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	6
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	306
		047	0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	0
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	3
	Prescribed Fire Only	001	0006_KAIBAB	NA	Slight	0-5%	Sat	3
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	9
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	263

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	193
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	346
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	117
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	202
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	512
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	78
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	38
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	17
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	285
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	9
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	146
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	544
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	323
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	85
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	1
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	184
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	45
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	1
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	205
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	28
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	137
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	6
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	84

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		046	0543_KAIBAB	NA	Slight	0 û15%	Sat	49
		047	0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	10
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	1
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	33
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	13
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	685
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	2
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	895
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	166
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	22
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	141
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	130
			0649_KAIBAB	Moderate	Mod	0-15%	Sat	18
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	35
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	29
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	2
Upper Cataract Creek	Grassland Restoration	006	0507_KAIBAB	NA	Slight	0-15%	Sat	115
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	26
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	6
	Higher Intensity Mechanical	006	0507_KAIBAB	NA	Slight	0-15%	Sat	22
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	53
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	21

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	95
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	21
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	21
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	16
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	101
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	374
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	191
	Prescribed Fire Only	006	0507_KAIBAB	NA	Slight	0-15%	Sat	53
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	28
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	71
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	25
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	4
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	86
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	26
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	1
	Prescribed Fire Only - Operational	006	0507_KAIBAB	NA	Slight	0-15%	Sat	229
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	85
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	114
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	96
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	101
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	80
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	253
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	138
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	33

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0523_KAIBAB	NA	Severe	15 to 120%	Unsat	22
	Savanna	006	0507_KAIBAB	NA	Slight	0-15%	Sat	24
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	10
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	35
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	0
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	2
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	59
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	62
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	73
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	2
Upper Cedar Wash (Local Drainage)	Aspen Treatment	023	0586_COCONINO	Moderate	Slight	0-15%	Sat	16
		027	0582a_COCONINO	Moderate	Slight	0-15%	Sat	11
	Grassland Restoration	003	0595_COCONINO	NA	Slight	0-15%	Sat	11
		027	0582a_COCONINO	Moderate	Slight	0-15%	Sat	1
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	22
		003	0595_COCONINO	NA	Slight	0-15%	Sat	21
		007	0594_COCONINO	NA	Slight	0-15%	Sat	2
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	42
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	19
			0586_COCONINO	Moderate	Slight	0-15%	Sat	167
		027	0582a_COCONINO	Moderate	Slight	0-15%	Sat	1,247
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	181
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	89
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	550
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	67

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	28
		046	0440_COCONINO	NA	Slight	0-15%	Sat	4
	Lower Intensity Mechanical	007	0594_COCONINO	NA	Slight	0-15%	Sat	7
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	5
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	90
			0586_COCONINO	Moderate	Slight	0-15%	Sat	2
		027	0582a_COCONINO	Moderate	Slight	0-15%	Sat	116
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	456
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	30
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	116
		046	0440_COCONINO	NA	Slight	0-15%	Sat	67
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	1
		003	0595_COCONINO	NA	Slight	0-15%	Sat	2
		007	0594_COCONINO	NA	Slight	0-15%	Sat	0
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	3
			0586_COCONINO	Moderate	Slight	0-15%	Sat	261
		027	0557a_COCONINO	Severe	Slight	0-15%	Sat	28
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	1,054
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	266
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	65
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	522
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	14
		003	0595_COCONINO	NA	Slight	0-15%	Sat	718
		007	0594_COCONINO	NA	Slight	0-15%	Sat	310

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	425
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	1
		027	0582a_COCONINO	Moderate	Slight	0-15%	Sat	74
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	60
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	234
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	38
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	1
		003	0595_COCONINO	NA	Slight	0-15%	Sat	9
		007	0594_COCONINO	NA	Slight	0-15%	Sat	1
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	47
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	8
			0586_COCONINO	Moderate	Slight	0-15%	Sat	26
		027	0557a_COCONINO	Severe	Slight	0-15%	Sat	0
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	926
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	162
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	4
		039	0505_COCONINO	Moderate	Slight	0-15%	Sat	41
			0523_COCONINO	Severe	Slight	0-15%	Sat	620
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	38
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	55
		047	0450_COCONINO	NA	Mod	15 to 120%	Sat	0
Upper Deadman Wash	Aspen Treatment	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	0
		003	0595_COCONINO	NA	Slight	0-15%	Sat	1
		007	0594_COCONINO	NA	Slight	0-15%	Sat	0

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	0
			0586_COCONINO	Moderate	Slight	0-15%	Sat	10
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	7
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	28
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	39
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	12
			0654_COCONINO	Moderate	Mod	0-80%	Sat	4
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	7
		050	0610_COCONINO	Moderate	Mod	0 - 15%	Sat	168
			0611_COCONINO	Moderate	Mod	0 - 15%	Sat	108
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	2
		003	0595_COCONINO	NA	Slight	0-15%	Sat	1
		007	0594_COCONINO	NA	Slight	0-15%	Sat	0
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	145
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	1
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	14
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	315
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	97
	Lower Intensity Mechanical	003	0595_COCONINO	NA	Slight	0-15%	Sat	2
		005	0640_COCONINO	NA	Slight	0-15%	Sat	2
		007	0594_COCONINO	NA	Slight	0-15%	Sat	3
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	136
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	1,250
			0557a_COCONINO	Severe	Slight	0-15%	Sat	6

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	0
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	734
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	22
			0565a_COCONINO	Severe	Severe	15-40%	Sat	18
			0584a_COCONINO	Severe	Severe	15-40%	Sat	52
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	12
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	178
		046	0473_COCONINO	NA	Slight	0 to 15%	Sat	10
		047	0450_COCONINO	NA	Mod	15 to 120%	Sat	11
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	147
			0654_COCONINO	Moderate	Mod	0-80%	Sat	161
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	13
		050	0610_COCONINO	Moderate	Mod	0 - 15%	Sat	17
			0611_COCONINO	Moderate	Mod	0 - 15%	Sat	67
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	2
		003	0595_COCONINO	NA	Slight	0-15%	Sat	13
		005	0640_COCONINO	NA	Slight	0-15%	Sat	3
		007	0594_COCONINO	NA	Slight	0-15%	Sat	11
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	136
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	127
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1,647
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	1,471
			0557a_COCONINO	Severe	Slight	0-15%	Sat	567
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	786

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	8
			0584a_COCONINO	Severe	Severe	15-40%	Sat	71
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	525
			0523_COCONINO	Severe	Slight	0-15%	Sat	12
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	27
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	745
		046	0473_COCONINO	NA	Slight	0 to 15%	Sat	301
		047	0450_COCONINO	NA	Mod	15 to 120%	Sat	309
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	110
			0654_COCONINO	Moderate	Mod	0-80%	Sat	374
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	440
		050	0610_COCONINO	Moderate	Mod	0 - 15%	Sat	13
			0611_COCONINO	Moderate	Mod	0 - 15%	Sat	426
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	74
		003	0595_COCONINO	NA	Slight	0-15%	Sat	176
		005	0640_COCONINO	NA	Slight	0-15%	Sat	8
		007	0594_COCONINO	NA	Slight	0-15%	Sat	637
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	12
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	3
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	5
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	125
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	148
			0523_COCONINO	Severe	Slight	0-15%	Sat	69
		042	0562_COCONINO	Severe	Severe	40-	Sat	32

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
		046	0473_COCONINO	NA	Slight	0 û15%	Sat	232
		047	0450_COCONINO	NA	Mod	15 to 120%	Sat	53
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	3
			0654_COCONINO	Moderate	Mod	0-80%	Sat	0
		050	0610_COCONINO	Moderate	Mod	0 - 15%	Sat	1
			0611_COCONINO	Moderate	Mod	0 - 15%	Sat	3
	Savanna	003	0595_COCONINO	NA	Slight	0-15%	Sat	10
		007	0594_COCONINO	NA	Slight	0-15%	Sat	1
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	116
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	10
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	466
		035	0553_COCONINO	Moderate	Slight	15-40%	Sat	3
			0584a_COCONINO	Severe	Severe	15-40%	Sat	4
		039	0506_COCONINO	Moderate	Slight	0-15%	Sat	12
			0523_COCONINO	Severe	Slight	0-15%	Sat	120
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	66
Upper Hell Canyon	Aspen Treatment	020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	10
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	0
	Grassland Restoration	006	0507_KAIBAB	NA	Slight	0-15%	Sat	26
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	23
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	17
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	8
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	3
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	175
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	10
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	19
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	281
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	397
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	56
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	90
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	143
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	21
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	6
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	140
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	24
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	0
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Lower Intensity Mechanical	006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	111
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	9
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	143
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	63
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	531
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	420
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	79
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	365

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
							sat	
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	109
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	138
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	4
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	4
	Prescribed Fire Only	006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	83
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	9
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	62
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	78
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	2
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	23
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	20
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	0
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	64
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	0
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	0
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	16
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	11
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	1
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	5
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	110
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	8

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	72
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	86
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	136
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	66
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	9
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	98
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	45
		046	0514_KAIBAB	NA	Slight	0-15%	Sat	0
		047	0523_KAIBAB	NA	Severe	15 to 120%	Unsat	0
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	10
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	0
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	6
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	136
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	76
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	14
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	0
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
		046	0587_KAIBAB	NA	Slight	0-15%	Sat	0
Upper Kana-a Wash	Prescribed Fire Only	021	0011_COCONINO	Slight	Slight	15-40%	NA/Sat	84
			0014_COCONINO	Slight	Slight	15-40%	NA/Sat	65
			0015_COCONINO	Slight	Slight	15-40%	NA/Sat	417
			0511_COCONINO	Moderate	Mod	15-40%	Sat	489
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	118
		030	0559_COCONINO	Slight	Slight	0-15%	Sat	1,429
		031	0561_COCONINO	Moderate	Mod	15-40%	Sat	1,290

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		040	0510_COCONINO	Slight	Slight	0-15%	Sat	2,650
			0512_COCONINO	Slight	Slight	0-15%	Sat	424
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	733
		046	0426_COCONINO	NA	Slight	0-15%	Sat	402
			0433_COCONINO	NA	Slight	0-15%	Sat	31
			0443_COCONINO	NA	Slight	0-15%	Sat	6
		047	0427_COCONINO	NA	Mod	15 to 120%	Sat	55
			0441_COCONINO	NA	Mod	15 to 120%	Sat	64
	Prescribed Fire Only - Operational	021	0014_COCONINO	Slight	Slight	15-40%	NA/Sat	155
			0015_COCONINO	Slight	Slight	15-40%	NA/Sat	1,123
			0511_COCONINO	Moderate	Mod	15-40%	Sat	68
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	21
		030	0559_COCONINO	Slight	Slight	0-15%	Sat	105
		031	0561_COCONINO	Moderate	Mod	15-40%	Sat	218
		040	0510_COCONINO	Slight	Slight	0-15%	Sat	35
			0512_COCONINO	Slight	Slight	0-15%	Sat	182
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	0
		047	0427_COCONINO	NA	Mod	15 to 120%	Sat	56
			0441_COCONINO	NA	Mod	15 to 120%	Sat	302
Upper Lee Canyon	Higher Intensity Mechanical	023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	35
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	16
		038	0284_KAIBAB	Moderate	Severe	15-40%	Unsat	30
		042	0681_KAIBAB	Severe	Severe	40-	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
	Lower Intensity Mechanical	023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	166
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	30
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	31
		038	0284_KAIBAB	Moderate	Severe	15-40%	Unsat	19
		042	0681_KAIBAB	Severe	Severe	40-120%	Sat	35
		047	0274_KAIBAB	NA	Severe	15 to 120%	Unsat	1
	Prescribed Fire Only	013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	195
			0282_KAIBAB	Slight	Mod	0-15%	Sat	367
		016	0276_KAIBAB	Severe	Severe	15-40%	Unsat	1
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	1,026
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	397
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	720
		038	0284_KAIBAB	Moderate	Severe	15-40%	Unsat	83
		042	0681_KAIBAB	Severe	Severe	40-120%	Sat	297
		046	0260_KAIBAB	NA	Mod	0-15%	Sat	0
		047	0261_KAIBAB	NA	Severe	15 to 120%	Unsat	5
			0274_KAIBAB	NA	Severe	15 to 120%	Unsat	29
	Prescribed Fire Only - Operational	001	0011_KAIBAB	NA	Slight	0-5%	Sat	0
		013	0275_KAIBAB	Moderate	Slight	0-15%	Sat	111
			0282_KAIBAB	Slight	Mod	0-15%	Sat	18
		023	0290_KAIBAB	Moderate	Slight	0-15%	Sat	31
		033	0291_KAIBAB	Moderate	Mod	15-40%	Unsat	42

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		037	0283_KAIBAB	Moderate	Slight	0-15%	Sat	84
		038	0284_KAIBAB	Moderate	Severe	15-40%	Unsat	63
		042	0681_KAIBAB	Severe	Severe	40-120%	Sat	21
		046	0260_KAIBAB	NA	Mod	0-15%	Sat	0
		047	0261_KAIBAB	NA	Severe	15 to 120%	Unsat	3
			0274_KAIBAB	NA	Severe	15 to 120%	Unsat	11
Upper Oak Creek	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	24
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	154
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	219
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	12
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	40
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	301
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	35
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	255
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	4
		046	0492_COCONINO	NA	Mod	0-15%	Sat	4
		047	0470_COCONINO	NA	Severe	15 to 120%	Sat	0
			0471_COCONINO	NA	Severe	15 to 120%	Unsuit	0
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	17
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	199
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	2,583

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	470
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	239
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	829
			0586_COCONINO	Moderate	Slight	0-15%	Sat	16
		024	0546_COCONINO	Severe	Slight	0-15%	Sat	7
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	1,581
		032	0549_COCONINO	Moderate	Mod	15-40%	Sat	0
			0550_COCONINO	Moderate	Mod	15-40%	Sat	2
			0565_COCONINO	Severe	Severe	15-40%	Sat	56
			0584_COCONINO	Severe	Severe	15-40%	Sat	1,263
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	9
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	31
		046	0492_COCONINO	NA	Mod	0-15%	Sat	7
		047	0470_COCONINO	NA	Severe	15 to 120%	Sat	12
			0471_COCONINO	NA	Severe	15 to 120%	Unsuit	14
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	1
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	2
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	103
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	29
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	145
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	69
			0565_COCONINO	Severe	Severe	15-40%	Sat	10
			0584_COCONINO	Severe	Severe	15-40%	Sat	115
		042	0575_COCONINO	Severe	Severe	40-	Unsuit	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	4
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	11
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	50
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	14
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	483
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	4
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	36
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	27
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	2
			0584_COCONINO	Severe	Severe	15-40%	Sat	35
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	0
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	0
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	3
	Savanna	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	28
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	12
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	36
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	4
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	21
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	1
Upper Padre Canyon	Grassland Restoration	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	18

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		009	0050_COCONINO	NA	Slight	0-5%	Sat	34
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	7
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	376
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	14
			0586_COCONINO	Moderate	Slight	0-15%	Sat	35
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	3
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	33
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	4
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	674
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	3
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	123
			0586_COCONINO	Moderate	Slight	0-15%	Sat	472
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	83
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	75
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	7
	Lower Intensity Mechanical	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	336
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	5
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	6
			0586_COCONINO	Moderate	Slight	0-15%	Sat	359
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	9
	Prescribed Fire Only	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	98
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	76
			0586_COCONINO	Moderate	Slight	0-15%	Sat	25
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	15
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	17
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	7

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	234
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	10
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	6
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	0
		009	0050_COCONINO	NA	Slight	0-5%	Sat	5
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	99
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	30
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	64
			0586_COCONINO	Moderate	Slight	0-15%	Sat	95
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	15
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	130
Upper Red Lake Wash	Aspen Treatment	034	0300_KAIBAB	Moderate	Mod	15-40%	Sat	0
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	0
	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	71
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	188
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	1,249
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	11
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	10
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	5
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	5
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	12
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	51
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	133
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	14
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	51
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	143
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	28
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	233
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	292
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	198
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	70
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	50
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	325
		033	0310_KAIBAB	Moderate	Mod	15-40%	Sat	11
		034	0300_KAIBAB	Moderate	Mod	15-40%	Sat	304
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	537
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	1,020
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	17
		042	0320_KAIBAB	Severe	Severe	40- 120%	Unsuit	7
		043	0431_KAIBAB	Severe	Severe	40- 120%	Unsuit	42
		047	0476_KAIBAB	NA	Severe	15 to 120%	Unsat	1
			0496_KAIBAB	NA	Mod	15 to 120%	Unsat	13
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	22
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	58
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	2
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	10
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	75
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	488
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	152
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	37
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	117
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	846
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	845
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	148
		033	0310_KAIBAB	Moderate	Mod	15-40%	Sat	160
		034	0300_KAIBAB	Moderate	Mod	15-40%	Sat	720
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	138
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	231
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	30
			0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	6
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	68
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	3
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	1
	Prescribed Fire Only	001	0006_KAIBAB	NA	Slight	0-5%	Sat	3
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	3
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	6
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	165

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	131
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	28
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	93
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	63
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	194
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	30
		033	0310_KAIBAB	Moderate	Mod	15-40%	Sat	33
		034	0300_KAIBAB	Moderate	Mod	15-40%	Sat	410
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	29
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	10
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	23
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	1
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	102
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	2
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	140
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	185
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	1,664
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	99
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	376
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	51
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	3
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	19
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	11
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un	197

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
							sat	
		034	0300_KAIBAB	Moderate	Mod	15-40%	Sat	182
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	339
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	402
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	0
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	14
		047	0476_KAIBAB	NA	Severe	15 to 120%	Unsat	23
			0496_KAIBAB	NA	Mod	15 to 120%	Unsat	140
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	2
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	2
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	171
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	0
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	42
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	13
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	61
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	3
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	2
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	48
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	195
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	658
		041	0564_KAIBAB	Severe	Severe	15-40%	Unsat	15
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	2
		047	0496_KAIBAB	NA	Mod	15 to 120%	Unsat	0

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
Upper Rio de Flag	Aspen Treatment	027	0570_COCONINO	Moderate	Slight	0-15%	Sat	0
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	8
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	3
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	9
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	8
		003	0595_COCONINO	NA	Slight	0-15%	Sat	9
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	6
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	45
			0586_COCONINO	Moderate	Slight	0-15%	Sat	187
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	9
			0557a_COCONINO	Severe	Slight	0-15%	Sat	157
			0570_COCONINO	Moderate	Slight	0-15%	Sat	958
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	450
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	59
			0584a_COCONINO	Severe	Severe	15-40%	Sat	368
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	8
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	7
		003	0595_COCONINO	NA	Slight	0-15%	Sat	4
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	2
			0586_COCONINO	Moderate	Slight	0-15%	Sat	64
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	1,819
			0557a_COCONINO	Severe	Slight	0-15%	Sat	48
			0570_COCONINO	Moderate	Slight	0-15%	Sat	1,965
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	169

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	126
			0584a_COCONINO	Severe	Severe	15-40%	Sat	280
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	27
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	28
			0654_COCONINO	Moderate	Mod	0-80%	Sat	55
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	256
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	1
		003	0595_COCONINO	NA	Slight	0-15%	Sat	1
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	21
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	363
			0557a_COCONINO	Severe	Slight	0-15%	Sat	29
			0570_COCONINO	Moderate	Slight	0-15%	Sat	1,194
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	14
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	50
			0584a_COCONINO	Severe	Severe	15-40%	Sat	229
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	151
		048	0654_COCONINO	Moderate	Mod	0-80%	Sat	127
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	49
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	45
		003	0595_COCONINO	NA	Slight	0-15%	Sat	181
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	4
			0586_COCONINO	Moderate	Slight	0-15%	Sat	4
		027	0551_COCONINO	Moderate	Slight	0-15%	Sat	3
			0557a_COCONINO	Severe	Slight	0-15%	Sat	29

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0570_COCONINO	Moderate	Slight	0-15%	Sat	53
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	24
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	12
			0584a_COCONINO	Severe	Severe	15-40%	Sat	27
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	0
		003	0595_COCONINO	NA	Slight	0-15%	Sat	11
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	95
		027	0557a_COCONINO	Severe	Slight	0-15%	Sat	46
			0570_COCONINO	Moderate	Slight	0-15%	Sat	77
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	76
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	0
			0584a_COCONINO	Severe	Severe	15-40%	Sat	152
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	0
Upper San Francisco Wash	Prescribed Fire Only	006	0566_COCONINO	NA	Slight	0-15%	Sat	70
		021	0014_COCONINO	Slight	Slight	15-40%	NA/Sat	107
			0015_COCONINO	Slight	Slight	15-40%	NA/Sat	126
			0511_COCONINO	Moderate	Mod	15-40%	Sat	31
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	514
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	204
		030	0558_COCONINO	Slight	Slight	0-15%	Sat	532
			0559_COCONINO	Slight	Slight	0-15%	Sat	1,467
		031	0561_COCONINO	Moderate	Mod	15-40%	Sat	1,206
		040	0510_COCONINO	Slight	Slight	0-15%	Sat	564
			0512_COCONINO	Slight	Slight	0-15%	Sat	1,966
		046	0433_COCONINO	NA	Slight	0-15%	Sat	248
			0443_COCONINO	NA	Slight	0-15%	Sat	25

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0444_COCONINO	NA	Slight	0 û15%	Sat	6
		047	0441_COCONINO	NA	Mod	15 to 120%	Sat	301
			0450_COCONINO	NA	Mod	15 to 120%	Sat	64
	Prescribed Fire Only - Operational	006	0566_COCONINO	NA	Slight	0-15%	Sat	151
		021	0014_COCONINO	Slight	Slight	15-40%	NA/Sat	133
			0015_COCONINO	Slight	Slight	15-40%	NA/Sat	392
			0511_COCONINO	Moderate	Mod	15-40%	Sat	15
			0513_COCONINO	Moderate	Mod	15-40%	Unsat	453
		028	0560_COCONINO	Slight	Slight	0-15%	Sat	18
		030	0558_COCONINO	Slight	Slight	0-15%	Sat	43
			0559_COCONINO	Slight	Slight	0-15%	Sat	69
		031	0561_COCONINO	Moderate	Mod	15-40%	Sat	158
		040	0510_COCONINO	Slight	Slight	0-15%	Sat	7
			0512_COCONINO	Slight	Slight	0-15%	Sat	1,193
		046	0433_COCONINO	NA	Slight	0 û15%	Sat	146
			0443_COCONINO	NA	Slight	0 û15%	Sat	59
		047	0441_COCONINO	NA	Mod	15 to 120%	Sat	625
			0450_COCONINO	NA	Mod	15 to 120%	Sat	359
Upper Spring Valley Wash	Aspen Treatment	003	0513_KAIBAB	NA	Slight	0-15%	Sat	0
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	1
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	0
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	14
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	1

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	21
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0557a_COCONINO	Severe	Slight	0-15%	Sat	7
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	18
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	47
		036	0310a_KAIBAB	Moderate	Mod	15-40%	Sat	1
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	0
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	5
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	2
	Grassland Restoration	001	0006_KAIBAB	NA	Slight	0-5%	Sat	2
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	67
			0595_COCONINO	NA	Slight	0-15%	Sat	5
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	1
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	648
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	8
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	171
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	2
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	1
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	1
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	4
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	11
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	1
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	0
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	23
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	129

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	15
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	1
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	56
			0595_COCONINO	NA	Slight	0-15%	Sat	1
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	2
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	57
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	2
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	6
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	104
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	13
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	391
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	95
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	279
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	91
		027	0304_KAIBAB	Moderate	Slight	0-15%	Sat	36
			0324_KAIBAB	Moderate	Slight	0-15%	Sat	202
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	1,381
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	3,609
			0551_COCONINO	Moderate	Slight	0-15%	Sat	42
			0557a_COCONINO	Severe	Slight	0-15%	Sat	18
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	742
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	79
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	685
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	53
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	7
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	2

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	56
			0405_KAIBAB	Moderate	Slight	0-15%	Sat	523
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	936
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	60
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	2
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	20
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	4
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	0
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	3
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	1
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	0
			0595_COCONINO	NA	Slight	0-15%	Sat	2
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	6
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	12
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	1
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	38
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	280
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	28
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	282
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	52
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
		027	0304_KAIBAB	Moderate	Slight	0-15%	Sat	49
			0324_KAIBAB	Moderate	Slight	0-15%	Sat	421
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	400
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	825

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0551_COCONINO	Moderate	Slight	0-15%	Sat	1
			0557a_COCONINO	Severe	Slight	0-15%	Sat	10
			0570_COCONINO	Moderate	Slight	0-15%	Sat	22
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	370
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	374
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	56
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	91
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	4
		036	0300a_KAIBAB	Moderate	Mod	15-40%	Sat	185
			0310a_KAIBAB	Moderate	Mod	15-40%	Sat	66
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	89
			0405_KAIBAB	Moderate	Slight	0-15%	Sat	69
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	120
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	121
		042	0320_KAIBAB	Severe	Severe	40-120%	Unsuit	124
			0562_COCONINO	Severe	Severe	40-120%	Sat	29
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	39
		047	0476_KAIBAB	NA	Severe	15 to 120%	Unsat	8
		048	0302_KAIBAB	Moderate	Severe	0 to 80%	Sat	97
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	2
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	69
		049	0612_COCONINO	Severe	Severe	40 to	Sat	5

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	0
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	13
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	5
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	11
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	0
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	0
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	143
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	43
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	56
		023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	28
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	422
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	117
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	547
			0551_COCONINO	Moderate	Slight	0-15%	Sat	25
			0570_COCONINO	Moderate	Slight	0-15%	Sat	49
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	37
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	37
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	58
		036	0310a_KAIBAB	Moderate	Mod	15-40%	Sat	154
		039	0305_KAIBAB	Moderate	Slight	0-15%	Sat	86
			0405_KAIBAB	Moderate	Slight	0-15%	Sat	8
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	8
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	123
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	6
		048	0302_KAIBAB	Moderate	Severe	0 to	Sat	20

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						80%		
			0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	18
			0322_KAIBAB	Severe	Severe	0 to 80%	Sat	18
		049	0612_COCONINO	Severe	Severe	40 to 120%	Sat	6
			0613_COCONINO	Severe	Severe	40 to 120%	Sat	6
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	75
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	45
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	756
			0595_COCONINO	NA	Slight	0-15%	Sat	11
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	188
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	672
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	111
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	197
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	3
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	10
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	152
		020	0407_KAIBAB	Severe	Severe	15-40%	Unsat	45
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	1
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	46
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	108
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	101

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0551_COCONINO	Moderate	Slight	0-15%	Sat	2
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	31
		029	0325_KAIBAB	Moderate	Slight	0-15%	Sat	16
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	17
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	45
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	96
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	51
		047	0476_KAIBAB	NA	Severe	15 to 120%	Unsat	25
		048	0312_KAIBAB	Severe	Severe	0 to 80%	Unsat	2
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	2
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	0
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	1
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	0
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	24
			0595_COCONINO	NA	Slight	0-15%	Sat	6
		004	0440_KAIBAB	NA	Slight	15-40%	Unsat	0
		006	0507_KAIBAB	NA	Slight	0-15%	Sat	40
		009	0020_KAIBAB	NA	Slight	0-5%	Sat	3
		010	0037_KAIBAB	NA	Slight	0-5%	Sat	7
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	39
		014	0326_KAIBAB	Moderate	Slight	0-15%	Sat	3
		019	0406_KAIBAB	Severe	Severe	15-40%	Unsat	33

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	47
		027	0324_KAIBAB	Moderate	Slight	0-15%	Sat	25
			0401a_KAIBAB	Moderate	Slight	0-15%	Sat	560
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	1,227
			0557a_COCONINO	Severe	Slight	0-15%	Sat	1
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	483
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	238
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	4
		036	0310a_KAIBAB	Moderate	Mod	15-40%	Sat	4
		039	0405_KAIBAB	Moderate	Slight	0-15%	Sat	141
			0563_KAIBAB	Moderate	Slight	0-15%	Sat	350
		041	0311_KAIBAB	Severe	Severe	15-40%	Unsat	2
		043	0431_KAIBAB	Severe	Severe	40-120%	Unsuit	10
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	7
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	0
Upper Sycamore Creek	Higher Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	43
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	8
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	8
			0595_COCONINO	NA	Slight	0-15%	Sat	9
		009	0050_COCONINO	NA	Slight	0-5%	Sat	3
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	1
			0585_COCONINO	Moderate	Slight	0-15%	Sat	158
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	0
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	145

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	190
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	743
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	703
			0582_COCONINO	Moderate	Slight	0-15%	Sat	906
			0586_COCONINO	Moderate	Slight	0-15%	Sat	375
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	132
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	105
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	100
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	73
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	67
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	2
			0575_COCONINO	Severe	Severe	40-120%	Unsuit	9
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	1
		046	0495_COCONINO	NA	Slight	0-15%	Sat	20
		047	0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	3
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	1
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	5
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Lower Intensity Mechanical	001	0006_KAIBAB	NA	Slight	0-5%	Sat	28
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	24

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		014	0565_KAIBAB	Severe	Slight	0-15%	Sat	12
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	14
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	82
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	296
			0582_COCONINO	Moderate	Slight	0-15%	Sat	10
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	1
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	6
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Un sat	114
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	82
		039	0563_KAIBAB	Moderate	Slight	0-15%	Sat	245
		042	0539_KAIBAB	Severe	Severe	40-120%	Unsuit	29
		046	0495_COCONINO	NA	Slight	0-15%	Sat	3
		047	0541_KAIBAB	NA	Severe	15 to 120%	Unsuit	1
		049	0540_KAIBAB	Severe	Severe	40 to 120%	Unsat	23
	Prescribed Fire Only	023	0537_KAIBAB	Moderate	Slight	0-15%	Sat	0
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	45
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	74
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	191
		008	0518_KAIBAB	NA	Slight	0-15%	Sat	1
		009	0050_COCONINO	NA	Slight	0-5%	Sat	46
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	19
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	16
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un	5

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
							sat	
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0582_COCONINO	Moderate	Slight	0-15%	Sat	14
			0586_COCONINO	Moderate	Slight	0-15%	Sat	6
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	12
		046	0495_COCONINO	NA	Slight	0-15%	Sat	155
	Savanna	001	0006_KAIBAB	NA	Slight	0-5%	Sat	16
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	22
			0595_COCONINO	NA	Slight	0-15%	Sat	7
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0585_COCONINO	Moderate	Slight	0-15%	Sat	0
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	960
			0537_KAIBAB	Moderate	Slight	0-15%	Sat	111
			0582_COCONINO	Moderate	Slight	0-15%	Sat	318
			0586_COCONINO	Moderate	Slight	0-15%	Sat	0
		026	0010_KAIBAB	Moderate	Slight	0-5%	Sat	31
		032	0402_KAIBAB	Severe	Severe	15-40%	Sat/Unsat	1
			0525_KAIBAB	Moderate	Severe	15-40%	Unsat	0
		0998_Kaiba b_tes	0998_KAIBAB	(blank)	(blank)	(blank)	(blank)	7
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
Upper Woods Canyon	Aspen Treatment	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	3
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	13

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	902
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	276
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	947
			0586_COCONINO	Moderate	Slight	0-15%	Sat	90
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	5
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	77
			0584_COCONINO	Severe	Severe	15-40%	Sat	376
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	0
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	24
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	835
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	621
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	838
			0586_COCONINO	Moderate	Slight	0-15%	Sat	124
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	476
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	256
			0584_COCONINO	Severe	Severe	15-40%	Sat	801
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	23
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	25
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	811
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	426
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	874
			0586_COCONINO	Moderate	Slight	0-15%	Sat	24
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	288
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	162
			0584_COCONINO	Severe	Severe	15-40%	Sat	696

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	1
		046	0495_COCONINO	NA	Slight	0-15%	Sat	34
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	65
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	16
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	32
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	29
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	43
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	1
			0584_COCONINO	Severe	Severe	15-40%	Sat	1
		046	0495_COCONINO	NA	Slight	0-15%	Sat	4
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	10
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	283
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	42
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	368
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	48
			0584_COCONINO	Severe	Severe	15-40%	Sat	52
Volunteer Canyon	Aspen Treatment	027	0536_COCONINO	Severe	Slight	0-15%	Sat	1
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	0
	Higher Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	23
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	33
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	769
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	93
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	206

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0582_COCONINO	Moderate	Slight	0-15%	Sat	1,020
			0586_COCONINO	Moderate	Slight	0-15%	Sat	592
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	5
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	431
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	1
			0584_COCONINO	Severe	Severe	15-40%	Sat	83
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	3
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	23
		046	0495_COCONINO	NA	Slight	0 û15%	Sat	22
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Lower Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	9
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	21
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	45
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	180
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	37
			0582_COCONINO	Moderate	Slight	0-15%	Sat	210
			0586_COCONINO	Moderate	Slight	0-15%	Sat	13
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	67
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	58
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	26
			0584_COCONINO	Severe	Severe	15-40%	Sat	171
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	37
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	36
		046	0495_COCONINO	NA	Slight	0 û15%	Sat	21
		047	0493_COCONINO	NA	Mod	15 to	Sat	5

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
		9999_Kaiba b_tes	9999_KAIBAB	(blank)	(blank)	(blank)	(blank)	0
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only	001	0053_COCONINO	NA	Slight	0-5%	Sat	12
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	41
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	17
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	10
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	25
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	51
			0584_COCONINO	Severe	Severe	15-40%	Sat	84
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	87
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	113
		9999_Kaiba b_tes	9999_KAIBAB	(blank)	(blank)	(blank)	(blank)	0
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only - Operational	001	0053_COCONINO	NA	Slight	0-5%	Sat	39
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	59
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	19
		015	0520_COCONINO	Severe	Slight	0-15%	Sat	70
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Unsat	7
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	11

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0582_COCONINO	Moderate	Slight	0-15%	Sat	12
			0586_COCONINO	Moderate	Slight	0-15%	Sat	0
		025	0578_COCONINO	Severe	Slight	0-15%	Sat	28
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	11
		032	0550_COCONINO	Moderate	Mod	15-40%	Sat	3
			0584_COCONINO	Severe	Severe	15-40%	Sat	6
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	1
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	4
		046	0495_COCONINO	NA	Slight	0-15%	Sat	526
		047	0470_COCONINO	NA	Severe	15 to 120%	Sat	0
			0493_COCONINO	NA	Mod	15 to 120%	Sat	6
		9999_Kaiba b_tes	9999_KAIBAB	(blank)	(blank)	(blank)	(blank)	0
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Savanna	001	0053_COCONINO	NA	Slight	0-5%	Sat	17
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	2
		023	0401_KAIBAB	Moderate	Slight	0-15%	Sat	97
			0582_COCONINO	Moderate	Slight	0-15%	Sat	294
			0586_COCONINO	Moderate	Slight	0-15%	Sat	36
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	41
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	5
Volunteer Wash	Aspen Treatment	011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1
		023	0586_COCONINO	Moderate	Slight	0-15%	Sat	29
		027	0557a_COCONINO	Severe	Slight	0-15%	Sat	3

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0570_COCONINO	Moderate	Slight	0-15%	Sat	2
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	4
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	3
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	1
	Grassland Restoration	003	0513_KAIBAB	NA	Slight	0-15%	Sat	0
			0595_COCONINO	NA	Slight	0-15%	Sat	13
		027	0582a_COCONINO	Moderate	Slight	0-15%	Sat	6
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	9
		003	0595_COCONINO	NA	Slight	0-15%	Sat	40
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	37
			0585_COCONINO	Moderate	Slight	0-15%	Sat	97
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	83
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1,380
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	10
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	247
			0557a_COCONINO	Severe	Slight	0-15%	Sat	147
			0570_COCONINO	Moderate	Slight	0-15%	Sat	75
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	6,809
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	11
			0584a_COCONINO	Severe	Severe	15-40%	Sat	29
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	25
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	7
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	3
		003	0595_COCONINO	NA	Slight	0-15%	Sat	1
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	9
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	17
			0586_COCONINO	Moderate	Slight	0-15%	Sat	300
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	64
			0557a_COCONINO	Severe	Slight	0-15%	Sat	18
			0570_COCONINO	Moderate	Slight	0-15%	Sat	749
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	1,423
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	90
			0584a_COCONINO	Severe	Severe	15-40%	Sat	19
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	94
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	2
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only	003	0595_COCONINO	NA	Slight	0-15%	Sat	0
		011	0519_KAIBAB	Moderate	Slight	0-15%	Sat	46
			0585_COCONINO	Moderate	Slight	0-15%	Sat	191
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	1
			0586_COCONINO	Moderate	Slight	0-15%	Sat	397
		027	0537a_KAIBAB	Moderate	Slight	0-15%	Sat	27
			0557a_COCONINO	Severe	Slight	0-15%	Sat	17
			0570_COCONINO	Moderate	Slight	0-15%	Sat	286
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	140
		035	0565a_COCONINO	Severe	Severe	15-40%	Sat	1
			0584a_COCONINO	Severe	Severe	15-40%	Sat	39

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	53
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	6
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only - Operational	001	0006_KAIBAB	NA	Slight	0-5%	Sat	0
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	280
		003	0513_KAIBAB	NA	Slight	0-15%	Sat	56
			0595_COCONINO	NA	Slight	0-15%	Sat	671
		007	0594_COCONINO	NA	Slight	0-15%	Sat	86
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	23
			0586_COCONINO	Moderate	Slight	0-15%	Sat	12
		027	0537a_KAIBAB	Moderate	Slight	0-15%	Sat	2
			0557a_COCONINO	Severe	Slight	0-15%	Sat	3
			0570_COCONINO	Moderate	Slight	0-15%	Sat	20
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	260
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	0
		042	0562_COCONINO	Severe	Severe	40-120%	Sat	91
		9999_Kaibab_tes	9999_KAIBAB	(blank)	(blank)	(blank)	(blank)	1
		(blank)	(blank)	(blank)	(blank)	(blank)	(blank)	0
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	1
		003	0595_COCONINO	NA	Slight	0-15%	Sat	14
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	21

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	15
			0586_COCONINO	Moderate	Slight	0-15%	Sat	446
		027	0401a_KAIBAB	Moderate	Slight	0-15%	Sat	0
			0537a_KAIBAB	Moderate	Slight	0-15%	Sat	72
			0557a_COCONINO	Severe	Slight	0-15%	Sat	8
			0570_COCONINO	Moderate	Slight	0-15%	Sat	29
			0582a_COCONINO	Moderate	Slight	0-15%	Sat	1,731
		035	0584a_COCONINO	Severe	Severe	15-40%	Sat	70
		050	0611_COCONINO	Moderate	Mod	0 - 15%	Sat	0
Walnut Creek- Lower Lake Mary	Higher Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	67
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	9
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	394
		022	0527_COCONINO	Moderate	Mod	15-40%	Sat	6
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	314
			0586_COCONINO	Moderate	Slight	0-15%	Sat	81
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	609
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	78
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	1,037
		Lake_ Cocon ino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	5
	Lower Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	16
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	15
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1,162
		022	0527_COCONINO	Moderate	Mod	15-40%	Sat	0
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	561

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0586_COCONINO	Moderate	Slight	0-15%	Sat	23
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	127
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	294
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	113
		039	0500_COCONINO	Severe	Slight	0-15%	Sat	20
			0523_COCONINO	Severe	Slight	0-15%	Sat	0
		Lake_ Cocon ino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	8
	Prescribed Fire Only	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	3
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	451
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	178
			0586_COCONINO	Moderate	Slight	0-15%	Sat	54
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	60
	Prescribed Fire Only - Operational	001	0053_COCONINO	NA	Slight	0-5%	Sat	226
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	63
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	28
		022	0527_COCONINO	Moderate	Mod	15-40%	Sat	19
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	10
			0586_COCONINO	Moderate	Slight	0-15%	Sat	39
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	97
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	13
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	84
		039	0500_COCONINO	Severe	Slight	0-15%	Sat	9
			0523_COCONINO	Severe	Slight	0-15%	Sat	1
		Lake_	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	656

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		Coconino						
	Savanna	001	0053_COCONINO	NA	Slight	0-5%	Sat	18
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	119
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	11
			0586_COCONINO	Moderate	Slight	0-15%	Sat	233
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	270
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	97
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	242
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	1
Walnut Creek-Upper Lake Mary	Aspen Treatment	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	0
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	3
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	2
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	23
	Grassland Restoration	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	6
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	18
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	76
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	0
			0586_COCONINO	Moderate	Slight	0-15%	Sat	28
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	12
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	36
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	0
	Higher Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	111
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Un	95

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
							sat	
		009	0050_COCONINO	NA	Slight	0-5%	Sat	0
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	2,931
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	16
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	913
			0586_COCONINO	Moderate	Slight	0-15%	Sat	3,152
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	48
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	1,002
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	66
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	62
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	736
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	83
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	24
	Lower Intensity Mechanical	001	0053_COCONINO	NA	Slight	0-5%	Sat	27
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	139
		009	0050_COCONINO	NA	Slight	0-5%	Sat	4
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	3,425
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	15
		023	0557_COCONINO	Severe	Slight	0-15%	Sat	8
			0582_COCONINO	Moderate	Slight	0-15%	Sat	1,114
			0586_COCONINO	Moderate	Slight	0-15%	Sat	2,696
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	14
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	54
			0584_COCONINO	Severe	Severe	15-40%	Sat	1,336
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	1

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	41
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	53
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	44
			0654_COCONINO	Moderate	Mod	0-80%	Sat	76
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	12
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	0
	Prescribed Fire Only	001	0053_COCONINO	NA	Slight	0-5%	Sat	8
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	29
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	224
		023	0557_COCONINO	Severe	Slight	0-15%	Sat	1
			0582_COCONINO	Moderate	Slight	0-15%	Sat	32
			0586_COCONINO	Moderate	Slight	0-15%	Sat	249
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	2
			0584_COCONINO	Severe	Severe	15-40%	Sat	200
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	47
			0654_COCONINO	Moderate	Mod	0-80%	Sat	9
		049	0613_COCONINO	Severe	Severe	40 to 120%	Sat	0
	Prescribed Fire Only - Operational	001	0053_COCONINO	NA	Slight	0-5%	Sat	27
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	487
		009	0050_COCONINO	NA	Slight	0-5%	Sat	23

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	242
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	352
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	117
			0586_COCONINO	Moderate	Slight	0-15%	Sat	158
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	34
		036	0537_COCONINO	Severe	Mod	15-40%	Sat	11
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	18
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	113
		048	0653_COCONINO	Moderate	Mod	0 to 80%	Sat	2
		Lake_Coconino	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	309
	Savanna	001	0053_COCONINO	NA	Slight	0-5%	Sat	50
		002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	118
		009	0050_COCONINO	NA	Slight	0-5%	Sat	4
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	1,628
		019	0515_COCONINO	NA	Mod	15-40%	Unsat	36
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	592
			0586_COCONINO	Moderate	Slight	0-15%	Sat	1,674
		027	0536_COCONINO	Severe	Slight	0-15%	Sat	5
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	241
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	63
		041	0524_COCONINO	Severe	Severe	15-40%	Sat	19
		042	0575_COCONINO	Severe	Severe	40-120%	Unsuit	2
		Lake_Cocon	Lake_COCONINO	(blank)	(blank)	(blank)	(blank)	14

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
		ino						
West Fork Oak Creek	Grassland Restoration	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	7
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	6
	Higher Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	16
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	961
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	168
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	216
			0586_COCONINO	Moderate	Slight	0-15%	Sat	915
		024	0546_COCONINO	Severe	Slight	0-15%	Sat	15
		032	0549_COCONINO	Moderate	Mod	15-40%	Sat	14
			0565_COCONINO	Severe	Severe	15-40%	Sat	19
			0584_COCONINO	Severe	Severe	15-40%	Sat	742
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	27
		048	0651_COCONINO	Severe	Severe	0 to 80%	Sat	1
	Lower Intensity Mechanical	002	0055_COCONINO	NA	Slight	0-5%	Sat/Un sat	2
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	185
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	147
		018	0530_COCONINO	Moderate	Mod	15-40%	Sat/Un sat	6
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	189
			0586_COCONINO	Moderate	Slight	0-15%	Sat	213
		024	0546_COCONINO	Severe	Slight	0-15%	Sat	1,690
		032	0549_COCONINO	Moderate	Mod	15-40%	Sat	603
			0550_COCONINO	Moderate	Mod	15-40%	Sat	12

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
			0565_COCONINO	Severe	Severe	15-40%	Sat	43
			0584_COCONINO	Severe	Severe	15-40%	Sat	768
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	98
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	3
		048	0651_COCONINO	Severe	Severe	0 to 80%	Sat	245
			0654_COCONINO	Moderate	Mod	0-80%	Sat	0
	Prescribed Fire Only	012	0579_COCONINO	Moderate	Slight	0-15%	Sat	73
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	8
			0586_COCONINO	Moderate	Slight	0-15%	Sat	24
		024	0546_COCONINO	Severe	Slight	0-15%	Sat	285
		032	0549_COCONINO	Moderate	Mod	15-40%	Sat	326
			0550_COCONINO	Moderate	Mod	15-40%	Sat	51
			0565_COCONINO	Severe	Severe	15-40%	Sat	40
			0584_COCONINO	Severe	Severe	15-40%	Sat	115
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	225
		047	0471_COCONINO	NA	Severe	15 to 120%	Unsuit	6
		048	0651_COCONINO	Severe	Severe	0 to 80%	Sat	63
	Prescribed Fire Only - Operational	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	75
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	2
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	17
			0586_COCONINO	Moderate	Slight	0-15%	Sat	2
		032	0584_COCONINO	Severe	Severe	15-40%	Sat	11
		044	0555_COCONINO	Severe	Severe	40-	Sat	3

6th Code	AltB_GenTy	Strata	TES MU# Forest	Harvst Lim	Erosion Hazard	Slope	Soil Cond	acres
						120%		
	Savanna	002	0055_COCONINO	NA	Slight	0-5%	Sat/Unsat	15
		011	0585_COCONINO	Moderate	Slight	0-15%	Sat	447
		012	0579_COCONINO	Moderate	Slight	0-15%	Sat	28
		023	0582_COCONINO	Moderate	Slight	0-15%	Sat	59
			0586_COCONINO	Moderate	Slight	0-15%	Sat	188
		032	0565_COCONINO	Severe	Severe	15-40%	Sat	10
			0584_COCONINO	Severe	Severe	15-40%	Sat	65
		044	0555_COCONINO	Severe	Severe	40-120%	Sat	1
		048	0651_COCONINO	Severe	Severe	0 to 80%	Sat	0
Yeager Draw	Higher Intensity Mechanical	032	0565_COCONINO	Severe	Severe	15-40%	Sat	4
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	46
		046	0453_COCONINO	NA	Mod	0 û15%	Unsat	9
	Lower Intensity Mechanical	032	0565_COCONINO	Severe	Severe	15-40%	Sat	39
		039	0523_COCONINO	Severe	Slight	0-15%	Sat	2
Grand Total								583,330

Baseline data

Roads, private land, grazing allotments, and powerline corridors are baseline disturbance area acres for the project area. Baseline activities are ground disturbance constants. For this analysis, roads and powerline corridors are synonymous because the area of powerline corridors that contains baseline ground disturbance is the access road. Ground disturbance from cattle grazing is difficult to quantify, however, ground disturbance does occur from grazing where cattle congregate, which are typically associated watering sites. For this analysis, we will use the baseline disturbance for grazing as an area adjacent to stock tanks (1/8 mile buffer). There are approximately 7,170 miles of roads within the analysis area according to three forest Geographic Information System (gis) data layers. These data layers did not differentiate between open and closed roads, so for this analysis, we assumed that all roads are open, therefore the actual acres of current ground disturbance is probably overstated for the cumulative effects analysis area. The 7,170 miles of road assumed a 15 foot width and assumed 100 percent disturbance. There are 101,461 acres of private land within the cumulative effects boundary area. Of these acres, there are variable levels of development ranging from municipal development in areas such as Flagstaff, Willimans, Tusayan, and Sedona to completely undeveloped. For this analysis, each private land parcel was classified as either having high or low development by examining each parcel with air photos to determine the level of development. For areas of high development, a disturbance factor of 70 percent was applied (this is the equivalent disturbed area factor used on the Apache-Sitgreaves Equivalent Disturbed Area process for high development). For areas of low development, a 10 percent disturbance factor was applied after examining aerial photos (the Apache-Sitgreaves Equivalent Disturbed Area process for low development applies a 20 percent disturbance factor and after reviewing parcels by air photo this factor was too high because there is a general lack of any development on many of the parcels).

Table 38. Cumulative Effects Baseline Data

6th CODE HUC NAME	Total 6th code acres	Acres of grazing allotment	Acres stock tank disturbance	Total Acres of Private Land	Acres of Private Land disturbance	Miles of roads	Acres of Road Disturbance	Total Acres of Base Disturbance	Percent of 6th code base disturbance
Anderson Canyon	31,284	31,284	14.2	125	13	37	67	93	0.3%
Babbitt Lake	28,413	28,413	10.3	196	20	121	221	250	0.9%
Bar M Canyon	17,551	17,551	12.4	127	13	76	139	164	0.9%
Bear Canyon	21,982	21,982	3.3	194	19	78	142	165	0.7%
Bear Jaw Canyon	11,135	11,135	0.3	76	8	34	63	70	0.6%
Big Spring Canyon	31,697	30,442	21.9	940	94	154	279	395	1.2%
Cataract Creek Headwaters	16,699	7,179	19.9	5,064	1,602	91	165	1,787	10.7%
Cedar Creek	8,888	5,085	1.8	0	0	11	20	21	0.2%
Cherry Canyon-Walnut Creek	28,330	19,292	25.4	1,043	142	148	269	437	1.5%
Cinder Basin	39,864	4,933	0.4	0	0	68	124	124	0.3%

6th CODE HUC NAME	Total 6th code acres	Acres of grazing allotment	Acres stock tank disturbance	Total Acres of Private Land	Acres of Private Land disturbance	Miles of roads	Acres of Road Disturbance	Total Acres of Base Disturbance	Percent of 6th code base disturbance
Coconino Wash Headwaters	51,193	37,425	10.9	591	247	162	294	552	1.1%
Curley Wallace Tank	13,431	13,431	3.2	143	14	33	61	78	0.6%
Dent and Sayer Tank	37,216	37,216	11.6	241	24	116	212	247	0.7%
Devil Dog Canyon	11,196	10,920	2.9	1,167	117	31	57	176	1.6%
Dogtown Wash	11,662	9,452	11.4	1,687	241	70	128	380	3.3%
Doney Park	42,133	20,979	13.5	5,445	3,146	234	425	3,584	8.5%
Double Cabin Park-Jacks Canyon	21,660	20,940	10.7	708	71	120	218	299	1.4%
Dry Creek	34,398	19,770	10.5	1,851	753	101	183	947	2.8%
Fry Canyon	19,175	19,143	18.0	249	25	66	120	163	0.8%
Garland Prairie	25,054	18,836	36.5	3,821	382	121	220	638	2.5%
Government Canyon	12,765	12,765	1.2	80	8	33	59	68	0.5%
Government Prairie	20,399	11,856	43.4	3,119	787	78	143	973	4.8%
Grapevine Canyon	19,186	19,186	10.1	118	12	34	61	83	0.4%
Grindstone Wash	17,796	12,765	7.1	244	24	76	138	169	1.0%
Johnson Creek	30,857	28,794	35.2	1,795	180	177	322	537	1.7%
Juan Tank Canyon	14,231	13,839	14.4	500	50	62	112	177	1.2%
Kinnikinick Canyon	24,895	24,774	16.7	14	1	64	116	134	0.5%
Klostermeyer Lake	28,109	28,109	5.6	0	0	67	121	127	0.5%
Little LO Spring Canyon	12,260	12,255	4.4	0	0	37	66	71	0.6%
Little Red Horse Wash	27,465	27,465	4.0	0	0	80	145	149	0.5%
Long Lake-Chavel Pass Ditch	14,590	14,476	16.4	0	0	50	91	108	0.7%
Lower Deadman Wash	31,266	21,852	0.0	0	0	82	148	148	0.5%
Lower Rio de Flag	35,308	10,094	28.5	13,710	5,922	131	239	6,189	17.5%

6th CODE HUC NAME	Total 6th code acres	Acres of grazing allotment	Acres stock tank disturbance	Total Acres of Private Land	Acres of Private Land disturbance	Miles of roads	Acres of Road Disturbance	Total Acres of Base Disturbance	Percent of 6th code base disturbance
Lower Sycamore Creek	30,677	30,677	11.6	86	9	14	25	45	0.1%
Lower Woods Canyon	26,131	25,637	8.9	226	23	61	111	143	0.5%
MC Canyon	21,686	21,686	9.1	0	0	81	147	156	0.7%
Meath Wash	37,538	32,905	18.0	691	69	98	177	265	0.7%
Middle Deadman Wash	22,888	21,929	5.4	1,925	192	114	208	406	1.8%
Middle Oak Creek	39,896	31,204	13.3	6,890	4,064	109	199	4,276	10.7%
Middle Spring Valley Wash	32,672	32,672	11.0	158	16	51	93	119	0.4%
Middle Sycamore Creek	18,335	16,033	16.8	42	4	46	83	104	0.6%
Miller Wash Headwaters	31,220	31,220	14.2	387	39	110	199	252	0.8%
Mormon Canyon	19,252	18,877	15.5	162	16	56	102	134	0.7%
Mormon Lake	25,968	24,294	15.6	1,594	518	95	172	706	2.7%
Munds Canyon	41,179	37,670	28.9	2,172	1,110	188	342	1,481	3.6%
Pitman Valley-Scholz Lake	28,459	24,963	49.1	3,623	408	139	253	710	2.5%
Porcupine Canyon-Walnut Creek	16,622	15,085	5.9	2,498	490	94	171	667	4.0%
Pumphouse Wash	31,546	26,868	25.5	2,545	1,415	168	306	1,746	5.5%
Rabbit Canyon	41,339	41,339	10.7	0	0	35	64	74	0.2%
Rain Tank Wash	38,483	38,483	18.7	275	28	89	163	209	0.5%
Rattlesnake Canyon	17,023	16,230	6.6	79	8	71	129	143	0.8%
Rattlesnake Wash	16,259	6,434	3.5	0	0	46	84	87	0.5%
Red Horse Wash Headwaters	19,561	19,561	10.2	163	16	63	115	141	0.7%
Sawmill Tank	13,730	11,750	14.6	1,649	242	70	128	384	2.8%
Sawmill Wash	12,385	12,385	7.2	0	0	45	83	90	0.7%
Secret Canyon	11,138	7,182	2.6	0	0	28	50	53	0.5%

6th CODE HUC NAME	Total 6th code acres	Acres of grazing allotment	Acres stock tank disturbance	Total Acres of Private Land	Acres of Private Land disturbance	Miles of roads	Acres of Road Disturbance	Total Acres of Base Disturbance	Percent of 6th code base disturbance
Sinclair Wash	6,766	1,884	2.5	3,150	1,634	34	62	1,699	25.1%
Smoot Lake	21,535	21,535	10.5	328	33	42	76	119	0.6%
Spring Creek	30,830	29,568	10.5	887	89	88	159	258	0.8%
Telephone Tank	14,934	4,959	12.9	1,069	405	43	79	497	3.3%
Tule Canyon	29,866	27,042	18.9	193	19	140	254	293	1.0%
Upper Cataract Creek	25,011	25,011	41.0	800	8	73	132	181	0.7%
Upper Cedar Wash (Local Drainage)	23,476	23,476	5.8	836	84	77	140	229	1.0%
Upper Deadman Wash	22,752	22,575	5.4	892	89	91	165	260	1.1%
Upper Hell Canyon	29,249	28,372	19.2	393	39	139	253	312	1.1%
Upper Kana-a Wash	38,801	629	0.0	0	0	85	155	155	0.4%
Upper Lee Canyon	29,537	25,149	6.9	403	40	62	112	159	0.5%
Upper Oak Creek	17,900	11,880	4.7	294	157	67	122	284	1.6%
Upper Padre Canyon	22,105	20,806	20.3	1,326	133	51	93	246	1.1%
Upper Red Lake Wash	26,930	26,930	23.1	1,710	170	125	227	420	1.6%
Upper Rio de Flag	44,551	29,877	30.4	8,918	3,563	218	396	3,990	9.0%
Upper San Francisco Wash	34,397	26,542	7.8	1,921	554	209	380	942	2.7%
Upper Spring Valley Wash	38,305	36,263	36.6	3,189	319	173	314	670	1.7%
Upper Sycamore Creek	14,916	12,566	12.6	2,370	237	62	112	362	2.4%
Upper Woods Canyon	12,671	12,573	5.6	0	0	80	146	151	1.2%
Volunteer Canyon	24,506	11,539	11.4	964	96	36	66	173	0.7%
Volunteer Wash	31,771	30,700	27.9	1,937	505	199	361	894	2.8%
Walnut Creek-Lower Lake Mary	18,920	17,714	5.6	512	51	92	168	224	1.2%
Walnut Creek-Upper Lake Mary	34,473	29,698	13.8	232	23	125	227	264	0.8%

6th CODE HUC NAME	Total 6th code acres	Acres of grazing allotment	Acres stock tank disturbance	Total Acres of Private Land	Acres of Private Land disturbance	Miles of roads	Acres of Road Disturbance	Total Acres of Base Disturbance	Percent of 6th code base disturbance
West Fork Oak Creek	27,339	22,402	8.6	185	18	127	231	258	0.9%
Yeager Draw	24,465	24,465	13.2	539	54	19	34	102	0.4%
	2,032,080	1,692,878	1,104	101,461	30,903	7,169	13,034	45,041	2.2%

Current Projects

Current ongoing is a summary of ground disturbing activites within 6th code watershed from 2009 to the present as stated within the FACTS activities layers and the BARC fire severity layer for the Slide Fire. The use of the last three years for current and ongoing is tied to the 1-2 year recovery time for vegetation as stated in Elliot et al, 2010. All activities use a 15% disturbance factor, so the acres overestimate ground disturbance on burning treatments, and maximize the ground disturbance for mechanical acres. Ground disturbance factors for the Slide Fire are as follows: unburned/very low= 0%, low = 2%, moderate = 62%, and high = 90% . This analysis is thought to over analyze the acres of ground disturbance from project area and does double count some treatment acres within the Slide Fire.

Table 39. Current Projects Total Acres and Expected Ground Disturbance Acres

Total acres treated (less Slide Fire)	Expected Ground disturbance less Slide Fire(acres)
132,837	19,926
Slide Fire Acres	Slide Fire Ground Disturbance
21,884	7,455
	TOTAL GROUND DISTURBANCE
	27,381

Table 40. Current and ongoing project acres by 6th code watershed and treatment type

Coconino National Forest Treatments

6th code watershed/treatment type	acres
Anderson Canyon	2,608
Broadcast Burning - Covers a majority of the unit	1,810
Thinning for Hazardous Fuels Reduction	399
Tree Encroachment Control	399
Babbitt Lake	436
Control of Understory Vegetation	77
Thinning for Hazardous Fuels Reduction	222
Wildland Fire Use	136
Bar M Canyon	3,026
Broadcast Burning - Covers a majority of the unit	629
Burning of Piled Material	165
Commercial Thin	209
Piling of Fuels, Hand or Machine	59
Thinning for Hazardous Fuels Reduction	7
Wildland Fire Use	1,957
Bear Jaw Canyon	247
Broadcast Burning - Covers a majority of the unit	247
Cherry Canyon-Walnut Creek	9,359
Broadcast Burning - Covers a majority of the unit	1,273
Burning of Piled Material	2,011
Commercial Thin	1,773
Permanent Land Clearing	150
Piling of Fuels, Hand or Machine	1,859
Thinning for Hazardous Fuels Reduction	1,859
Tree Encroachment Control	104

Kaibab National Forest Treatments

6th code watershed/treatment type	acres
Bear Canyon	85
Wildfire - Fuels Benefit	85
Big Spring Canyon	2,746
Broadcast Burning - Covers a majority of the unit	709
Burning of Piled Material	900
Commercial Thin	719
Group Selection Cut (UA/RH/FH)	249
Piling of Fuels, Hand or Machine	168
Cataract Creek Headwaters	1,461
Broadcast Burning - Covers a majority of the unit	683
Burning of Piled Material	64
Piling of Fuels, Hand or Machine	713
Cedar Creek	872
Wildfire - Fuels Benefit	872
Coconino Wash Headwaters	4,971
Broadcast Burning - Covers a majority of the unit	2,741
Burning of Piled Material	276
Piling of Fuels, Hand or Machine	335
Wildfire - Fuels Benefit	391
Wildfire - Natural Ignition	1,229
Curley Wallace Tank	5,541
Wildfire - Natural Ignition	5,541
Dent and Sayer Tank	6,443
Wildfire - Fuels Benefit	4,245
Wildlife Habitat Mechanical treatment	2,198

Wildlife Habitat Mechanical treatment	330
Dent and Sayer Tank	1,943
Control of Understory Vegetation	0
Thinning for Hazardous Fuels Reduction	0
Wildland Fire Use	1,943
Doney Park	948
Broadcast Burning - Covers a majority of the unit	566
Burning of Piled Material	86
Chipping of Fuels	106
Site Preparation for Natural Regeneration - Manual	104
Thinning for Hazardous Fuels Reduction	86
Double Cabin Park-Jacks Canyon	2,871
Broadcast Burning - Covers a majority of the unit	2,511
Wildfire - Natural Ignition	204
Wildland Fire Use	157
Dry Creek	237
Slide Fire	237
Fry Canyon	2,288
Slide Fire	668
Broadcast Burning - Covers a majority of the unit	306
Burning of Piled Material	907
Commercial Thin	407
Kinnikinick Canyon	2,667
Broadcast Burning - Covers a majority of the unit	1,167
Commercial Thin	500
Piling of Fuels, Hand or Machine	500
Thinning for Hazardous Fuels Reduction	500
Lower Rio de Flag	2,649

Devil Dog Canyon	70
Broadcast Burning - Covers a majority of the unit	70
Dogtown Wash	865
Broadcast Burning - Covers a majority of the unit	202
Burning of Piled Material	286
Piling of Fuels, Hand or Machine	377
Garland Prairie	272
Burning of Piled Material	180
Piling of Fuels, Hand or Machine	91
Government Canyon	142
Wildfire - Fuels Benefit	142
Government Prairie	435
Burning of Piled Material	75
Piling of Fuels, Hand or Machine	273
Wildfire - Natural Ignition	87
Grindstone Wash	1,235
Broadcast Burning - Covers a majority of the unit	1,235
Johnson Creek	1,455
Broadcast Burning - Covers a majority of the unit	1,022
Burning of Piled Material	103
Piling of Fuels, Hand or Machine	330
Juan Tank Canyon	13
Piling of Fuels, Hand or Machine	13
Little Red Horse Wash	3,360
Broadcast Burning - Covers a majority of the unit	11
Burning of Piled Material	58
Piling of Fuels, Hand or Machine	54
Wildfire - Fuels Benefit	3,160

Broadcast Burning - Covers a majority of the unit	565
Burning of Piled Material	762
Liberation Cut	0
Piling of Fuels, Hand or Machine	687
Thinning for Hazardous Fuels Reduction	597
Tree Encroachment Control	21
Yarding - Removal of Fuels by Carrying or Dragging	16
Lower Woods Canyon	272
Broadcast Burning - Covers a majority of the unit	272
Middle Oak Creek	4
Burning of Piled Material	2
Thinning for Hazardous Fuels Reduction	2
Mormon Canyon	488
Broadcast Burning - Covers a majority of the unit	488
Mormon Lake	7,296
Broadcast Burning - Covers a majority of the unit	2,079
Burning of Piled Material	1,171
Commercial Thin	3,203
Piling of Fuels, Hand or Machine	353
Thinning for Hazardous Fuels Reduction	330
Wildland Fire Use	161
Munds Canyon	2,267
Burning of Piled Material	13
Piling of Fuels, Hand or Machine	256
Thinning for Hazardous Fuels Reduction	269
Wildfire - Natural Ignition	1,729
Porcupine Canyon-Walnut Creek	33
Burning of Piled Material	11
Piling of Fuels, Hand or Machine	11

Wildfire - Natural Ignition	77
Lower Sycamore Creek	38
Wildfire - Fuels Benefit	38
MC Canyon	193
Broadcast Burning - Covers a majority of the unit	193
Meath Wash	127
Broadcast Burning - Covers a majority of the unit	127
Miller Wash Headwaters	5,936
Wildfire - Fuels Benefit	1,301
Wildfire - Natural Ignition	848
Wildlife Habitat Mechanical treatment	3,786
Pitman Valley-Scholz Lake	1,792
Broadcast Burning - Covers a majority of the unit	359
Burning of Piled Material	956
Commercial Thin	195
Group Selection Cut (UA/RH/FH)	68
Piling of Fuels, Hand or Machine	214
Rabbit Canyon	58
Wildfire - Fuels Benefit	58
Rain Tank Wash	2,144
Broadcast Burning - Covers a majority of the unit	789
Burning of Piled Material	205
Wildfire - Fuels Benefit	1,151
Rattlesnake Wash	313
Broadcast Burning - Covers a majority of the unit	313
Red Horse Wash Headwaters	897
Wildfire - Natural Ignition	897
Sawmill Tank	78
Burning of Piled Material	78

Thinning for Hazardous Fuels Reduction	11
Pumphouse Wash	11,423
Broadcast Burning - Covers a majority of the unit	2,180
Burning of Piled Material	3,797
Commercial Thin	3,784
Piling of Fuels, Hand or Machine	303
Thinning for Hazardous Fuels Reduction	357
Slide Fire	895
Tree Encroachment Control	107
Rabbit Canyon	193
Control of Understory Vegetation	1
Thinning for Hazardous Fuels Reduction	1
Wildland Fire Use	191
Rattlesnake Canyon	1,584
Wildfire - Natural Ignition	1,222
Wildland Fire Use	362
Sinclair Wash	103
Broadcast Burning - Covers a majority of the unit	53
Burning of Piled Material	25
Commercial Thin	25
Telephone Tank	1,813
Broadcast Burning - Covers a majority of the unit	833
Burning of Piled Material	444
Commercial Thin	536
Upper Deadman Wash	842
Wildfire - Natural Ignition	768
Wildland Fire Use	223
Upper Oak Creek	4,362
Broadcast Burning - Covers a majority of the unit	533

Tule Canyon	7,064
Broadcast Burning - Covers a majority of the unit	260
Burning of Piled Material	223
Wildfire - Fuels Benefit	6,580
Upper Cataract Creek	116
Burning of Piled Material	12
Piling of Fuels, Hand or Machine	104
Upper Hell Canyon	1,700
Broadcast Burning - Covers a majority of the unit	1,628
Burning of Piled Material	37
Piling of Fuels, Hand or Machine	35
Upper Lee Canyon	1,765
Burning of Piled Material	25
Piling of Fuels, Hand or Machine	25
Wildfire - Natural Ignition	1,715
Upper Red Lake Wash	1
Burning of Piled Material	1
Upper Spring Valley Wash	7,979
Broadcast Burning - Covers a majority of the unit	239
Burning of Piled Material	1,148
Piling of Fuels, Hand or Machine	113
Thinning for Hazardous Fuels Reduction	57
Wildfire - Natural Ignition	6,421
Grand Total	60,167

Burning of Piled Material	124
Slide Fire	3,651
Thinning for Hazardous Fuels Reduction	54
Upper Padre Canyon	4,131
Broadcast Burning - Covers a majority of the unit	3,955
Commercial Thin	59
Piling of Fuels, Hand or Machine	59
Thinning for Hazardous Fuels Reduction	59
Upper Rio de Flag	4,152
Broadcast Burning - Covers a majority of the unit	2,014
Burning of Piled Material	1,459
Commercial Thin	498
Permanent Land Clearing	4
Piling of Fuels, Hand or Machine	79
Site Preparation for Natural Regeneration - Manual	10
Thinning for Hazardous Fuels Reduction	79
Wildlife Habitat Regeneration cut	10
Upper San Francisco Wash	687
Broadcast Burning - Covers a majority of the unit	299
Burning of Piled Material	318
Piling of Fuels, Hand or Machine	42
Thinning for Hazardous Fuels Reduction	28
Upper Woods Canyon	1,575
Wildfire - Natural Ignition	375
Wildland Fire Use	1,200
Volunteer Canyon	3,323
Broadcast Burning - Covers a majority of the unit	1,116
Burning of Piled Material	964

Commercial Thin	1,244
Volunteer Wash	686
Broadcast Burning - Covers a majority of the unit	506
Site Preparation for Natural Regeneration - Manual	90
Wildlife Habitat Regeneration cut	90
Walnut Creek-Lower Lake Mary	2,200
Broadcast Burning - Covers a majority of the unit	2,103
Piling of Fuels, Hand or Machine	96
Walnut Creek-Upper Lake Mary	416
Thinning for Hazardous Fuels Reduction	8
Wildfire - Natural Ignition	408
West Fork Oak Creek	16,432
Slide Fire	16,432
Grand Total	72,670

Future Foreseeable projects

The following table summarizes the acres of treatment by project from future and foreseeable projects. The total acres of treatment are multiplied by 15 percent to display the expected acres of ground disturbance, and as such are overestimating burn acres and underestimating rock pit acres and are assuming all harvest treatments would be high intensity treatments.

Table 41. Future Foreseeable Projects

	6 th code acres	Aspen restoration	Bill Williams Mountain	Camp Navajo	City	Community Tank	Dog Town	Grapevine Interconnect	Eastside	Elk Park	Hart Prairie	Jack Smith Schultz	Mahan Landmark	Marshall	McCracken	Munds Park	Rock Pits COF	Rock Pits KNF	Railroad	Schultz Rehab	Schultz Salvage	Turkey Barney	Upper Basin	Upper Beaver Creek	WAPA	Wing Mountain	Woody Ridge	FWPP	TOTAL TREAT ACRES	TOTAL Ground Disturb	% of 6th c ode
6th CODE HUC NAME																															
Anderson Canyon	31,284	0	0	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	187	0	0	0	229	34	0%
Babbitt Lake	28,413	0	0	0	0	0	0	0	0	0	141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	141	21	0%
Bar M Canyon	17,551	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	125	0	0	0	0	125	19	0%
Bear Canyon	21,982	50	0	0	0	0	0	0	0	0	0	0	0	0	422	0	0	15	0	0	0	0	0	0	0	0	0	0	488	73	0%
Bear Jaw Canyon	11,135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	25	0	0	0	0	0	0	0	0	36	5	0%
Big Spring Canyon	31,697	49	0	0	4,473	0	4,173	0	0	0	0	0	0	0	49	0	0	13	0	0	0	0	0	0	0	0	0	0	8,757	1,314	4%
Cataract Creek Headwaters	16,699	0	1,429	0	36	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500	225	1%
Cedar Creek	8,888	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Cherry Canyon-Walnut Creek	28,330	0	0	0	0	0	0	0	3,180	0	0	0	0	7,647	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,827	1,624	6%
Cinder Basin	39,864	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	256	0	0	0	256	38	0%
Coconino Wash Headwaters	51,193	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0	0	0	36	5	0%
Curley Wallace Tank	13,431	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Dent and Sayer Tank	37,216	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	16	2	0%
Devil Dog Canyon	11,196	0	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	10	0%
Dogtown Wash	11,662	0	87	0	2,500	0	2,463	0	0	0	0	0	0	0	811	0	0	0	0	0	0	0	0	0	0	0	0	0	5,861	879	8%
Doney Park	42,133	0	0	0	0	0	0	0	530	0	0	0	0	0	0	0	0	0	0	518	146	0	0	0	0	0	0	183	1,377	207	0%
Double Cabin Park-Jacks Canyon	21,660	0	0	0	0	0	0	0	0	0	0	0	4,202	0	0	0	0	0	0	0	0	0	0	5,756	0	0	0	0	9,958	1,494	7%
Dry Creek	34,398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,152	0	0	0	0	0	0	1,152	173	1%
Fry Canyon	19,175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,222	0	1,222	183	1%
Garland Prairie	25,054	0	0	3,512	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,512	527	2%
Government Canyon	12,765	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Government Prairie	20,399	0	0	7,234	0	0	0	0	0	0	442	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,676	1,151	6%
Grapevine Canyon	19,186	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0	43	6	0%
Grindstone Wash	17,796	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Johnson Creek	30,857	0	789	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	789	118	0%
Juan Tank Canyon	14,231	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Kinnikinick Canyon	24,895	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	202	0	0	0	206	31	0%

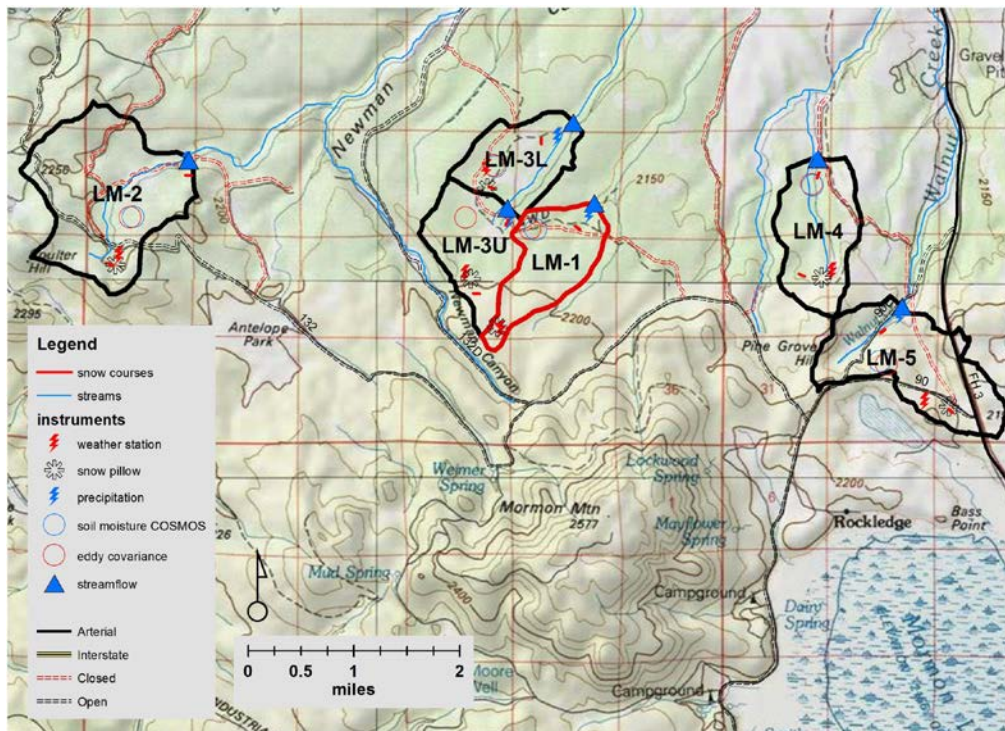
Klostermeyer Lake	28,109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Little LO Spring Canyon	12,260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	408	0	0	0	0	0	0	0	408	61	0%
Little Red Horse Wash	27,465	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Long Lake-Chavel Pass Ditch	14,590	0	0	0	0	0	0	0	0	0	0	2,519	0	0	0	0	0	0	0	0	0	0	0	78	0	0	0	2,597	390	3%	
Lower Deadman Wash	31,266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	0	200	30	0%		
Lower Rio de Flag	35,308	0	0	0	0	0	0	0	1,060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,214	3,274	491	1%	
Lower Sycamore Creek	30,677	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	177	0	0	0	0	0	0	177	27	0%	
Lower Woods Canyon	26,131	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	
MC Canyon	21,686	0	0	0	0	0	0	0	0	0	0	0	0	0	6,314	0	0	5	0	0	0	0	0	0	0	0	0	6,319	948	4%	
Meath Wash	37,538	0	157	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	157	24	0%	
Middle Deadman Wash	22,888	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	147	0	0	0	0	0	0	0	159	24	0%	
Middle Oak Creek	39,896	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	
Middle Spring Valley Wash	32,672	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	7	1	0%	
Middle Sycamore Creek	18,335	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	987	0	0	0	0	0	0	998	150	1%
Miller Wash Headwaters	31,220	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	3	0%	
Mormon Canyon	19,252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	193	0	0	0	193	29	0%		
Mormon Lake	25,968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111	0	0	0	2,426	2,537	380	1%	
Munds Canyon	41,179	0	0	0	0	0	0	0	0	0	0	0	0	0	0	350	17	0	0	0	0	0	0	0	0	0	0	0	367	55	0%
Pitman Valley-Scholz Lake	28,459	8	0	0	370	0	370	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	760	114	0%
Porcupine Canyon-Walnut Creek	16,622	0	0	0	0	0	0	0	530	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	530	80	0%
Pumphouse Wash	31,546	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,345	0	1,345	202	1%	
Rabbit Canyon	41,339	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	
Rain Tank Wash	38,483	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	
Rattlesnake Canyon	17,023	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,173	0	0	0	0	1,173	176	1%	
Rattlesnake Wash	16,259	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	
Red Horse Wash Headwaters	19,561	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	9	1	0%	
Sawmill Tank	13,730	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0	0	103	15	0%	
Sawmill Wash	12,385	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	171	0	0	0	190	29	0%		
Secret Canyon	11,138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,684	0	0	0	0	0	0	3,684	553	5%	
Sinclair Wash	6,766	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	
Smoot Lake	21,535	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	11	2	0%		
Spring Creek	30,830	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,361	0	0	0	0	0	0	1,361	204	1%	
Telephone Tank	14,934	0	0	5,932	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	128	0	0	6,074	911	6%		
Tule Canyon	29,866	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1	0%		
Upper Cataract Creek	25,011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	7	1	0%		
Upper Cedar Wash (Local Drainage)	23,476	0	0	0	0	0	0	0	0	0	0	0	0	0																	

Upper Hell Canyon	29,249	11	1,871	0	167	0	167	0	0	0	0	0	0	0	0	7,375	0	0	0	0	0	0	0	0	0	0	9,592	1,439	5%		
Upper Kana-a Wash	38,801	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	318	0	0	0	318	48	0%	
Upper Lee Canyon	29,537	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,156	0	0	0	0	1,156	173	1%		
Upper Oak Creek	17,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0%		
Upper Padre Canyon	22,105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	284	0	0	0	284	43	0%	
Upper Red Lake Wash	26,930	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	14	2	0%		
Upper Rio de Flag	44,551	0	0	0	0	0	0	0	530	0	852	1,574	0	0	0	0	19	0	422	0	0	0	0	0	0	5,836	0	3,121	12,354	1,853	4%
Upper San Francisco Wash	34,397	0	0	0	0	0	0	0	1,060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	295	0	0	0	1,355	203	1%
Upper Spring Valley Wash	38,305	169	0	0	0	865	0	0	0	0	261	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	1,309	196	1%		
Upper Sycamore Creek	14,916	0	0	777	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	777	117	1%		
Upper Woods Canyon	12,671	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	382	0	0	0	382	57	0%		
Volunteer Canyon	24,506	0	0	10,623	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,623	1,593	7%		
Volunteer Wash	31,771	0	0	400	0	0	0	0	0	0	4,257	0	0	0	0	0	0	0	0	0	0	0	0	0	3,800	0	0	8,457	1,269	4%	
Walnut Creek-Lower Lake Mary	18,920	0	0	0	0	0	0	0	0	3,322	0	0	0	2,805	0	0	5	0	0	0	0	0	0	0	0	0	6,131	920	5%		
Walnut Creek-Upper Lake Mary	34,473	0	0	0	0	0	0	0	0	3,564	0	0	0	154	0	0	7	0	0	0	0	0	0	0	0	0	3,725	559	2%		
West Fork Oak Creek	27,339	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	10,065	0	0	0	0	10,070	1,510	6%		
Yeager Draw	24,465	0	0	0	0	0	0	173	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	173	26	0%		
TOTAL	2,032,080	405	4,402	28,477	7,546	865	7,209	214	6,890	6,886	9,786	1,574	6,739	10,605	14,971	350	101	190	422	690	146	17,835	1,156	7,546	2,229	9,763	2,567	7,944	157,509	23,627	1%

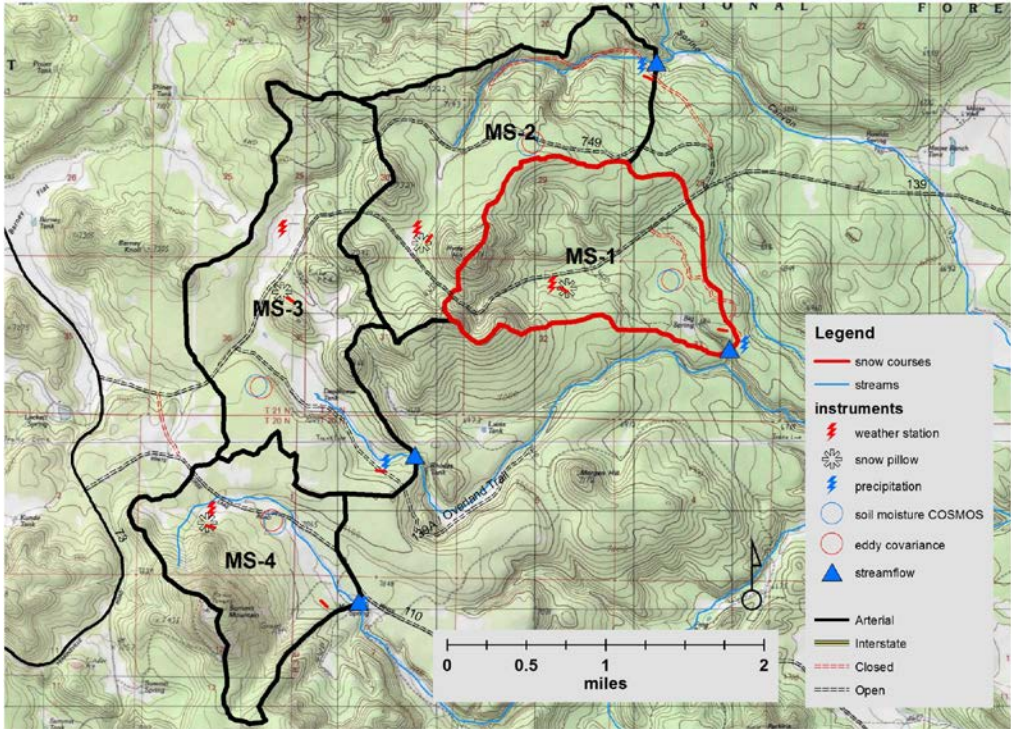
Attachment 4. Paired Watershed Study Locations and Soil Disturbance Details

The detailed paired watershed study plan (Masek-Lopez 16, 2013) can be found in the project record.

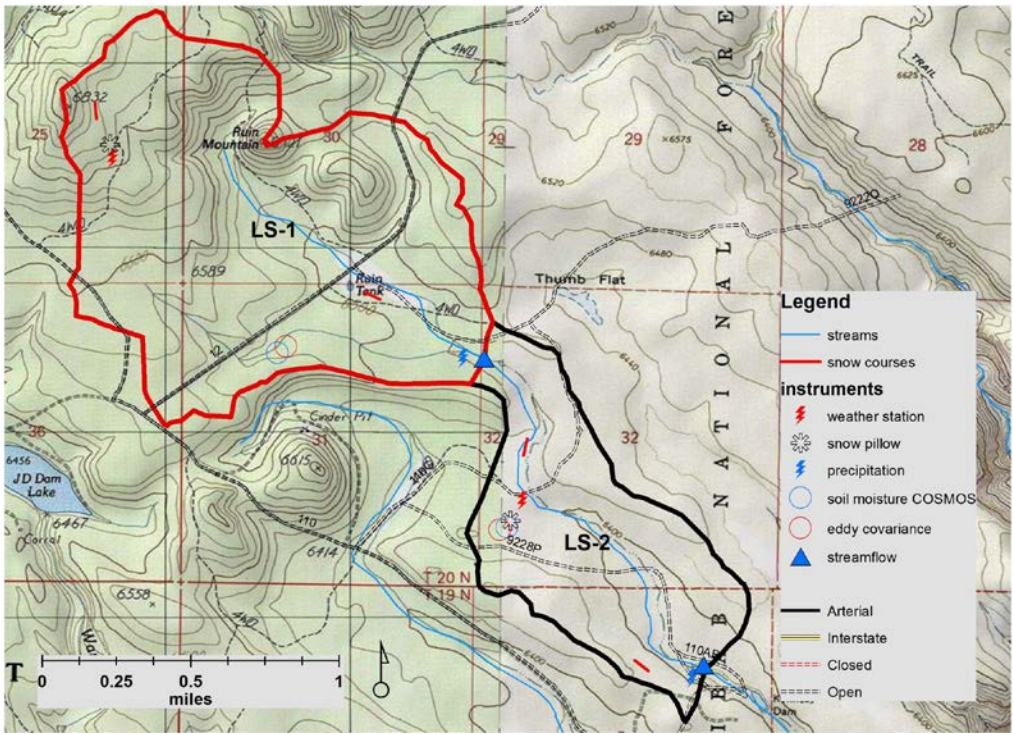
Paired Watershed Locations and Instrumentation in the Walnut Creek-Upper Lake Mary 6th HUC watershed



Paired Watershed Locations and Instrumentation in the Big Spring Canyon 6th HUC watershed



Paired Watershed Locations and Instrumentation in the Middle Sycamore Creek 6th HUC watershed



4FRI Paired Watershed Study Scientific Instrument Footprint

equipment category	item	size source	length (ft)	width (ft)	individual footprint (ft ²)	quantity	cummulative footprint (ft ²)
Biophysical monitoring							
	rebar markers	4/plot, 10 plots/watershed	0.042	0.042	0.0017	480	1
	<i>Bioophysical Mon. total</i>				0.0017		1
Precipitation							
	Precipitaticn gauges	SRP engineering drawing, p. 4	10	6	60	12	720
	Precipitaticn sampler	Amy Lewis	1	diameter	10	12	118
	<i>Precipitation total</i>				70		838
Weather Station							
	Weather Station pole with solar and radio	SRP engineering drawing, p. 6	6	diameter	59	12	710
Snow water equivalence							
	Snotel sites						

ultrasonic snow depth		6	diameter	59	12	710
sensor pole with radio and solar	SRP engineering drawing, p. 2					
rain/snow station standpipe	Rickly	4	diameter	39	12	473
snow pillow	Rickly	10	8	80	12	960
snow courses	pins to mark ends, 2 per wtrshd.	0.042	0.042	0.0017	48	1
<i>SWE total</i>				179		2143
Soil water storage						
COSMOS	HydroInnova	5	4	20	12	240
TDR	Campbell Scientific	12	2	24	36	864
<i>soil water storage total</i>				44		1104
Evapotranspiration						
Granier sapflux	NAU					
trees (1' dia. ave.)	12 per site	1	diameter	118	6	710
PVC conduit for cables	4" X 30' average	30	0.33	10	6	60

tower	Valles Caldera tower	16	16	256	6	1536
solar power system	SunWize	10	10	100	6	600
data logger and battery housing		8	6	48	6	288
eddy covar. site as a whole	Tom Kolb, 0.30 ac total each			13,068	6	78,408
Surface Water Discharge						
Streamflow flume & instrumentation pole	SRP engineering drawing, p. 5	12	10	120	4	480
Streamflow large weir w/ flume & instrumentation pole	SRP engineering drawing, p. 11	20	12	240	8	1920
Level TROLL 500 transducer, vented cable	InSitu Inc.	included	included		12	
crest gage	Rickly	1	1	1	12	12
SW discharge subtotal				361		2,412
Water quality						
Autosampler (a.k.a stream sedimentation sampler)	SRP engineering drawing, p. 7 minus pole	10	10	100	12	1200
in situ turbidimeter	together with flume	included	included			
Water Quality subtotal				100		1,200
Sediment Yield						
silt fences, 6/watershed	Robichaud and Brown 2002	30	8	240	72	17,280
Sediment Yield subtotal				240		17,280
TOTAL FOOTPRINT					sq. feet	104,096
					acres	2.39

Attachment 5. Soil and Water Responses to Public Comments

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
Stakeholder Group/Waltz, Cara #98, May 28, 2013			
SH-1. Page 3, #4 (key issue #1)	The stakeholder group suggest openings promote snowpack accumulation and water retention and few openings are planned	Snowpack accumulation and water retention	Thank you for your comment. Treatments designed for snowpack accumulation and water retention are outside the scope of the project and do not meet the purpose and need (DEIS chapter 1, page 8) which is to reestablish and restore forest structure and pattern, forest health and vegetation composition and diversity. The need is to increase forest resiliency and sustainability and protect soil productivity and improve soil and watershed function. However, action alternative C includes a paired watershed study that would study the effects of forest treatments on water balance including snowpack water retention and water yield. Any increases in water yield are a secondary benefit of proposed forest restoration
SH-2. Page 6, 4b, 4d (recommendations)	The stakeholder group would like the proposed action and to provide a broader range of opening sizes and shapes capable of retaining a greater volume of snow water including guidelines.	Snowpack accumulation and water retention	Same response as comment SH-1.
SH-3. Page 13, subconcern 4, #1	Add guidance that will protect old trees during prescribed fire.	Soil Moisture and Old Tree Protection during Prescribed Burning and Soil Moisture Factor	Design features, and Soil and Water BMP's and mitigation measures (Appendix C, page 587 of DEIS) have been developed and will be implemented to maintain and protect soil productivity, minimize sediment delivery and protect water quality Specifically, design criteria #SW6 states, in areas to be prescribed burned fires prescriptions should be designed to minimize soil temperatures over the entire area. Fire prescriptions should be designed so that soil and fuel moisture temperatures are such that fire severity is minimized and soil health and productivity are maintained. Consequently old trees would be protected from prescribed fire.
SH-4. Page 16, Key Issue #5, pt 4.	Recommends adding FWPP to cumulative effects analysis.	Cumulative Effects	The FWPP has been added to the cumulative effects analysis and effects will be disclosed in the final EIS.
Gatewood, Wildwood Consulting LLC, Cara # 151. May 28, 2013			

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
SG-1. Page 2, Comment from page 23 of DEIS.	Rio de Flag should be mapped as a resource at risk.	Resource mapping	Thank you for your comment. The risks to the Rio de Flag have been analyzed and will be mitigated as part of the Flagstaff Watershed Protection Project (FWPP) project, which is also analyzed under cumulative effects on pg. 697 of the 4FRI DEIS. The Rio de Flag watershed will be added to the map as recommended.
SG-2. Page 2. Comment from page 24 of DEIS.	Is there a need to reduce fuel loadings in values at risk areas like streamside management zone?	Fuel loading effects to streamside management zones	Fuel reduction treatments are planned within streamside management zones. Best Management Practices and Design Criteria have been designed to mitigate potential adverse effects to soils, water quality, riparian and non-riparian vegetation and the aquatic environment of perennial streams. These include: SW8 (pg. 582), SW32(pg. 588)
SG-3. Page 3. Comment from page 26 of DEIS	A more detailed discussion of watershed features trying to be protected restored might be helpful. Watershed would exhibit high geomorphic, hydrologic, and biotic integrity is pretty vague.	Characterization of watershed function	Page 56 of the Soil Specialist report defines watershed condition and the process used to classify watershed condition and function. Page 26, 27 of DEIS (Watershed at the 6th Hydrologic Unit Code (HUC) Scale specifies which watershed features (or indicators) could improve watershed function and include reduction of tree density that would move the fire regime condition class towards historical range, decommissioning of unneeded roads to their natural condition, improvement of soil and riparian functional condition. Page 48 of the Soil Specialist report also details which watershed indicators need to improve to improve watershed function (Watershed dysfunction in the treatment area is a result in large part from dense forests with fire regime condition classes of 2 or 3, high density of road networks that can alter hydrology, riparian condition less than functional and other factors).
SG-4. Page 3. Comment from page 27, DEIS.	It is unclear here whether there are “32 miles of ephemeral streams.....” on the project area or on the entire Coconino National Forest (CNF). It should be clear for each statement whether forest-wide or for the project portion of the forest, even if that approach is identified earlier in the document .	Characterization of ephemeral streams	The 32 miles of degraded ephemeral channel are within the project area on the Coconino National Forest. There are 7 miles of degraded non-riparian streamcourses on the Kaibab National Forest.
SG-4. Page 4. Comment from	There should be a definition of “Steep slopes” in the Glossary as it is used in this DEIS	Characterization of steep slopes	Steep slopes is used in chapter 1 (page 11) and chapter 3 (pages 109, 183), in reference to MSO habitat and soil. Steep slopes generally refer to those slopes greater than about 40%. I suggest we include in

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
page 352 DEIS			parenthesis (slopes greater than about 40%) after the 3 uses in Chapter 1 and 3.
SG-5. Page 7. Comment from page 611 DEIS	Steep slopes are not defined – 40%, 50%, more? Add to Glossary?	Characterization of steep slopes	Same response as SG-4.
(NAU 4FRI DEIS Comments 5-29-13) (Springer/M. Lopez). Cara # 162			
NAU-1.	Concern 1: Conduct a word search in the document for the words “construct [or construction of] up to 15 weirs and 20 weather stations ...” and change the wording to read something like this: “Install and maintain scientific instruments, weirs, flumes, sediment traps and survey courses in up to 12 watersheds (up to 3 total acres of disturbance) to support watershed research and provide forest management tools to managers to protect watershed health.	Request for improved discussion of the research instrumentation associated with the paired watershed research	Thank you for your comment. Your recommendation will be incorporated into the FEIS.
NAU Concern 2, Recommendation, pg. 3	Concern 2: 1. Insert discussion of how the watershed study affects treatments, including the following: a. no treatment of the three control watersheds, b. continued road access (by researchers) for the duration of the study, c. follow-up burn treatments on experimental watersheds, and d. deferring treatment during the 7-year calibration period. 2. Change the prescriptions for the control watersheds from burn only and minimal mechanical treatment to “no treatment	Request for road access to research sites and changes to treatment regimes and timelines to facilitate watershed research	Control watershed will remain untreated as recommended. Roads that remain open for administrative use will be available for access to research sites for the duration of the study. Page vi, 2 nd bullet of the EIS Summary states “On those acres proposed for prescribed fire, two fires would be conducted over the 10-year period.” The paired watershed study is not expected to affect follow-up prescribed fire treatments. Prescribed burning treatments would require implementation protection measures (i.e., removal) for research instrumentation. Treatments in experimental watersheds will be deferred during the 7-year calibration period. Control watershed will not be treated.
NAU Concern	Concern 3:	Request to change	Evidence-based restoration treatments are beyond the scope of this

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
3, Recommendation, pg. 4	1. Amend treatment prescriptions for watershed MS-3, LM-3L and LM-4 to evidence-based restoration from the current proposed treatment. Work with ERI to define the methods of evidence-based treatment for these watersheds. 2. On page 47 – Alternative development process – please add that, besides eliminating mechanical thinning and burning in control watersheds, the watershed research will change the treatment prescription on approximately 2,700 acres to evidence-based restoration.	treatment prescriptions in research watersheds to evidence-based restoration	project.
NAU Concern 4, Recommendation, pg. 4	Concern 4: Please clarify what is meant by “A weather station located outside of the immediate foreground (300 feet)”.	Request for clarification of the meaning of foreground	Sites, travelways, special places, and other areas are assigned a Concern Level value of 1, 2, or 3 to reflect the relative High, Medium, or Low importance of aesthetics. Seen Areas and Distance Zones are mapped from these 1, 2, or 3 areas to determine the relative sensitivity of scenes based on their distance from an observer; these zones are identified as Foreground (up to 1/2 mile from the viewer), Middleground (up to 4 miles from the foreground), and Background (4 miles from the viewer to the horizon). Reference: Landscape Aesthetics A Handbook for Scenery Management. Agriculture Handbook 701.
NAU Concern 5, Recommendation, pg. 5	Concern 5: The 4FRI Team should work collaboratively with NAU, ERI, and SRP to select and reanalyze a control watershed for the Lake Mary set of watersheds. NAU’s preferences from highest to lowest are LM-1C, LM-1A, LM-1D and LM-1B.	Request for collaboration in identifying control watersheds for the Lake Mary paired watersheds	A new control watershed for the Lake Mary set of watersheds will be selected collaboratively with NAU, ERI, and SRP and analyzed in the FEIS.
NAU, page 5, Other comments regarding the proposed paired	One minor edit could be made on page 262. The phrase “and wildlife and watershed research and restoration” should probably read, “and wildlife and watershed research on restoration” (emphasis added).	Editorial recommendation	This editorial recommendation will be incorporated into the FEIS.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
watershed study			
NAU, Part 2, Other Watershed Related Topics, pg. 6	What is the difference between a significant and a non-significant forest plan amendment? Please, clarify.	Request for clarification on types of forest plan amendments	Regarding the definitions, see page X of Appendix C. it is defined for all alternatives 2. plan amendments are part of the record of decision 3. its unclear what additional information is needed -4. See previous response to stakeholders 5. plan amendments are based on the need to be consistent with the direct in the forest plan - see project's purpose and need and desired conditions, see previous response on evidence-based
NAU, Part 2, Other Watershed Related Topics, pg. 6	What is the timing of plan amendments relative to the EIS?	Request for clarification on the timing of plan amendments as they relate to the 4FRI project	Comment is not related to soils, watershed, water quality, or riparian areas.
NAU, Part 2, Other Watershed Related Topics, pg. 6	Besides table 2, where can we find more details about the proposed plan amendments (especially regarding interspace)?	Request for more detailed information on forest plan amendments	Comment is not related to soils, watershed, water quality, or riparian areas.
NAU, Part 2, Other Watershed Related Topics, pg. 6	In appendix B it is stated “the interspaces between groups may range from 20 to 200 feet, but generally between 25 and 100 feet apart from drip line to adjacent drip line”. Could you, please, provide a distribution of the different interspace distances (eg. 20% 25-40’, 40% 40-80’, etc.)? This would be very helpful in evaluating how planned interspaces may affect snowpack accumulation and retention that will have a large effect on water balance.	Request for more detailed explanation of how interspaces would be distributed	Comment is not related to soils, watershed, water quality, or riparian areas.
NAU, Part 2, Other Watershed Related Topics, pg. 6	Would changing 3 experimental watersheds to evidence-based restoration require a plan amendment? One of the watersheds (LM-3L) is essentially already evidence-based, since >90% has a savanna prescription.	Request for explanation regarding whether changing treatment	Comment is not related to soils, watershed, water quality, or riparian areas.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
		prescription in a research watershed requires a forest plan amendment	
NAU, Part 2, Other Watershed Related Topics, pg. 6	We prefer the term “water balance research” to water “yield” research	Request for change in terminology in discussion of paired watershed research	Although the term “water balance research” better describes the objectives of the proposed research, “water yield research” is more easily understood by the general public and other stakeholders. The FEIS will therefore refer to the research as “water yield research” although we recognize the complexity and comprehensive nature of the study.
NAU, pg. 7	Please define the desired conditions for soil and watershed function or reference where in the document these can be found.	Request for definition of desired conditions for soils and watersheds	Desired conditions for soils can be found on pg. 25, paragraph 5 of the DEIS. Desired conditions for watersheds can be found on pg. 26, paragraph 2.
NAU, pg. 7	The Rio de Flag watershed is not a source of water for the City of Flagstaff. Concern about the Rio de Flag centers on flood risk due to forest being highly susceptible to crown fire.	Recommend removal of Rio de Flag as a source of water for Flagstaff	Agreed. The Rio de Flag is not a source of water for the City of Flagstaff. This information will be corrected in the FEIS.
NAU, pg. 7	How have soil condition and function been determined? Please, provide a brief explanation.	soil condition	
NAU, pg. 7	How have soil condition and function been determined? Please, provide a brief explanation.	soil condition and function	Please see Methodology and Analysis Process on page 8 of the Soil Resources Specialist’s Report.
NAU, pg. 7	Are there treatments planned in the 15% of area that does not have satisfactory soil condition? If so, what mitigating measures are planned?	treatments on unsatisfactory soils	Yes treatments are planned on unsatisfactory soils. The intent is to improve soil condition see SW BMPs in appendix C - SW 11, 14, 22, 24, 25, 26, 27, 28, 29, 30, 31,35, pages 584 to 589 in the hard copy and CD DEIS.
NAU, pg. 7	Please, include a Hydrologic Condition Framework map for the project area so we can visually see where the priorities areas are.	Request for map of watershed condition	I believe this comment is intended to reference the Watershed Condition Framework rather than Hydrologic Condition Framework. Watershed conditions for all National Forest System lands, including

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
		framework	those within the 4FRI analysis area are available online at: WCATT 1.3.0 (Build 40)
NAU, pg. 7	We recommend an emphasis on engineering assessment of road drainage and simple measures to reduce long-term concentration of water along roadways, such as replacement of culverts with rolling water bars and mulching of abandoned roadbeds.	Roads	Page 28, paragraph 4 states “the desired condition is to restore decommissioned road prisms to their natural condition (USDA 1987, USDA 1988) .”
NAU, pg. 7	This section is pretty vague about what would actually be done. If there is greater detail elsewhere in the document, such as Table 111, please reference it.	Requesting more detailed information	I’m unsure as to what specific section this comment is referring.
NAU, pg.	Where are the references for the main body of the DEIS? I was looking for USDA 2009 and could not find it.	References	References can be found on pages 357-435 of the DEIS and are included in the project record.
NAU, pg. 7	By “major watersheds” do you mean 5th code watersheds? Please, clarify, since earlier there was discussion of the 6th code watersheds	5 th code watersheds (HUC10)	Yes. This will be clarified in the FEIS.
NAU, pg. 8	Define ephemeral channel functionality	Ephemeral streams	Ephemeral channel functionality has been described on page iii, paragraph 5 of the DEIS. Desired conditions for ephemeral channels are described on page 27, paragraph 5 and page 28, paragraph 1 of the DEIS. Desired conditions for ephemeral channels are more specifically described on page 8, paragraph 2 of the Water Quality and Riparian Areas Specialist’s Report.
NAU, pg. 8	Again, while the desired condition may be to restore decommissioned road prisms to their natural condition, this may be prohibitively expensive. It is not uncommon to find historic roads in the forest that have naturally revegetated and are stable. The focus should be on making sure that road prisms have frequent and adequate channels across them so that water can pass without being concentrated on or along the roadbed. Also, removal of culverts is	Road decommissioning	Page 28, paragraph 4 states “the desired condition is to restore decommissioned road prisms to their natural condition (USDA 1987, USDA 1988) .” Appendix C – Design Features, BMPs, and Mitigation includes soil and water resources BMPs designed to prevent degradation water quality during and after forest treatments, including road decommissioning.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	advisable, since without ongoing maintenance they are like to plug and cause erosion and sedimentation. Some of these culverts could likely be reused for temporary roads associated with restoration work or they could be recycled, both of which may help defray costs for the contractor. While road decommissioning is very important for soil and watershed condition, doing it in an economically practical fashion is necessary to ensure that practices will be adequately implemented. Also, if all roadbeds were to be ripped to restore the beds to natural condition, this would cause a tremendous amount of disturbance that would likely promote a flush of invasive plant growth.		
NAU, pg. 8	Again, please use the term “water balance” rather than “water yield”. Yield is only one part of what we will investigate and is not more important than the other parts of the water balance. Please, search and replace throughout the document so that instead of “water yield” it reads “water balance”, unless water yield is explicitly intended	Water balance vs. water yield	Although the term “water balance research” better describes the objectives of the proposed research, “water yield research” is more easily understood by the general public and other stakeholders. The FEIS will therefore refer to the research as “water yield research” although we recognize the complexity and comprehensive nature of the study.
NAU, pg. 8	Is there some sense of how much total area might be treated by an essentially evidence-based restoration approach according to, “Remove tree canopy to pre-settlement condition within 2–5 chains of the spring”? It seems like evidence-based restoration could be applied to 1.2 to 7.8 acres surrounding each spring. Dr. Abe Springer and ERI would be very interested to know how the Forest Service will determine the desired acres of pre-settlement condition around springs. Ponderosa pine restoration treatments for the purpose of restoring springs is a novel approach, with little or no literature to support the supposition in table 16 that a 2-5 chain radius is	Springs restoration	The reference to “2-5 chains” is for demonstrational purposes only. It is anticipated that springs restoration would be implemented under consultation and coordination of local spring experts at NAU, the Museum of Northern Arizona, and Spring Stewardship Institute. Why are we using chains as a unit of measure in a document intended for the general public? Why don't we just call it a Gunter's chain for clarity – or maybe just use acres instead?

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	appropriate. We encourage the Forest Service to treat this as a research opportunity and test varying treatment intensities and radii around springs to determine which treatments are most beneficial. Through research, monitoring and an adaptive management process, we may over time come to understand the best approaches for restoring ponderosa pine forest to benefit spring ecosystems.		
NAU, pg. 9	Oak Creek has had many more than 2 exceedences of the water quality standard for E. coli and at more than one location.	Water Quality	The Riparian and Water Quality Specialist's Report and DEIS will be revised to reflect this information.
NAU, pg. 9	"Escherichia coliform (E. coli)" should read "Escherichia coli (E. coli)". Note the use of "coli" rather than "coliform" and italics rather than no italics.	E. coli	The Riparian and Water Quality Specialist's Report and DEIS will be revised to correct the syntax of the Escherichia coli (E. coli).
NAU, pg. 10	Lower Lake Mary is not a designated domestic water source, so far as we know. Upper Lake Make is a designated municipal water source.	Domestic water sources	The Riparian and Water Quality Specialist's Report and DEIS will be revised to properly reflect Upper Lake Mary as the only municipal water source in the Lake Mary watershed.
NAU, pg. 10	Covington and Moore (1994) would be a good citation for the statement "Water yields from the ponderosa pine vegetation type are likely reduced from historic conditions due to increased stand densities that result in higher evapotranspiration rates	Recommended citation	The citation will be added to the Riparian and Water Quality Specialist's Report and DEIS to support the statement related to reduced water yields from the ponderosa pine vegetation type.
NAU, pg. 11	Design Criteria number SW2 – This is a big concern. Because of the volume of fiber that needs to be removed each year, the contractor may be tempted to push the envelope and put equipment on the ground when soil moisture conditions are not favorable. Can some consequences (such as financial penalties) be imposed as part of this design criteria?	Recommendation related to mechanical treatments under wet ground conditions	This comment addresses a contract compliance issue and is not directly related to the NEPA analysis. Contract compliance issues would be addressed during project implementation.
NAU, pg. 11	Design Criteria number SWX – There should be	Mechanical	This comment is likely referencing a term known as "felling to the

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	design criteria that describe how planned hauling and burning practices may minimize soil burn severity. A member of the 4FRI team has previously given the impression that, as far as possible, “haul to the lead” would be used to bring unlimbed trees to a landing where they would be limbed, the limbs shredded and chips hauled for biomass production and the logs hauled for use in saw timber and/or composite wood products. Hence, there would probably remain at the landing some concentrated material that would likely burn at a high temperature, but little slash burned out in the unit. Please, discuss to what extent “haul to the lead” or other similar practices will be used.	treatments / logging operations	lead” whereby trees are felled in a predetermined direction to facilitate transport to the landing. This practice minimizes soil disturbance by reducing the number of turns necessary to position the machinery for skidding of harvested trees. Transporting (i.e., skidding) of trees with limbs intact is known as whole-tree skidding. This practice also reduces soil disturbance in comparison to skidding of limbed logs by reducing soil gouging. Concentrated material at landings could either be utilized or distributed across treatment areas to minimize burn severity.
NAU, pg. 11	Design Criteria number SW8 (page 582) – This design criteria does not sound consistent with the LTRS ~~Check Between~~ . c this design criteria and the Large Tree Implementation Plan to see if the two are compatible with regards to ephemeral channels and riparian areas.	Best Management Practices	SW8 refers to a common Best Management Practice designed to protect water quality during forest mechanical operations. The purpose of establishing vegetative filter strips is to prevent sediment delivery to streamcourses. This BMP is also intended to reduce fire intensity (and therefore soil burn severity) on areas located in close proximity to water bodies and ephemeral channels.
AZ State Forestry (AZ4FRIDEISComments). Cara #166			
AZSF-1	In the DEIS pages 38-39 and 47, water yield is considered, but only as a potential research item. There is not any emphasis on actually designing treatments to capture snowfall and increase water flow. There is no recognition that within the present alternatives, implementation could be designed with the intent of increasing snowfall retention and water yield. The Forest Service should work with experts in this field to design and implement other aspects of treatments that will increase water yield.	Alternatives lack recognition of water yield	Thank you for your comment. Treatments designed to capture snowfall and increase water yield are outside the scope of the project and do not meet the purpose and need (DEIS chapter 1, page 8) which is to reestablish and restore forest structure and pattern, forest health and vegetation composition and diversity. The need is to increase forest resiliency and sustainability and protect soil productivity and improve soil and watershed function. However, action alternative C includes a paired watershed study that would study the effects of forest treatments on water balance including snowpack water retention and water yield. Any increases in water yield are a secondary benefit of proposed forest restoration.
Grand Canyon Trust (4FRIDEISComments). Cara#172			

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
GCT-1	In this case we urge the Forest Service to amend plans in a way that affords additional rather than less protection to springs and riparian areas from anthropogenic forces.	Request to amend Forest plans	This request is outside the scope of this project; however, as stated in the Draft Revised Kaibab National Forest Plan, protecting springs and wetlands came forward as an important need for change. Improved desired conditions for springs and wetlands have been incorporated into the Draft Kaibab National Forest Land and Resource Management Plan.
	What is the difference between a significant and a non-significant forest plan amendment? Please, clarify.		Comment is not related to soils, watershed, water quality, or riparian areas
	What is the timing of plan amendments relative to the EIS?		Comment is not related to soils, watershed, water quality, or riparian areas
	Besides table 2, where can we find more details about the proposed plan amendments (especially regarding interspace)?		Comment is not related to soils, watershed, water quality, or riparian areas
	In appendix B it is stated “the interspaces between groups may range from 20 to 200 feet, but generally between 25 and 100 feet apart from drip line to adjacent drip line”. Could you, please, provide a distribution of the different interspace distances (eg. 20% 25-40’, 40% 40-80’, etc.)? This would be very helpful in evaluating how planned interspaces may affect snowpack accumulation and retention that will have a large effect on water balance.		Comment is not related to soils, watershed, water quality, or riparian areas
	Would changing 3 experimental watersheds to evidence-based restoration require a plan amendment? One of the watersheds (LM-3L) is essentially already evidence-based, since >90% has a savanna prescription.		Comment is not related to soils, watershed, water quality, or riparian areas
CBD Lininger (Cara 180 and 204 2013-0529LiningerCBD_1451MST)			
CBD-1. Page 25 and 26 of	The Forest Service must cease its practice of refusing to disclose the location and effects of	Disclosure of effects of roads on	Thank you for your comment. The DEIS proposes no new permanent road construction (DEIS page 40, p 63, p 81, p 88). The DEIS

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
comment letter	new road construction and take a hard look at potential site-specific impacts to the environment. New roads may destroy large trees and coarse woody structure, permanently impair soil productivity and alter plant communities, and even if their use is temporary. New road construction may significantly impact soils and water quality, and this is a significant issue for environmental analysis. The Forest Service must cease its standard practice of refusing to disclose the location and effects of new road construction and take a hard look at potential site-specific impacts to the environment, as required by NEPA. New roads and ground-based logging activities may cause significant losses of soil productivity (Gucinski et al. 2001: 21) (“Losses of productivity associated with road-caused, accelerated erosion are site specific and variable in extent, but they are commonly reported for all steep slope landscapes.”). New roads can permanently impair soil productivity even if their use is temporary (Trombulak and Frissell 2000	various resources including soil productivity.	proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area. Chapter 3 of the draft EIS (DEIS) disclosed the affected environment for each resource (including roads) and the direct/indirect environmental consequences associated with the action alternatives in chapter 3, from page 63 to page 345. Effects analysis of roads (Transportation) can be found from page 329-333. Table 31, chapter 2, page 98 of the DEIS provides a comparison of the predicted effects of proposed treatments by alternative. The best (and relevant) available science, information, first-hand knowledge of the resources within the project area and experience with past and similar projects informed the effects analysis. Design features, mitigation measures and the following Soil and Water BMP's (SW2, SW14, SW16, SW20, SW24, SW30, SW32, T7, T8, RS3) located in Appendix C, page 567 of DEIS have been developed and will be implemented (for temporary road construction) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality. The Chapter 3 soil and water analysis (DEIS, table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance would occur (including temporary road construction) under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity. No new permanent roads would be constructed for this project. Temporary roads would be constructed to provide necessary access for forest treatments and decommissioned after use. The effects of roads are analyzed and disclosed at the following locations in the DEIS: pg. 26, para. 2; pg. 28, para. 3-5; pg. 29 para 1 and 2; pg. 40, para. 2; pg. 41, para. 1; pg. 47, para. 7; pg. 62, para. 6; pg. 63, para. 1; pg. 63, para. 2; pg. 65, table 16; pg. 74, table 18; pg. 81, para. 1; pg. 88, para. 2; pg. 109, para. 2; pg. 110, para. 3 and 6; pg. 111, para. 1; pg. 116, para. 2-4; pg. 142, para. 2 and table 52; 162, para. 2; pg. 185 (entire page); pg. 186, para. 1 and table 69; pg. 201, table 71; pg. 291, para. 6; pg. 221, para. 1. Additionally, Appendix C – provides design

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
			features, BMPs, and mitigation measures to protect soils and water quality as they relate to roads. These include SW10-12, 14, 16, 17, 20, 22, 24, 30, 31. The Riparian and Water Quality Specialist's Report provides a detailed description of the effects of forest roads on pg. 50 and 62-64.
CBD-3, comment letter page 25	New roads and ground-based logging activities may cause significant losses of soil productivity.	Disclosure of effects of roads on soil productivity.	The DEIS proposes no new permanent road construction (DEIS page 40, p 63, p 81, p 88). The DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area. Design features, mitigation measures and the following Soil and Water BMP's (SW2, SW14, SW16, SW20, SW24, SW30, SW32, T7, T8, RS3) located in Appendix C, page 567 of DEIS have been developed and will be implemented (for temporary road construction) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality. The Chapter 3 soil and water analysis (DEIS, table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance would occur (including temporary road construction) under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity.
CBD-4, comment letter page 27	To comply with NEPA, the Forest Service must study, develop and describe (rather than mention and dismiss) an <u>action alternative</u> that foregoes road building on steep slopes and sensitive soils where it may increase erosion or impair soil productivity.	Disclosure of effects of roads on soil	The DEIS proposes no new permanent road construction (DEIS page 40, p 63, p 81, p 88). The DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area. Temporary road construction is proposed in action alternatives. Implementation of design features, mitigation measures and the following Soil and Water BMPs (Appendix C, page 567) (SW2, SW14, SW16, SW20, SW24, SW30, SW32, T7, T8, RS3) are expected to prevent increases in erosion and loss of soil productivity as well as protect water quality and therefore, no new action alternative is required. BMP SW 8 specifically requires a 100-120

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
			foot vegetated, protected streamside management zone on adjoining soils with severe erosion hazard. Chapter 3 of the draft EIS (DEIS) discloses the affected environment for each resource (including roads) and the direct/indirect environmental consequences associated with the action alternatives in chapter 3, from page 63 to page 345. Effects analysis of roads (Transportation) can be found from page 329-333. The best (and relevant) available science, information, first-hand knowledge of the resources within the project area and experience with past and similar projects informed the effects analysis. The Chapter 3 soil and water analysis (DEIS, table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance would occur (including temporary road construction) under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity. Need to add to DEIS: We agree that construction of temporary roads located on steep slopes that have severe erosion hazard require additional mitigation measures and BMPs not specifically identified in BMP #14 or others. Therefore, the DEIS will incorporate a new soil and water BMP (BMP # 38) to protect the soil from accelerated erosion thereby protecting downstream water quality in connected perennial streams. SW BMP-38 will be added to FEIS with this wording; Provide soil and site protection on newly disturbed soils located on temporary roads on soils with severe erosion hazard as needed. Avoid locating temporary roads on soils with severe erosion hazard. Where unavoidable, provide soil protection through implementation of any of the following methods to control sediment and protect water quality. Methods may include, but are not limited to: wattling, hydromulching, straw or woodshred mulching, spread slash, erosion mats, terraces, blankets, mats, silt fences, riprapping, tackifiers, soil seals, seeding and side drains, and appropriately spaced water bars or water spreading drainage features. Temporary roads will be decommissioned and footprint obliterated and protected with any of the above methods.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
CBD, pg. 27, paragraph 1	Road-related soil erosion is a chronic source of sediment production that can limit water quality (Bowman 2001, Gucinski et al. 2001). The distance that sediment travels is an important factor in determining how much eroded soil is delivered to a water body. Soil loss and erosion occurring closer to a stream have greater potential to deliver sediment and lead to water quality impairment than erosion triggered farther away from streams. For this reason, road-stream crossings have high potential to adversely impact water quality (Endicott 2008). In addition, road construction and fuel treatments may combine to increase overland water flow and runoff by removing vegetation and altering physical and chemical properties of soil, which can permanently alter watershed function (Elliot 2010, Robichaud et al. 2010). This has implications for the purpose and need to protect municipal water supplies from socially undesirable effects of flooding and erosion.	Roads	No new permanent roads would be constructed for this project. Temporary roads would be constructed to provide necessary access for forest treatments and decommissioned after use. The effects of roads are analyzed and disclosed at the following locations in the DEIS: pg. 26, para. 2; pg. 28, para. 3-5; pg. 29 para 1 and 2; pg. 40, para. 2; pg. 41, para. 1; pg. 47, para. 7; pg. 62, para. 6; pg. 63, para. 1; pg. 63, para. 2; pg. 65, table 16; pg. 74, table 18; pg. 81, para. 1; pg. 88, para. 2; pg. 109, para. 2; pg. 110, para. 3 and 6; pg. 111, para. 1; pg. 116, para. 2-4; pg. 142, para. 2 and table 52; 162, para. 2; pg. 185 (entire page); pg. 186, para. 1 and table 69; pg. 201, table 71; pg. 291, para. 6; pg. 221, para. 1. Additionally, Appendix C – provides design features, BMPs, and mitigation measures to protect soils and water quality as they relate to roads. These include SW10-12, 14, 16, 17, 20, 22, 24, 30, 31. The Riparian and Water Quality Specialist's Report provides a detailed description of the effects of forest roads on pg. 50 and 62-64.
CBD, pg. 27, paragraph 2	The extent and location road construction and its effects to soil erosion, runoff channelization and suspended sediment loads merit a hard look in the analysis. To comply with NEPA, the Forest Service must study, develop and describe (rather than mention and dismiss) an action alternative that foregoes road building on steep slopes and sensitive soils where it may increase erosion or impair productivity. 40 C.F.R. § 1502.14. Such an alternative would provide the decision-maker and the public with a meaningful basis on which to compare environmental impacts. See Steinke (2013: 90) (in all action alternatives, 22 miles of new road construction would occur “on severe erosion hazard soils”).	Roads	No new permanent roads would be constructed for this project. Temporary roads would be constructed to provide necessary access for forest treatments and decommissioned after use. The effects of roads are analyzed and disclosed at the following locations in the DEIS: pg. 26, para. 2; pg. 28, para. 3-5; pg. 29 para 1 and 2; pg. 40, para. 2; pg. 41, para. 1; pg. 47, para. 7; pg. 62, para. 6; pg. 63, para. 1; pg. 63, para. 2; pg. 65, table 16; pg. 74, table 18; pg. 81, para. 1; pg. 88, para. 2; pg. 109, para. 2; pg. 110, para. 3 and 6; pg. 111, para. 1; pg. 116, para. 2-4; pg. 142, para. 2 and table 52; 162, para. 2; pg. 185 (entire page); pg. 186, para. 1 and table 69; pg. 201, table 71; pg. 291, para. 6; pg. 221, para. 1. Additionally, Appendix C – provides design features, BMPs, and mitigation measures to protect soils and water quality as they relate to roads. These include SW10-12, 14, 16, 17, 20, 22, 24, 30, 31. The Riparian and Water Quality Specialist's Report provides a detailed description of the effects of forest roads on pg. 50 and 62-64.
CBD, pg. 27,	Project design features may fail to mitigate	Best Management	Appendix C – provides design features, BMPs, and mitigation

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
para. 3	significant cumulative effects (Endicott (2008: 93) (“... [A] lack of science to validate [Best Management Practices] effectiveness has been noted as a shortcoming of many BMPs related to forest roads...”). New roads directly remove and cumulatively fragment wildlife habitat, and they indirectly contribute to biological invasions of noxious weeds (Gucinski et al. 2001). Significant cumulative effects of road construction are foreseeable because similar activity will occur in the FWPP, Hart Prairie, Mahan-Landmark, Marshall, Upper Beaver and Wing Mountain projects.	Practices	measures to protect soils and water quality as they relate to roads. These include SW10-12, 14, 16, 17, 20, 22, 24, 30, 31. These practices have generally been shown to effectively minimize and mitigate adverse effects to soil productivity and water quality when properly implemented. The FWPP, Hart Prairie, Mahan-Landmark, Marshall, Upper Beaver and Wing Mountain projects have been analyzed as potential Cumulative effects in Appendix F – Cumulative Effects.
CBD, pg. 27, para. 4	Pursuant to the Clean Water Act, each federal agency must comply with all Federal, state and local requirements concerning the control and abatement of water pollution. 33 U.S.C. § 1323(a). The project area includes several water bodies that have been designated as water quality impaired pursuant to Section 303(d) of the Clean Water Act, particularly for mercury in fish tissue: Upper and Lower Lake Mary, Soldiers, Soldiers Annex, and Lower Long Lakes. According to page 41 of the Water Quality and Riparian Areas Specialist Report, “The [Arizona Dept. Environmental Quality – “ADEQ”] has concluded that watershed loading can potentially be reduced through management of sedimentation and vegetative stability. Recommendations included a review of upland and drainage conditions, so that areas requiring soil stabilization measures and channel improvements may be identified.” The report further states on page 70: Short-term, localized adverse effects to surface water quality are possible in ephemeral drainages within or adjacent to high intensity treatment areas, Subwatersheds [sic] with greater treatment acreages, such as Walnut Creek-Upper Lake	Water quality and TMDLs	In this comment, the following point is reiterated: “Implementation of BMPs and SWCPs as specified in Table 1 would minimize adverse effects to surface water quality and riparian ecosystem function.” Additionally, Appendix C provides design features, BMPs, and mitigation measures to protect soils and water quality as they relate to mechanical forest treatments, prescribed fire, and roads. These practices have generally been shown to effectively minimize and mitigate adverse effects to soil productivity and water quality when properly implemented. As described on pg. 70, para. 4 in the Riparian and Water Quality Specialist’s Report, It is unlikely that any of the Action Alternatives would contribute enough sediment or other pollutants to ephemeral or intermittent drainages within the project area to result in impairment of any downstream waterbodies.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	Mary (8,334 treatment acres), Upper Spring Valley Wash (7,369 treatment acres, and Volunteer Canyon (6,249 treatment acres) pose the highest risk of short term, localized adverse effects to water quality. Potential adverse effects include increases in turbidity, total dissolved solids, total suspended solids, and nutrients. Implementation of BMPs and SWCPs as specified in Table 1 would minimize adverse effects to surface water quality and riparian ecosystem function. The report is forthright on pages 44-45, 69 and 75 about the risks to riparian and aquatic systems from road construction and use in the project. Roads, skid trails and landings present a clear risk to riparian and aquatic habitats for increasing sedimentation, erosion, and turbidity, and they may cause the Forest Service to violate Total Maximum Daily Load ("TMDL") restrictions on water pollution. Therefore, the report admits on page 9, "Cumulative effects to water quality and riparian areas, when combined with past, present, and reasonably foreseeable future actions could be significant."		
pg. 28, para. 2	The 4FRI project will be implemented simultaneously with the construction of the Kelly Motorized Trails Project. The Kelly project will bring increased usage to lands south of Lake Mary, and are likely to bring increased motorized traffic to the roads surrounding the Kelly trails. During and after 4FRI implementation, national forest lands will be opened to recreational motorized traffic with a significant but undisclosed mileage of newly constructed roads and reopened roads around Lake Mary. How will the Forest Service limit the cumulative effects of these two projects? How will it prevent trespass from the Kelly project onto roads used for the 4FRI project?	Cumulative effects of Kelly Motorized Trails Project	The Kelly Motorized Trails Project is included in Table 154. Reasonably foreseeable recreation projects within the project area.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	How will it pay for increased enforcement and the need to completely obscure closed and re-closed roads after 4FRI project implementation? The Forest Service must describe cumulative impacts of the Kelly project and 4FRI project and offer a plan for controlling motorized vehicle traffic onto the roads to be constructed and used in the action alternatives. The plan should account for the costs of thoroughly obliterating and completely obscuring roads around the Kelly project area. The Forest Service should also offer a contingency plan should TMDL levels in Lake Mary increase as a result of the two projects.		
Cara 207 CBD attachment #7 Responses - Watershed, pp 25-30, 71-92			
Pages 25-30 of comment letter. Referenced once on page 27 and once on page 32 of comment letter.	Effects of Forest Biomass Use on Watershed Processes in the Western United States. Elliot, 2010. Western Journal of Applied Forestry. The comment letter references this article stating road construction increases runoff and can permanently alter watershed function.	Reference from pages 25-30 of attachment #7. “	The comment letter references this article stating road construction increases runoff and can permanently alter watershed function. 4FRI is not proposing any new road construction but is proposing temporary road construction with We do not disagree that there is increased risk of runoff and erosion from forest treatments and (new or temporary road construction) if protective design features and best management practices are not made part of the action. The article goes on to say following well-established management practices can minimize these risks. No new permanent roads would be constructed for this project. Temporary roads would be constructed to provide necessary access for forest treatments and decommissioned after use. The effects of roads are analyzed and disclosed at the following locations in the DEIS: pg. 26, para. 2; pg. 28, para. 3-5; pg. 29 para 1 and 2; pg. 40, para. 2; pg. 41, para. 1; pg. 47, para. 7; pg. 62, para. 6; pg. 63, para. 1; pg. 63, para. 2; pg. 65, table 16; pg. 74, table 18; pg. 81, para. 1; pg. 88, para. 2; pg. 109, para. 2; pg. 110, para. 3 and 6; pg. 111, para. 1; pg. 116, para. 2-4; pg. 142, para. 2 and table 52; 162, para. 2; pg. 185 (entire page); pg. 186, para. 1 and table 69; pg. 201, table 71; pg. 291, para. 6; pg. 221, para. 1. Additionally, Appendix C – provides design

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
			features, BMPs, and mitigation measures to protect soils and water quality as they relate to roads. These include SW10-12, 14, 16, 17, 20, 22, 24, 30, 31. The Riparian and Water Quality Specialist's Report provides a detailed description of the effects of forest roads on pg. 50 and 62-64. The 4FRI project minimizes vegetation treatment impacts to soil and site productivity through establishment of management practices and implementation of design features, mitigation measures and the following Soil and Water BMP's listed and located in Appendix C, page 567 of DEIS. They have been developed and will be implemented (for timber harvest and fuels operations and retention of coarse woody debris) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality.
Referenced once on page 27 of comment letter. Pages 79-103 of comment letter	Cumulative Watershed Effects on Fuel Management in the Western United States. Robichaud et al. GTR-231. 2010. The comment letter references this article stating road construction increases runoff and can permanently alter watershed function.	Reference from pages 71-92 of attachment #7	This reference is used in the Soil report on pages 60, 86, 89, 96 and 413. The reference does not contain any statements stating road construction can permanently alter watershed function. 4FRI is not proposing any new road construction but is proposing temporary road construction. However, we do not disagree that there is increased risk of runoff and erosion from new (or temporary) road construction if protective design features and best management practices are not made part of the action. The article goes on to say following well-established management practices can minimize these risks. No new permanent roads would be constructed for this project. Temporary roads would be constructed to provide necessary access for forest treatments and decommissioned after use. The effects of roads are analyzed and disclosed at the following locations in the DEIS: pg. 26, para. 2; pg. 28, para. 3-5; pg. 29 para 1 and 2; pg. 40, para. 2; pg. 41, para. 1; pg. 47, para. 7; pg. 62, para. 6; pg. 63, para. 1; pg. 63, para. 2; pg. 65, table 16; pg. 74, table 18; pg. 81, para. 1; pg. 88, para. 2; pg. 109, para. 2; pg. 110, para. 3 and 6; pg. 111, para. 1; pg. 116, para. 2-4; pg. 142, para. 2 and table 52; 162, para. 2; pg. 185 (entire page); pg. 186, para. 1 and table 69; pg. 201, table 71; pg. 291, para. 6; pg. 221, para. 1. Additionally, Appendix C – provides design features, BMPs, and mitigation measures to protect soils and water quality as they relate to roads. These include SW10-12, 14, 16, 17, 20,

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
			22, 24, 30, 31. The Riparian and Water Quality Specialist's Report provides a detailed description of the effects of forest roads on pg. 50 and 62-64. The 4FRI project minimizes vegetation treatment impacts to soil and site productivity through establishment of management practices and implementation of design features, mitigation measures and the following Soil and Water BMP's listed and located in Appendix C, page 567 of DEIS. They have been developed and will be implemented (for timber harvest and fuels operations and retention of coarse woody debris) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality.
Cara 210 CBD attachment #10 Responses – Soil and Water, pp 16-135			
Pages 26-27 of comment letter	Forest Roads, A Synthesis of Scientific Literature. Gucinski et al, 2001 GTR-509. The comment letter references this publication on page 26 stating, "New roads and ground-based logging activities may cause significant losses of soil productivity (Gucinski et al. 2001: 21) ("Losses of productivity associated with road-caused, accelerated erosion are site specific and variable in extent, but they are commonly reported for all steep slope" landscapes.") Page 27 comment letter. "Road-related soil erosion is a chronic source of sediment production that can limit water quality (Bowman 2001, Gucinski et al. 2001)". Page 27 comment letter. "New roads directly remove and cumulatively fragment wildlife habitat, and they indirectly contribute to biological invasions of noxious weeds (Gucinski et al. 2001)".	References from pages 16-135 of attachment #10.	Note of the citations in the comment letter occur in the Gucinski reference as quoted. GTR reference does not state "Undesirable consequences include adverse effects on hydrology and geomorphic features (such as debris slides and sedimentation), habitat fragmentation, predation, road kill, invasion by exotic species, dispersal of pathogens, degraded water quality and chemical contamination, degraded aquatic habitat, use conflicts, destructive human actions (for example, trash dumping, illegal hunting, fires), lost solitude, depressed local economies, loss of soil productivity, and decline in biodiversity." Reference does not state "New roads and ground-based logging activities may cause significant losses of soil productivity" Page 22 of GTR states, "Forest roads can significantly affect site productivity by removing and displacing topsoil, altering soil properties, changing microclimate, and accelerating erosion". Reference does not state "New roads directly remove and cumulatively fragment wildlife habitat, and they indirectly contribute to biological invasions of noxious weeds". However, the intent of the references is likely to show the presence of new or existing roads can cause losses in soil productivity, degrade water quality and fragment wildlife habitat and spread invasive weeds. Soil report cites Gucinski on pages 90 and 91 stating, Temporary

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
			roads may have fewer adverse effects than do permanent roads, depending on the extent to which they are decommissioned (Gucinski et al. 2000). Because of this, after use, all temporary roads would be restored and may be shallow ripped (~6”), seeded, drained and/or covered with slash from landings. However, we do not disagree that there is increased risk of runoff and erosion or spread of invasive weeds from new (or temporary) road construction if protective design features and best management practices are not made part of the action. The article goes on to say following well-established management practices can minimize these risks. No new permanent roads would be constructed for this project. Temporary roads would be constructed to provide necessary access for forest treatments and decommissioned after use. The effects of roads are analyzed and disclosed at the following locations in the DEIS: pg. 26, para. 2; pg. 28, para. 3-5; pg. 29 para 1 and 2; pg. 40, para. 2; pg. 41, para. 1; pg. 47, para. 7; pg. 62, para. 6; pg. 63, para. 1; pg. 63, para. 2; pg. 65, table 16; pg. 74, table 18; pg. 81, para. 1; pg. 88, para. 2; pg. 109, para. 2; pg. 110, para. 3 and 6; pg. 111, para. 1; pg. 116, para. 2-4; pg. 142, para. 2 and table 52; 162, para. 2; pg. 185 (entire page); pg. 186, para. 1 and table 69; pg. 201, table 71; pg. 291, para. 6; pg. 221, para. 1. Additionally, Appendix C – provides design features, BMPs, and mitigation measures to protect soils and water quality as they relate to roads. These include SW10-12, 14, 16, 17, 20, 22, 24, 30, 31. The Riparian and Water Quality Specialist’s Report provides a detailed description of the effects of forest roads on pg. 50 and 62-64. Page 28 (DEIS), paragraph 4 states “the desired condition is to restore decommissioned road prisms to their natural condition (USDA 1987, USDA 1988) “. Appendix C – Design Features, BMPs, and Mitigation includes soil and water resources and invasive weed control BMPs are designed to prevent degradation water quality during and after forest treatments, and including road decommissioning. The 4FRI project minimizes vegetation treatment impacts to soil and site productivity and invasive weeds through establishment of management practices and implementation of design features, mitigation measures and the following Soil and Water BMP’s listed and located in Appendix C, page 567 of DEIS. They have been

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
			developed and will be implemented to maintain and protect soil productivity,
5CGs et. Al (Cara196-200 2013-0529fiveconservation_Group_Comments_And_Lit)			
5CGs, pg. 7, para. 3	A more specific and highly significant example of differences between the collaborative Strategy and the DEIS implementation plan for large trees occurs in riparian areas. On page 11, the collaborative Strategy contains this selection criterion: “Where large trees are growing (rooted) within a riparian area and compromising available soil moisture or light that support that area’s unique biophysical conditions.” In contrast, the DEIS implementation plan for large trees lacks an equivalent limitation, but instead states, “If treatment occurs [in riparian areas], an equivalent number of large replacement trees remain where there is evidence that pre-settlement trees have grown in similar root and crown proximity to a particular seep or spring in the past.” DEIS at 647. Vegetation patterns in and around riparian areas vary temporally and spatially, based on flooding history, water availability and soil composition (Hupp, 1988, Stromberg et al. 1993, Hupp and Osterkamp 1996, Poff 2002). Creating a one-for-one tree arrangement in riparian areas, representing the spatial arrangement of the previous century, is not necessarily the most appropriate way to protect soil stability and riparian forest health. The Forest Service should recognize the stakeholder agreement to conservatively treat riparian areas and leave large trees in place where possible. Also, please note that there is a typo in the DEIS statement cited above: a “seep” or “spring” is not necessarily a riparian zone. Riparian areas are characterized by moving	Large tree retention in riparian areas and definition of riparian areas	Page 647, paragraph 2, last sentence states “However, it is likely to be a very rare circumstance that conifer trees of any size would need to be removed from forested riparian zones.”

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	water and/or floodplains, and not all seeps and springs have riparian zones. The wording should be changed to indicate that this part of the document is discussing riparian areas.		
5CDs-2, comment letter page 13	New roads can destroy large trees and coarse woody structure, permanently impair soil productivity and alter plant communities, and even if their use is temporary.	Kit to do	The DEIS proposes no new permanent road construction (DEIS page 40, p 63, p 81, p 88). The DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area. The Chapter 3 soil and water analysis (DEIS, table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance would occur (including temporary road construction) under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity. Temporary roads would be constructed to provide necessary access for forest treatments and decommissioned after use. The effects of roads are analyzed and disclosed at the following locations in the DEIS: pg. 26, para. 2; pg. 28, para. 3-5; pg. 29 para 1 and 2; pg. 40, para. 2; pg. 41, para. 1; pg. 47, para. 7; pg. 62, para. 6; pg. 63, para. 1; pg. 63, para. 2; pg. 65, table 16; pg. 74, table 18; pg. 81, para. 1; pg. 88, para. 2; pg. 109, para. 2; pg. 110, para. 3 and 6; pg. 111, para. 1; pg. 116, para. 2-4; pg. 142, para. 2 and table 52; 162, para. 2; pg. 185 (entire page); pg. 186, para. 1 and table 69; pg. 201, table 71; pg. 291, para. 6; pg. 221, para. 1. Additionally, Appendix C – provides design features, BMPs, and mitigation measures to protect soils and water quality as they relate to roads. These include SW10-12, 14, 16, 17, 20, 22, 24, 30, 31. The Riparian and Water Quality Specialist’s Report provides a detailed description of the effects of forest roads on pg. 50 and 62-64. Page 60, paragraph 3 through page 61, paragraph 4 provides a more detailed description of the effects of roads on soil productivity and water quality, including construction and decommissioning. Finally, this section also notes that Implementation of effective Best Management Practices (BMPs) and Soil and Water Conservation Practices (SWCPs) during road decommissioning would improve surface water quality since these road segments would no longer be redirecting surface flows via ditches and delivering sediment and

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
			other pollutants directly to streamcourses. Decommissioning of 941 miles of roads would improve surface water quality, particularly where stream crossings would become naturalized over time.
5CGs, pg. 13, para. 3	The project area includes several water bodies that are on Arizona's "303(d)" list as impaired for water quality, particularly for mercury in fish tissue: Upper and Lower Lake Mary, Soldiers, Soldiers Annex, and Lower Long Lakes. According to page 41 of the Water Quality and Riparian Areas Specialist Report, "The [Arizona Dept. Environmental Quality –"ADEQ"] has concluded that watershed loading can potentially be reduced through management of sedimentation and vegetative stability. Recommendations included a review of upland and drainage conditions, so that areas requiring soil stabilization measures and channel improvements may be identified." The report further states on page 70: Short-term, localized adverse effects to surface water quality are possible in ephemeral drainages within or adjacent to high intensity treatment areas, Subwatersheds [sic] with greater treatment acreages, such as Walnut Creek-Upper Lake Mary (8,334 treatment acres), Upper Spring Valley Wash (7,369 treatment acres, and Volunteer Canyon (6,249 treatment acres) pose the highest risk of short term, localized adverse effects to water quality. Potential adverse effects include increases in turbidity, total dissolved solids, total suspended solids, and nutrients. Implementation of BMPs and SWCPs as specified in Table 1 would minimize adverse effects to surface water quality and riparian ecosystem function. The report is forthright on pages 44-45, 69 and 75 about the risks to	Water Quality and TMDLs	In this comment, the following point is reiterated: "Implementation of BMPs and SWCPs as specified in Table 1 would minimize adverse effects to surface water quality and riparian ecosystem function." Additionally, Appendix C provides design features, BMPs, and mitigation measures to protect soils and water quality as they relate to mechanical forest treatments, prescribed fire, and roads. These practices have generally been shown to effectively minimize and mitigate adverse effects to soil productivity and water quality when properly implemented. As described on pg. 70, para. 4 in the Riparian and Water Quality Specialist's Report, It is unlikely that any of the Action Alternatives would contribute enough sediment or other pollutants to ephemeral or intermittent drainages within the project area to result in impairment of any downstream waterbodies.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	riparian and aquatic systems from road construction and use in the project. Roads, skid trails and landings present a clear risk to riparian and aquatic habitats for increasing sedimentation, erosion, and turbidity, and they may cause the Forest Service to violate Total Maximum Daily Load (“TMDL”) restrictions on water pollution. Therefore, the report admits on page 9, “Cumulative effects to water quality and riparian areas, when combined with past, present, and reasonably foreseeable future actions could be significant.”		
5CGs, pg. 13, para. 6	The 4FRI project will be implemented simultaneously with the construction of the Kelly Motorized Trails Project. The Kelly project will bring increased usage to lands south of Lake Mary, and are likely to bring increased motorized traffic to the roads surrounding the Kelly trails.	Cumulative effects of Kelly Motorized Trails Project	The Kelly Motorized Trails Project is included in Table 154. Reasonably foreseeable recreation projects within the project area. Temporary roads would be decommissioned upon completion of activities.
5CGs, pg. 14, para. 1	The Forest Service should also offer a contingency plan should TMDL levels in Lake Mary increase as a result of the two projects.	Water quality and TMDLs	Appendix C – provides design features, BMPs, and mitigation measures to protect soils and water quality as they relate to roads. These include SW10-12, 14, 16, 17, 20, 22, 24, 30, 31. These practices have been proven effective at mitigating adverse effects to soil productivity and water quality when properly implemented.
5CDs-5. Comment letter page 14	It should explain why it will rely on fencing instead of taking proactive measures to limit motorized vehicle traffic, reintroduce natural predators, and limit livestock damage to aspen. According to pages 76-77 of the Water Quality and Riparian Areas Specialist Report supporting the DEIS, “Although there are no quantifiable data regarding the impacts that vertebrate herbivores and OHV traffic have on aspen stands and springs of the KNF and CNF, it is generally accepted that adverse effects to aspen stands and spring habitats from these activities are occurring.” The Forest Service intends to	Motorized traffic, aspen stand conditions, and predator reintroduction	Motorized vehicle traffic will be reduced through decommissioning of 904 miles of unnecessary roads (DEIS, pg. 28, para. 2). Reintroduction of natural predators is beyond the scope of this project. Fencing of aspen stands is also intended to exclude all vertebrate herbivores, including domestic livestock from these areas. Artificial waters are intended for use by domestic livestock and wildlife.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	rely on approximately 82 miles of aspen fencing to control for these risks to aspen forests. It should explain why it will rely on fencing instead of taking proactive measures to limit motorized vehicle traffic, reintroduce natural predators, and limit livestock damage to aspen. When large predators, particularly wolves, were reintroduced to Yellowstone National Park, USA, and Banff National Park, Canada, the wolves brought elk populations to manageable levels, and as a result of the decrease in grazing pressure, aspen populations near wolves rebounded (Hebblewhite et al. 2005, Ripple and Beschta 2007). How will the costs of fencing construction and maintenance for years into the future compare with the costs of removing artificial water supplies that occur within several miles of aspen stands, or with the costs of removing roads that pass through aspen stands and allow vehicle trespass?		
Dick Artley, A Few Comments on 4FRI draft EIS. 2013-0422			
DA, page 2, View 2	The DEIS indicates temporary road construction is a connected action to this timber sale. The DEIS at page 40 indicates that temporary roads will be “decommissioned” after use. If the Responsible Officials really wants to eliminate the sediment originating from temporary roads they will obliterate all temporary roads after use and say this will be done in the final EIS and ROD.	Roads	Page 350 of the DEIS provides a definition of road decommissioning. These include: activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1, FSM 7705—Transportation System, USDA 2003). FSM 7712.11- Exhibit 01 identifies five levels of treatments for road decommissioning which can achieve the intent of the definition. These include blocking the entrance, revegetation, waterbarring, removing fills and culverts, establishing drainageways and removing unstable road shoulders, and full obliteration, recontouring, and restoring natural slopes.
DA-1, comment letter page 4	If the Responsible Officials really wants to eliminate the sediment originating from temporary roads they will obliterate all temporary roads after use and say this will be	Effects to aquatic resources	Thank you for your comment. Chapter 2, page 65 of the DEIS states construction (and decommissioning) temporary roads is an action common to the action alternatives. Page 65 further states reconstructing and improving roads, relocating a minimal number of

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	done in the final EIS and ROD. Comment: Decommissioning these temporary roads will not remove the running surface. Therefore, since temporary roads are outsloped with no ditch, sediment will be generated during precipitation events, find its way to streams and harm the aquatic resources for decades until the next timber sale. No amount of brush or grass placed on an outsloped running surface will stop sediment from being generated and deposited in streams.		road miles, and decommissioning existing roads and unauthorized routes is a common action to action alternatives. This would result in reduced sediment delivery to aquatic resources as well. Table 15 displays management actions and road adaptive management strategies designed to mitigate effects to soil and water resources and include complete road obliteration, blocking entrance reducing motorized impacts, re-establishing road drainage, removal of culverts, installation of waterbars, protecting against erosion with slash. In addition, Appendix C, page 567 includes design features, mitigation measures and the following Soil and Water BMP's (SW2, SW14, SW16, SW20, SW24, SW30, SW32, T7, T8, RS3) that will be implemented (for temporary road construction) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality and aquatic resources. The potential for soil disturbance and soil erosion is disclosed in the DEIS on page 109 to page 113 (affected environment), and on page 113 to page 118 (environmental consequences) and pages 118-126 (Water) and in the soil specialist report from page 60 to page 120. The Chapter 3 soil and water analysis (DEIS, table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance would occur (including temporary road construction) under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity.
DA, page 12	Herbicides containing Glyphosate, Methyl Parathion, Triclopyr, Imazapyr, and Imidacloprid must Never be used on Public Land for Any Reason Under the Proposed Action Table 16 states the following phrase several times: "remove noxious weeds." Beginning at page 256 the DEIS discusses	Use of herbicides	Herbicides would be used to control invasive and noxious weeds as they are found within treatment area. All herbicides would be used in accordance with the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	Noxious and Invasive Weeds. If herbicides will be applied the public will want to know where and the type of herbicide that will be applied. Why? The research shows the herbicides listed above are lethal to some species. Comment: Please expand the description of the proposed action to describe the types of herbicide that will be applied and the exact location of this application with a map of sufficiently small scale that the public can easily locate and avoid these areas. Comment: The chemicals listed above kill aquatic life even if the concentrations of the chemical in water are very low. Fish deaths will occur in the streams in the project area and the herbicide toxicity will extend many miles downstream. Herbicides must never be allowed to contact water ... even so-called aquatic-safe herbicides. These chemicals are also quite toxic to mammals (including humans), birds and insects. Under some conditions they are lethal. They cause: · birth defects · non-Hodgkin's lymphoma · mitochondrial damage · cell asphyxia · miscarriages · attention deficit disorder · endocrine disruption DNA damage		

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
Dick Artley Opposing Views Logging Harm (Scientific Gray Literature/Popular Press/Popular Science)			
DA 2/1, page 2, view #2	Timber Harvest Opposing View #2 - “Timber harvest operations have been shown to have many effects on adjacent watercourses and on the aquatic ecosystems they support. This may occur from introductions or loss of woody debris, loss of riparian vegetation, accelerated stream bank and bed erosion, the alteration of natural channel form and process, and the reduction of stream habitat diversity. However, the existing literature indicates one of the most insidious effects of logging is the elevation of sediment loads and increased sedimentation within the drainage basin. Sediment generation from various forestry practices has been studied extensively in the past. Forestry practices which generate suspended sediments include all operations that disturb soil surfaces such as site preparations, clear-cutting, log skidding, yarding, slash burns, heavy equipment operation and road construction and maintenance.”	Primary Science	The referenced citation provides an excellent review of the literature of the effects of forest operations on aquatic ecosystems. Guidance provided by Waters (1995) includes Best Management Practices designed to minimize or mitigate adverse effects to water quality. Most of these BMPs are included in Appendix C of the DEIS (SW2, SW4, SW7, SW9, SW10, SW11, SW12, SW14, SW19, SW23 through SW36). These BMPs have been developed and will be implemented (for timber harvest operations) to maintain and protect soil productivity, minimize sediment delivery to streamcourses and other water bodies and improve and protect water quality.
DA-2/2, page 18, view #24	Timber Harvest Opposing View #2 - “Timber harvest operations have been shown to have many effects on adjacent watercourses and on the aquatic ecosystems they support. This may occur from introductions or loss of woody debris, loss of riparian vegetation, accelerated stream bank and bed erosion, the alteration of natural channel form and process, and the reduction of stream habitat diversity. However, the existing literature indicates one of the most insidious effects of logging is the elevation of sediment loads and increased sedimentation within the drainage basin. Sediment generation from various forestry practices has been studied extensively in the	Scientific Gray Literature	This comment that was included in “Opposing Views” discusses the potential for sedimentation from timber harvesting. The potential for soil disturbance and soil erosion is disclosed in the DEIS on page 109 to page 113 (affected environment), and on page 113 to page 118 (environmental consequences) and pages 118-126 (Water) and in the soil specialist report from page 60 to page 120. The Chapter 3 soil and water analysis (DEIS, table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance would occur (including temporary road construction) under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity. Additionally, design features, mitigation measures and the following Soil and Water BMP’s (SW2, SW4, SW7, SW9, SW10, SW11, SW12, SW14, SW19, SW23 through SW36) located in Appendix C,

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	past. Forestry practices which generate suspended sediments include all operations that disturb soil surfaces such as site preparations, clear-cutting, log skidding, yarding, slash burns, heavy equipment operation and road construction and maintenance.” Anderson, P.G. 1996. “Sediment generation from forestry operations and associated effects on aquatic ecosystems” Proceedings of the Forest-Fish Conference: Land Management Practices Affecting Aquatic Ecosystems, May 1-4, 1996, Calgary, Alberta. http://www.alliance-pipeline.com/contentfiles/45_Sediment_generation.pdf		page 567 of DEIS have been developed and will be implemented (for timber harvest operations) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality. Please note the hyperlink to the website did not result in an article on timber harvest and sedimentation. It led to a website for the alliance pipeline company.
DA, Logging Harm, pg. 18, para. 4 (View No. 24).	"Even 'kinder, gentler' commercial logging still inflicts environmental impacts such as eroded topsoil, degraded water quality, destroyed wildlife habitat, and extirpated species that are every bit as much symptoms of forest health problems as large-scale, severe wildfires." Ingalsbee, Timothy Ph.D. "Logging for Firefighting: A Critical Analysis of the Quincy Library Group Fire Protection Plan." Unpublished research paper. 1997. http://www.fire-ecology.org/research/logging-for-firefighting_2.htm	Scientific Gray Literature related to logging impacts	Appendix C, pages 580 through 590 (SW1-SW37) provide design features, BMPs, and mitigation measures to protect soils and water quality during and after mechanized forest restoration treatments. The referenced article is a 1997 unpublished research paper for the Western Ancient Forest Campaign and is a critical analysis of the Quincy Library Group Bill (H.R.858).
DA, Logging Harm, pg 24, View No. 32	Large-scale logging (by any name) has devalued our forests, degraded our waters, damaged soils, and endangered a wide variety of plants and animals. How will the current round of politically and environmentally propelled 'restorative' logging proposals differ, in	Popular Press related to logging and forest restoration	The Four-Forest Restoration Initiative (4FRI) is a planning effort designed to restore ponderosa pine forest resiliency and function across four national forests in Arizona including the Coconino, Kaibab, Apache-Sitgreaves, and Tonto National Forests (DEIS, pg. 2) The referenced article is an opinion statement related to forest restoration and logging. No scientific literature or references are

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	practice, from past logging regimes?" Keene, Roy Restorative Logging? "More rarity than reality" Guest Viewpoint, the Eugene Register Guard March 10, 2011 http://eugeneweekly.com/2011/03/03/views3.html		provided to support author's position.
DA, Logging Harm, pg 25, View No. 33	Timber Harvest Opposing View #33 - "Timber harvesting operations affect hydrologic processes by reducing canopy interception and evapotranspiration. Many studies have documented changes in soil properties following tractor yarding (Stone, 1977; Cafferata, 1983), and low-ground-pressure skidding (Sidle and Drlica, 1981). More recently, researchers have evaluated cable yarding (Miller and Sirois, 1986; Purser and Cundy, 1992). In general, these studies report decreased hydraulic conductivity and increased bulk density in forest soils after harvest." Keppeler, Elizabeth T. Robert R. Ziemer Ph.D., and Peter H. Cafferata "Effects of Human-Induced Changes on Hydrologic Systems." An American Water Resources Association publication, June 1994 http://www.fs.fed.us/psw/publications/ziemer/Ziemer94a.PDF	Primary Science related to hydrologic processes	It is well-documented that mechanical forest treatments have the potential to alter forest hydrologic processes. he commenter references a scientific publication on the effects of cable yarding in a second growth redwood stand in northern California. No cable yarding is proposed within the 4FRI project area.
DA, Logging Harm, pg 25, View No. 34	Timber Harvest Opposing View #34 - "Among these four species of amphibians, the spotted salamander is most likely to be affected	Primary Science related to logging effects on spotted	This non-refereed research paper discusses the effects of logging on amphibian larvae populations, and specifically spotted salamanders on the Ottawa National Forest in Michigan. The report concludes that

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	adversely by the logging as this species of salamander relies on dense forests with full canopies (Harding, 1997)." "Looking at the study on a larger scale, the potential for changes caused by logging is great. Absence of trees could influence water temperature by altering available sunlight, conductivity by changing the amount of organic matter that collects in the vernal ponds, or pH if the logging process deposits foreign residues to the area. Also heavy equipment used to harvest the timber has the potential to alter the terrain." "Modifications to the landscape could change how water flows and collects at the surface and change the size, shape, and location of the vernal ponds. Loss or alteration to small temporary water sources less than four hectares can be extremely detrimental to amphibians water (Semlitsch, 2000). Without vernal ponds amphibians would have difficulty inhabiting forested areas because they rely on the ponds as breeding grounds. If logging disturbs the ponds, amphibian populations could diminish in the areas that surround these vernal pools." Klein, Al 2004. Logging Effects on Amphibian Larvae Populations in Ottawa National Forest. http://www.nd.edu/~underc/east/education/documents/AKlein2004Pre-loggingssurveyofamphibianlarvaeinvernalpools.pdf	salamanders and other amphibians	The Ottawa National Forest should be able to utilize the information to harvest timber in a manner that retains amphibian welfare. The environmental effects each action alternative to water quantity, water quality and riparian areas are disclosed in Table 31, pages 102 and 103 of the DEIS and in the Water Quality and Riparian Area Specialist's Report, Table 6, page 39.
DA-2/5, page 27, view #36	"I will turn first to forest thinning aimed at reducing fire risks. There is surprisingly little scientific information about how thinning actually affects overall fire risk in national forests."	Popular Press	These statements are made by Senior Attorney Nathaniel Lawrence (Natural Resource Defense Council). The fourth statement says logging equipment compacts soils. In the 4FRI project, compaction of soil is mitigated through implementation of the Design Features, mitigation measures and the following Soil and Water BMP's (SW1, SW2) located in Appendix C, page 567 for timber harvest operations

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	“How can it be that thinning could increase fire risks? First, thinning lets in sunlight and wind, both of which dry out the forest interior and increase flammability. Second, the most flammable material - brush, limbs, twigs, needles, and saplings - is difficult to remove and often left behind. Third, opening up forests promotes brushy, flammable undergrowth. Fourth, logging equipment compacts soil so that water runs off instead of filtering in to keep soils moist and trees healthy. Fifth, thinning introduces diseases and pests, wounds the trees left behind, and generally disrupts natural processes, including some that regulate forest health, all the more so if road construction is involved.” Lawrence, Nathaniel, NRDC senior attorney “Gridlock on the National Forests” Testimony before the U.S. House of Representatives Subcommittee on Forests and Forest Health (Committee on Resources) December 4, 2001. http://www.nrdc.org/land/forests/tnl1201.asp		to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality.
DA-2/6, Page 29, view #40	Timber Harvest Opposing View #6 - “Federal auditors have found that the Forest Service frequently fails to assess, prevent or correct environmental damage from logging on the national forests. After inspecting 12 timber projects in the field from 1995 to 1998, the Agriculture Department's inspector general found that all were deficient and that 'immediate corrective action is needed.' A new report on the audits found that the environmental studies required before logging was approved were poorly done, the rules to protect streams and wildlife habitat from undue	Popular Press	The article references inspections conducted by the USDA inspector general. Twelve timber projects were inspected in the field from 1995 to 1998, and deficiencies were noted in all of them. The article is dated as these inspections were conducted a minimum of 16 years ago. These inspections were conducted prior to the development of the program titled: National Best Management Practices for Water Quality Management on National Forest System Lands (FS-990a, April 2012). Best Management Practices, design features, and mitigation measures have been developed to minimize or mitigate adverse effects of mechanical forest treatments. These include SW1-SW37 in Appendix C of the DEIS (pages 580-590).

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	damage during logging were not followed, and the steps planned to repair some of the harm after logging were not carried out. The inspector general, Roger C. Viadero, reported on Jan. 15 to Mike Dombeck, chief of the Forest Service, that the review had found "numerous serious deficiencies." Agency officials generally agreed with the report's conclusions and recommendations."		
DA, Logging Harm, pg 30, View No. 42	Timber Harvest Opposing View #42 - "In addition to the direct effects of habitat loss and fragmentation, logging typically reduces ecosystem health by: a) damaging aquatic habitats through siltation, reduction in stream complexity and increased water temperatures." McIntosh, B.A., J.R. Sedell, J.E. Smith, R.C. Wissmar S.E. Clarke, G.H. Reeves, and L.A. Brown "Management history of eastside ecosystems: changes in fish habitat over 50 years, 1935-1992." 1994 GTR-321 93-181 http://www.fs.fed.us/pnw/publications/pnw_gtr321/	Primary Science	The referenced article specifically addresses the effects of land use changes on anadromous fish populations in Washington and Oregon. There are no anadromous fish within the 4FRI analysis area. This comment is therefore irrelevant to the project.
DA, Logging Harm, pg 30, View No. 43	Timber Harvest Opposing View #43 - "Logging practices can indirectly result in changes in the biological components of a stream, and can have direct and indirect on the physical environment in streams. The primary environmental changes of concern are the effects of siltation, logging debris, gravel scouring, destruction of developing embryos and alevins, blockage of streamflow, decrease in surface and intragravel dissolved oxygen,	Scientific Gray Literature	The referenced article is a non-refereed publication on the effects of logging on coastal headwater streams of western Oregon, which is not relevant to this project. However, several Best Management Practices similar to those outlined in Appendix C of the DEIS are recommended. These practices have been shown to be effective at minimizing and mitigating adverse effects to water quality and riparian habitats when properly implemented. The environmental effects each action alternative to water quantity, water quality and riparian areas are disclosed in Table 31, pages 102 and 103 of the DEIS and in the Water Quality and Riparian Area

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	increase in maximum and diel water temperatures, changes in pool/riffle ratios and cover, redistribution of fishes, reduction in fish numbers, and reduction in total biomass.” Moring, John R. Ph.D. 1975. “The Alsea Watershed Study: Effects of Logging on the Aquatic Resources of Three Headwater Streams of the Alsea River, Oregon – Part III.” Fishery Report Number 9 Oregon Department of Fish and Wildlife. http://www.for.gov.bc.ca/hfd/library/ffip/Moring_JR1975b.pdf		Specialist’s Report, Table 6, page 39.
DA-2/9, page 36, view #52,	Timber Harvest Opposing View #9 - “For much of the past century the Forest Service, entrusted as the institutional steward of our National Forests, focused its management on an industrial-scale logging program. The result of the massive logging and road construction program was to damage watersheds, destroy wildlife habitat and imperil plant and animal species.” “The continued logging of our National Forests also wastes American tax dollars and diminishes the possibilities of future economic benefits. The Forest Service lost \$2 billion dollars on the commercial logging program between 1992-1997. Annually, timber produces roughly \$4 billion while recreation, fish and wildlife, clean water, and unroaded areas provide a combined total of \$224 billion to the American economy. Forests purify our drinking water - 60 million Americans get their drinking water from National Forests. When the dramatic values of ecological goods and services are taken into account, it is clear that protecting National Forests creates more economic benefits than		The reference provided was an invalid (dead) link. However, based on the quotes provided, this reference appears to be a position statement against logging on NFS lands. It is important for the reviewer to understand that the purpose of the 4FRI project is not simply commercial logging, but forest restoration (i.e., to reestablish and restore forest structure and pattern, forest health, and vegetation composition and diversity). There is a need to increase forest resiliency and sustainability, protect soil productivity, and improve soil and watershed function.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	continued logging.”		
DA-2/10, page 37, view #53	Timber Harvest Opposing View #53 - “The Act to Save America’s Forests is based on the principles of conservation biology. It would make the protection native biodiversity the primary goal of federal forest management agencies. The bill would protect over 20 million acres of core forest areas throughout the nation, including ancient forests, roadless areas, key watershed, and other special areas. It is a comprehensive, sustainable, and ecologically-sound plan for protecting and restoring the entire federal forest system. If the current pace of logging planned by the Forest Service continues, nearly all of America’s ancient and roadless wild forests will soon be lost forever. According to a recent report by the World Resources Institute, only one percent of the original forest cover remains in large blocks within the lower 48 states. The Act to Save America’s Forests incorporates the solution recommended by the report, namely to protect core forest areas from any logging and to allow sustainable forest practices around these protected forests. Endorsed by over 600 leading scientists, this bill may be the last hope for America’s forests.” Raven, Peter, Ph.D., from his February 9, 2001 letter to Senator Jean Carnahan http://www.saveamericasforests.org/Raven.htm	Popular Press (a letter)	This is a letter discussing a bill to protect 20 million acres of forest. In order for comments to result in improved analysis and decisions, they need to be within the scope of the project, relevant to the project and have a direct relationship to the proposed actions. We could not find meaningful recommendations or comments for the Responsible Official to consider.
DA-2/11, page 42, view #59	Timber Harvest Opposing View #11 - “The proposition that forest values are protected with	Popular Press (supported by	The publication is, in general a position statement against commercial logging. However, Part III. Considerations for Ecosystem-Based

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	more, rather than less logging, and that forest reserves are not only unnecessary, but undesirable, has great appeal to many with a vested interest in maximizing timber harvest. These ideas are particularly attractive to institutions and individuals whose incomes depend upon a forest land base. (page 2)" "On the other hand, approaches that involve reserving of a portion of the land base, or harvest practices that leave commercially valuable trees uncut to achieve ecological goals, are often considered much less desirable as they reduce traditional sources of timber income. (page 2)" Franklin, Jerry Ph.D., David Perry Ph.D., Reed Noss Ph.D., David Montgomery Ph.D. and Christopher Frissell Ph.D. 2000. "Simplified Forest Management to Achieve Watershed and Forest Health: A Critique." http://www.coastrange.org/documents/forestreport.pdf	references, some of which are Primary Science)	Management Approaches, provides general guidance related to land management in the form of a checklist. The document is a good reference for analytical considerations for projects such as 4FRI. However, most of these concerns are covered in the DEIS.
DA-2/12, page 43, view #60,	Timber Harvest Opposing View #12 - "Consequently, we specifically criticize the "simplified structure-based management" approaches derived from simple structural models and traditional silvicultural systems such as clearcutting. In our view, the assumptions underpinning simplified structure-based management (SSBM) are not supported by the published scientific literature on structural development of natural forests, disturbance ecology, landscape ecology and conservation biology, or by the relationships between ecosystem structures and processes. In this report, we review scientific findings associated with each of these areas with particular attention		

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	to the over-simplified structural models associated with SSBM and the importance and viability of forest reserves to achieve various ecological goals. (page 2) “We do not believe, however, that scientific literature or forestry experience supports the notions that intensively managed forests can duplicate the role of natural forests, or that sufficient knowledge and ability exist to create even an approximation of a natural old-growth forest stand.” (page 3) Franklin, Jerry F. Ph.D. and James K. Agee Ph.D. 2007. “Forging a Science-Based National Forest Fire Policy.” Issues in Science and Technology. A National Wildlife Federation publication sponsored by the Bullitt Foundation http://www.coastrange.org/documents/forestreport.pdf		
DA-2/13, page 48, view #70	Timber Harvest Opposing View #70 - “Logging equipment compacts soils. Logging removes biomass critical to future soil productivity of the forest. Logging disturbs sensitive wildlife. Logging typically requires roads and skid trails which create chronic sources of sedimentation that degrades water quality and aquatic organism habitat. Logging roads and skid trails are also a major vector for the spread of weeds. Logging disrupts nutrient cycling and flows. Logging can alter species composition and age structure (i.e. loss of old growth). Logging can alter fire regimes. Logging can change water cycling and water balance in a drainage. The litany of negative	Gray Literature	This is a community blog posted with an opinion on logging damage to wildlife fire regime, water balance and soils. Chapter 3 of the draft EIS (DEIS) discloses the affected environment for each resource (and the direct/indirect environmental consequences associated with the action alternatives. Table 31, chapter 2, page 98 of the DEIS provides a comparison of the predicted effects of proposed treatments by alternative. The potential for soil disturbance and soil erosion is disclosed in the DEIS on page 109 to page 113 (affected environment), and on page 113 to page 118 (environmental consequences) and pages 118-126 (Water) and in the soil specialist report from page 60 to page 120. Additionally, design features, mitigation measures and the following Soil and Water BMP’s (SW2, SW4, SW7, SW9, SW10, SW11, SW12, SW14, SW19, SW23 through SW36) located in Appendix C, page 567 of DEIS have been developed and will be implemented (for timber harvest operations) to

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	impacts is much longer, but suffice it to say that anyone who suggests that logging is a benefit or benign is not doing a full accounting of costs.” Those who suggest that logging “benefits” the forest ecosystem are using very narrow definitions of “benefit.” Much as some might claim that smoking helps people to lose weight and is a “benefit” of smoking.” Wuerthner, George “Who Will Speak For the Forests?”NewWest, January 27, 2009 http://www.newwest.net/topic/article/who_will_speak_for_the_forests/C564/L564/		mitigate soil compaction, maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality. The Chapter 3 soil and water analysis (DEIS, table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance would occur (including temporary road construction) under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity.
DA-2/14, page 49, view #71.,	Timber Harvest Opposing View #71 - "After logging, peak pipeflow was about 3.7 times greater than before logging." "The use of heavy logging equipment was expected to compact the soil, reduce infiltration rates, and increase surface runoff. In addition, heavy equipment might collapse some of the subsurface pipes, increasing local pore water pressure and the chance of landslides (Sidle, 1986)." Ziener, Robert R. Ph.D., "Effect of logging on subsurface pipeflow and erosion: coastal northern California, USA." Proceedings of the Chengdu Symposium, July 1992. IAHS Publication. No. 209, 1992 http://www.fs.fed.us/psw/publications/ziemer/Ziener92.PDF	Gray Literature	This is from proceedings from a symposium and discusses the effects of timber harvesting on northern California coastal environments. Northern California coastal environments have different environmental and climatic conditions (much more precipitation), different tree species, and different timber harvesting levels and protocols than the Ponderosa Pine dominated forests in the 4FRI project area and have higher risk of compaction of soil and increase surface runoff than within the 4FRI project area. The effects disclosed in chapter 3 of the DEIS are site-specific to this project. The potential for soil disturbance and soil erosion is disclosed in the DEIS on page 109 to page 113 (affected environment), and on page 113 to page 118 (environmental consequences) and pages 118-126 (Water) and in the soil specialist report from page 60 to page 120. Additionally, design features, mitigation measures and the following Soil and Water BMP's (SW2, SW4, SW7, SW9, SW10, SW11, SW12, SW14, SW19, SW23 through SW36) located in Appendix C, page 567 of DEIS have been developed and will be implemented (for timber harvest operations) to mitigate soil compaction, maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality. The Chapter 3 soil and water analysis (DEIS, table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance would occur (including temporary road construction) under all action

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
			alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity.
DA, Logging Harm, pg 50, View No. 72	Timber Harvest Opposing View #72 - "As conservation-minded scientists with many years of experience in biological sciences and ecology, we are writing to bring your attention to the need to protect our National Forests. Logging our National Forests has not only degraded increasingly rare and valuable habitat, but also numerous other services such as recreation and clean water." "Unfortunately, the past emphasis of management has been on logging and the original vision for our National Forests has failed to be fully realized. During the past several decades, our National Forests have suffered from intense commercial logging. Today almost all of our old growth forests are gone and the timber industry has turned our National Forests into a patchwork of clearcuts, logging roads, and devastated habitat." "It is now widely recognized that commercial logging has damaged ecosystem health, clean water, and recreational opportunities-- values that are highly appreciated by the American public. The continued logging of our National Forests also wastes American tax dollars and diminishes the possibilities of future economic benefits. The Forest Service and independent economists have estimated that timber accounts for only 2.7 percent of the total values of goods and services derived from the National Forests, while recreation and fish and wildlife produce 84.6 percent." From an April 16, 2002 letter to President Bush asking him to stop all logging in the national	Popular Press	Although the link was invalid, a reference to the letter was found. This letter, from known and respected scientists, requests the President of the United States to replace commercial logging with a scientifically-based program to restore habitat and native species throughout the 192 million acre national forest system. As described on page 2 of the DEIS, the Forest Service is proposing to conduct restoration activities on approximately 587,923 acres of the Coconino NF and Kaibab NF. This proposed project is therefore well aligned with what the scientists are recommending. The effects to water quality for each action alternative are disclosed in Table 31, pages 102 and 103 of the DEIS and in the Water Quality and Riparian Area Specialist's Report, Table 6, page 39.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	forests. http://www.forestwatch.org/content.php?id=108		
DA-2/16, page 60, view #73	Timber Harvest Opposing View #73 - “Recently, so called "salvage" logging has increased on national forests in response to a timber industry invented "forest health crisis" which points the finger at normal forest processes of fire, fungi, bacteria, insects and other diseases. In fact the crisis in the national forests is habitat destruction caused by too much clearcutting. My long-term studies of forest diseases in Idaho show the loss by disease and insect activity in all age classes of forests to be less than or slightly more than 1 percent per year over the past thirty-eight years. These findings are consistent with Forest Service national level data. Forests are structured systems of many life forms interacting in intricate ways and disturbances are essential to their functioning. It's not fire disease fungi bacteria and insects that are threatening the well being of forests. Disease, fire, windthrow, and other disturbances are a natural part of the forest ecosystem and assist in dynamic processes such as succession that are essential to long term ecosystem maintenance. The real threat facing forests are excessive logging, clearcutting and roadbuilding that homogenize and destroy soil, watersheds and biodiversity of native forests.” Partridge, Arthur Ph.D., Statement at a Press Conference with Senator Robert Torricelli about S. 977 and HR 1376), the Act to Save America's Forests April 28, 1998, U.S. Capitol http://www.saveamericasforests.org/news/ScientistsStatement.htm	Popular Press	This is a statement made at a press conference with Senator Robert Torricelli about a study conducted in Idaho on salvage logging, forest health, and threats including clearcutting to soils, watersheds and biodiversity. The 4FRI project is not proposing salvage or clearcut logging. . In order for comments to result in improved analysis and decisions, they need to be within the scope of the project, relevant to the project and have a direct relationship to the proposed actions. We could not find meaningful recommendations or comments for the Responsible Official to consider.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
DA-2/17, page 61, view #74	Timber Harvest Opposing View #74 - "CONCLUSIONS In our overview of the impacts of forest management activities on soil erosion and productivity, we show that erosion alone is seldom the cause of greatly reduced site productivity. However, erosion, in combination with other site factors, works to degrade productivity on the scale of decades and centuries. Extreme disturbances, such as wildfire or tractor logging, cause the loss of nutrients, mycorrhizae, and organic matter. These combined losses reduce long-term site productivity and may lead to sustained periods of extended erosion that could exacerbate degradation Managers should be concerned with harvesting impacts, site preparation disturbances, amount of tree that is removed, and the accumulation of fuel from fire suppression. On erosion-sensitive sites, we need to carefully evaluate such management factors." Elliot, W.J.; Page-Dumroese, D.; Robichaud, P.R. 1999. The effects of forest management on erosion and soil productivity. Proceedings of the Symposium on Soil Quality and Erosion Interaction, Keystone, CO, July 7, 1996. Ankeney, IA: Soil and Water Conservation Society. 16 p. http://forest.moscowfsl.wsu.edu/smp/docs/docs/Elliot_1-57444-100-0.html	Popular Science	We do not disagree that soil and site productivity can be negatively affected if protective design features and best management practices are not made part of the action. The 4FRI project minimizes vegetation treatment impacts to soil and site productivity through implementation of design features, mitigation measures and the following Soil and Water BMP's listed and located in Appendix C, page 567 of DEIS. They have been developed and will be implemented (for timber harvest and fuels operations and retention of coarse woody debris) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality. The Chapter 3 soil and water analysis (DEIS, table 32, page 116 and pages 119-125) and (Soils Specialist report pages 62-92 and Attachment #1, page 165) shows less than 15% soil disturbance would occur (including temporary road construction) under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
Dick Artley's Opposing Views Attachment 4 Road Construction Harm			
DA 3/1, page 1, view #1	Wildlife to do		
DA-3/2, page 2, view #2	Debris slides over a 20-year period were inventoried on 137,500 acres of forested land in the Klamath Mountains of southwest Oregon. Frequency during the study period was about one slide every 4.3 years on each 1,000 acres-an erosion rate of about 1/2 yd³ per acre per year. Erosion rates on roads and landings were 100 times those on undisturbed areas, while erosion on harvested areas was seven times that of undisturbed areas. Three-quarters of the slides were found on slopes steeper than 70 percent and half were on the lower third of slopes." "Soil erosion rates due to debris slides were many times higher on forests with roads, landings, and logging activity than on undisturbed forests."	Popular Science	This is a report from logging operations on the Klamath National Forest in SW Oregon. SW Oregon environments have different environmental and climatic conditions (much more precipitation), than the dryer Ponderosa Pine dominated forests in the 4FRI project area and have higher risk of debris slides and higher erosion rates. In addition, the article states three-quarters of the slides were found on slopes steeper than 70%. 4FRI does not propose any ground disturbance treatments or roads construction on slopes greater than 40% and consequently, have very low risk of debris slides and associated erosion than on the Klamath. The effects disclosed in chapter 3 of the DEIS are site-specific to this project. The potential for soil disturbance and soil erosion is disclosed in the DEIS on page 109 to page 113 (affected environment), and on page 113 to page 118 (environmental consequences) and pages 118-126 (Water) and in the soil specialist report from page 60 to page 120. Additionally, design features, mitigation measures and the following Soil and Water BMP's located in Appendix C, page 567 of DEIS have been developed and will be implemented (for timber harvest operations) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality.
DA Road_Const_H arm, pg. 2, View 3.	Road Construction Opposing View #3 - " 'Roads may have unavoidable effects on streams, no matter how well they are located, designed or maintained. The sediment contribution to streams from roads is often much greater than that from all other land management activities combined, including log skidding and yarding.' (Gibbons and Salo 1973). Research by Megahan and Kidd in 1972 found that roads built in areas with highly erosive soils can	Scientific Gray Literature	The link provided was invalid, but the citation was found. The article provides a general description of ecological consideration that should be incorporated into sound forest management practices. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	contribute up to 220 times as much sediment to streams as intact forests.” “Applying Ecological Principles to Management of the U.S. National Forests” Issues in Ecology Number 6 Spring 2000 http://www.watertalk.org/wawa/ecosci.html		88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/4, page 3, view #4	Road Construction Opposing View #4 - “Plot-level studies have demonstrated the ability of forest roads to intercept and route both subsurface and surface overland flow more efficiently to the stream network. Significant amount of subsurface throughflow can be intercepted by the road, as a function of the road cut depth and the current saturation deficit, and then redirected, concentrating the flow in particular areas below the road. Road drainage concentration increases the effective length of the channel network and strongly influences the distribution of erosional processes. The concept of wetness index has been used in the study as a surrogate for subsurface throughflow, and the effect of forest roads on subsurface throughflow rerouting has been assessed by evaluating the changes in terms of draining upslope areas. A threshold model for shallow slope instability has been used to analyse erosional impacts of drainage modifications. In the model, the occurrence of shallow landsliding is evaluated in terms of drainage areas, ground slope and soil properties (i.e., hydraulic conductivity, bulk density, and friction angle). The model has been used to generate hypotheses about the broader geomorphic effect of roads. Modelling results have been compared with available field data collected in north-eastern Italy.” Borga, M., F. Tonelli, G. Dalla Fontana and F.	Primary Science	The referenced citation is merely an abstract. The abstract is only broadly relevant to roads within the project area as the publication is based on roads located in Italy. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist’s Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	Cazorzi “Evaluating the Effects of Forest Roads on Shallow Landsliding” Geophysical Research Abstracts, Vol. 5, 13312, 2003 http://www.cosis.net/abstracts/EAE03/13312/EAE03-J-13312.pdf		
DA-3/5, page 4, view #5	Road Construction Opposing View #5 - “A large scale land use experiment has taken place over the last 40 years in the mountainous areas of the northwestern U.S. through timber harvesting. This land use change effects the hydrology of an area through two mechanisms: • Clear-cut logging which causes changes in the dynamics of Rain-On-Snow (ROS) events due to changes in the accumulation and ablation of snow caused by vegetation effects on snow interception and melt; and • Construction and maintenance of forest roads which channel intercepted subsurface flow and infiltration excess runoff to the stream network more quickly.” Bowling, L.C., D. P. Lettenmaier, M. S. Wigmosta and W. A. Perkins “Predicting the Effects of Forest Roads on Streamflow using a Distributed Hydrological Model” from a poster presented at the fall meeting of the American Geophysical Union, San Francisco, CA, December 1996. http://www.ce.washington.edu/~lxb/poster.html	Scientific Gray Literature?	The link provided was invalid (i.e., returned no results). The first comment is related to clearcutting, which is irrelevant to this project. The second comment is related to the effects of roads in the northwest U.S. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist’s Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
DA-3/6, Page 4, view #6	Dick		
DA-3/7, page 5, view #7	Road Construction Opposing View #7 - "The present road system constitutes a legacy of current and potential sources of damage to aquatic and riparian habitats, mostly through sedimentation, and to terrestrial habitats through fragmentation and increased access" (Amaranthus et al 1985)." "The failure of the Report to properly address mitigation costs associated with the ecological effects is a serious problem that needs to be addressed in future drafts. Similarly, passive-use values need to be taken seriously and considered throughout the Roads Report. In order to rectify these problems, most of the Socio-Economic Effects subsections will have to be reworked. Failing to do so, the Roads Report will paint an incomplete picture of the costs and benefits associated with the Forest Service's road program." Brister, Daniel. "A Review and Comment on: Forest Service Roads: A Synthesis of Scientific Information, 2nd Draft, USDA Forest Service." December 1998. http://www.wildlandscpr.org/forest-service-roads-synthesis-scientific-information-socio-economic-impacts	Popular Press	The article provides a review of the Forest Service roads policy titled: Forest Service Roads: a Synthesis of Scientific Information (1998). The article is a position statement that identifies proposed weaknesses in the analysis and policy. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales. Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/8. Page 6, view #8	Road Construction Opposing View #8 - "Sediment input to freshwater is due to either the slower, large-scale process of soil erosion, or to rapid, localized "mass movements," such as		The reference cited is specific to salvage logging following mountain pine beetle infestations. The 4FRI project does not include salvage logging. The effects of roads on water quality, including the potential for

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	landslides. Forest practices can increase the rate at which both processes occur. Most sediment from forestry arises from landslides from roads and clearcuts on steep slopes, stream bank collapse after riparian harvesting, and soil erosion from logging roads and harvested areas. Roads, particularly those that are active for long periods of time, are likely the largest contributor of forestry-induced sediment (Furniss et al. 1991)." "Sediment can increase even when roads comprise just 3% of a basin (Cederholm et al. 1981)." "More than half the species present in the study area will likely be negatively impacted by sedimentation from logging roads." "In areas made highly turbid (cloudy) from sedimentation, the foraging ability of adults and juveniles may be inhibited through decreased algal production and subsequent declines in insect abundance, or, for visual-feeding taxa dependent on good light, through their inability to find and capture food. Highly silted water may damage gill tissue and cause mortality or physiological stress of adults and juveniles." Bunnell, Fred L. Ph.D., Kelly A. Squires and Isabelle Houde. 2004 "Evaluating effects of large-scale salvage logging for mountain pine beetle on terrestrial and aquatic vertebrates." Mountain Pine Beetle Initiative Working Paper 1. Canadian Forest Service. http://warehouse.pfc.forestry.ca/pfc/25154.pdf		sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
DA-3/9, page 6, view #9,	Mike		
DA-3/10, page 7, view #10	deleted		
DA-3/11, page 7, view #11	Mike		
DA-3/12, page 7, view #12	Dick		
DA-3/13, page 8, view #13	Road Construction Opposing View #13 - "Few marks on the land are more lasting than roads." "The negative effects on the landscape of constructing new roads, deferring maintenance, and decommissioning old roads are well documented. Unwanted or non-native plant species can be transported on vehicles and clothing by users of roads, ultimately displacing native species. Roads may fragment and degrade habitat for wildlife species and eliminate travel corridors of other species. Poorly designed or maintained roads promote erosion and landslides, degrading riparian and wetland habitat through sedimentation and changes in streamflow and water temperature, with associated reductions in fish habitat and productivity. Also, roads allow people to travel into previously difficult or impossible to access areas, resulting in indirect impacts such as ground and habitat disturbance, increased pressure on wildlife species, increased litter, sanitation needs and vandalism, and increased frequency of human-caused fires." EPA entry into the Federal Register: March 3, 2000 (Volume 65, Number 43) Page 11675, "National Forest System Road Management."	Scientific Gray Literature	The publication discusses and discloses the adverse ecological effects of forest roads, which are not refuted. The citation concludes with a statement of support for a road management strategy on NFS lands that would improve service to users, protect environmental values, enhance public safety, mitigate environmental impacts, promote viable local communities, and boost credibility of our natural resource management. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales. Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	http://www.epa.gov/fedrgstr/EPA-GENERAL/2000/March/Day-03/g5002.htm		
DA-3/14, page 9, view #14	Road Construction Opposing View #14 - "Fragmentation caused by roads is of special interest because the effects of roads extend tens to hundreds of yards from the roads themselves, altering habitats and water drainage patterns, disrupting wildlife movement, introducing exotic plant species, and increasing noise levels. The land development that follows roads out into rural areas usually leads to more roads, an expansion process that only ends at natural or legislated barriers." "Forest Fragmentation and Roads" Eastern Forest Environmental Threat Assessment Center U.S. Forest Service - Southern Research Station http://www.forestthreats.org/publications/su-srs-018/fragmentation	Scientific Gray Literature	The emphasis of this web page reference is forest fragmentation caused by roads. However other adverse effects of forest roads are discussed. These potential adverse effects are not refuted. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales. Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/15, page 9, view #15	Road Construction Opposing View #15 - "A huge road network with vehicles ramifies across the land, representing a surprising frontier of ecology. Species-rich roadsides are conduits for few species. Roadkills are a premier mortality source, yet except for local spots, rates rarely limit population size. Road avoidance, especially due to traffic noise, has a greater ecological impact. The still-more-important barrier effect subdivides populations, with demographic and probably genetic consequences. Road networks crossing landscapes cause local hydrologic and erosion effects, whereas stream networks and distant valleys receive major peak-flow and sediment impacts. Chemical effects mainly occur near roads. Road networks interrupt horizontal	Scientific Gray Literature	The publication provides a global-scale review of the ecological effects of road corridors. It does not address road construction. The article primarily concentrates on major, arterial roads and not unpaved forest roads. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales. Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	ecological flows, alter landscape spatial pattern, and therefore inhibit important interior species. Thus, road density and network structure are informative landscape ecology assays. Australia has huge road-reserve networks of native vegetation, whereas the Dutch have tunnels and overpasses perforating road barriers to enhance ecological flows. Based on road-effect zones, an estimated 15–20% of the United States is ecologically impacted by roads.” Forman, Richard T. and Lauren E. Alexander “Roads and their Major Ecological Effects” Annual Review of Ecology and Systematics, Vol. 29: 207-231, November 1998 http://arjournals.annualreviews.org/doi/abs/10.1146/annurev.ecolsys.29.1.207?cookieSet=1&journalCode=ecolsys.1		road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/16, page 10, view #16	Dick		
DA-3/17, page 10, view #17	Wildlife		
DA 3/18, page 11, view #18	Road Construction Opposing View #18 - "Rarely can roads be designed and built that have no negative impacts on streams. Roads modify natural drainage patterns and can increase hillslope erosion and downstream sedimentation. Sediments from road failures at stream crossings are deposited directly into stream habitats and can have both on-site and off-site effects. These include alterations of the channel pattern or morphology, increased bank erosion and changes in channel width, substrate composition, and stability of slopes adjacent to the channels." "All of these changes result in important biological consequences that can affect the	Primary Science	This publication provides a comprehensive review of the ecological effects of forest roads, and, more specifically, the effects of stream crossing. These adverse effects are not refuted. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	entire stream ecosystem. One specific example involves anadromous salmonids, such as salmon and steelhead, that have complex life histories and require suitable stream habitat to support both juvenile and adult life stages." "A healthy fishery requires access to suitable habitat that provides food, shelter, spawning gravel, suitable water quality, and access for upstream and downstream migration. Road-stream crossing failures have direct impacts on all of these components." Furniss, Michael J., Michael Love Ph.D. and Sam A. Flanagan "Diversion Potential at Road-Stream Crossings." USDA Forest Service. 9777 1814—SDTDC. December 1997. http://www.stream.fs.fed.us/water-road/w-r-pdf/diversionpntl.pdf		road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/19, page 12, view #19	Road Construction Opposing View #19 - "Barry Noon, a professor of wildlife ecology at Colorado State University, noted that scientific research has consistently shown the adverse effects of roads on hydrologic processes and fish and wildlife populations. "One of the key things to recognize is the effects of the roads extend far beyond their immediate footprint," Noon said. For example, "in terms of hydrology, the roads are leading to faster runoff of water, often with great increases in sedimentation, particularly following storm events, and roads in watersheds often lead to increases in the intensity of floods." " These changes degrade fish habitat because of the increased sedimentation that leads to decreases in water quality, Noon said. And	Popular Press	This web page citation includes a discussion of the adverse effects of road systems on hydrologic processes, which are not refuted. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	roads fragment wildlife habitat and create areas that animals avoid, often as result of increased hunting, he said.” Gable, Eryn “Battling beetles may not reduce fire risks – report” Land Letter, March 4, 2010 http://www.xerces.org/2010/03/04/battling-beetles-may-not-reduce-fire-risks-report/		
DA-3/20, page 12, view #20	Roads and skid trails have been identified as a major contributor to increased turbidity of water draining logging areas resulting in increases from 4 to 93 parts per million (Hoover, 1952). Forest roads have been found to have erosion rates from one to three orders of magnitude greater than similar undisturbed areas (Megahan, 1974) and perhaps account for as much as 90 percent of all forest erosion (Megahan, 1972). Forest roads can also cause soil erosion and stream sedimentation, which adversely impact on the nation’s water quality (Authur et al., 1998)	Gray Literature	This article and comment were released in the proceedings from conference 34 international erosion control association; ISSN 1092-2806 place of publication unknown. They study was conducted on the Tuskegee National Forest in Alabama and studies the effectiveness of four alternative road sediment control treatments: vegetation, riprap, sediment fences, and settling basins (detention ponds), in reducing sediment export to the forest floor were evaluated. Studying the effectiveness of alternative roads sediment control treatments are outside the scope of the project and do not meet the purpose and need (DEIS chapter 1, page 8) which is to reestablish and restore forest structure and pattern, forest health and vegetation composition and diversity. In addition, the climatic conditions on the Tuskegee National Forest are not similar to climatic condition in the 4FRIproject area (they are hotter and wetter) and have higher potential for soil erosion than in the 4FRI project area. The DEIS proposes no new permanent road construction (DEIS page 40, p 63, p 81, p 88). The DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area. Also see response DA #2 above relative to disclosure of site-specific effects and mitigation measures and soil and water BMPs designed to protect water quality.
DA-3/21, page 13, view #21	Road Construction Opposing View #21 - "Roads have well-documented, short- and long-term effects on the environment that have become highly controversial, because of the value society now places on unroaded wildlands and because of wilderness conflicts with resource	Primary Science	This publication provides a comprehensive description of the effects of forest roads, which include physical, ecological, geomorphic and hydrologic effects, indirect and landscape level effects (such as effects on aquatic habitat, terrestrial vertebrates, and biodiversity conservation), and socioeconomic effects (such as passive-use value, economic effects on development and range management). These

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	extraction." "(Road) consequences include adverse effects on hydrology and geomorphic features (such as debris slides and sedimentation), habitat fragmentation, predation, road kill, invasion by exotic species, dispersal of pathogens, degraded water quality and chemical contamination, degraded aquatic habitat, use conflicts, destructive human actions (for example, trash dumping, illegal hunting, fires), lost solitude, depressed local economies, loss of soil productivity, and decline in biodiversity." Gucinski, Hermann Ph.D., Michael J. Furniss, Robert R. Ziemer Ph.D. and Martha H. Brookes, Editors. 2001. "Forest Roads: A Synthesis of Scientific Information." USDA Forest Service, General Technical Report PNW-GTR-509. http://www.fs.fed.us/pnw/pubs/gtr509.pdf		effects are not refuted. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/22, page 13, view #22	Fire		
DA-3/23, page 14, view #23	Many forested landscapes are fragmented by roads, but our understanding of the effects of these roads on the function and diversity of the surrounding forest is in its infancy. I investigated the effect of roads in otherwise continuous forests on the macroinvertebrate fauna of the soil. I took soil samples along transects leading away from the edges of unpaved roads in the Cherokee National Forest in the Southern Appalachian mountains of the United States. Roads significantly depressed both the abundance and the richness of the macroinvertebrate soil fauna. Roads also significantly reduced the depth of the leaf-litter layer. These effects persisted up to 100 m into	Gray Literature	This is a paper submitted to the Conservation Biology Journal on the effects of roads on the macroinvertebrate fauna of the soil in the Cherokee National Forest in the southern Appalachian mountains. The study investigates the effects of roads on macroinvertebrates in the soil which is outside the scope of the 4FRI project. The 4FRI project is not proposing construction of any new roads and temporary roads will be obliterated, and adequately protected from erosional processes protecting both soil nutrient cycling function and loss of soil productivity (DEIS page 40, p 63, p 81, p 88). The DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area. Furthermore, the study site is located in dissimilar environmental, climatic and soil conditions than soils in the 4FRI project area.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	the forest. Wider roads and roads with more open canopies tended to produce steeper declines in abundance, richness, and leaf-litter depth, but these effects were significant only for canopy cover and litter depth. The macroinvertebrate fauna of the leaf litter plays a pivotal role in the ability of the soil to process energy and nutrients. These macroinvertebrates also provide prey for vertebrate species such as salamanders and ground-foraging birds. The effect of roads on the surrounding forest is compounded by the sprawling nature of the road system in this and many other forests. My data suggest that even relatively narrow roads through forests can produce marked edge effects that may have negative consequences for the function and diversity of the forest ecosystem.” Haskell, David G. Ph.D. 1999 “Effects of Forest Roads on Macroinvertebrate Soil Fauna of the Southern Appalachian Mountains” http://www.jstor.org/stable/2641904		Chapter 3 of the draft EIS (DEIS) disclosed the affected environment for each resource (including roads) and the direct/indirect environmental consequences associated with the action alternatives in chapter 3, from page 63 to page 345. Pages 109 – 118 disclose affected environment and environmental effects to soil in and pages 119-136 disclose affected environment and environmental effects to water resources and pages 118-126 (Water) and in the soil specialist report from page 60 to page 120.
DA-3/24, page 15, view #24	Road Construction Opposing View #24 - “Roads remove habitat, alter adjacent areas, and interrupt and redirect ecological flows. They subdivide wildlife populations, foster invasive species spread, change the hydrologic network, and increase human use of adjacent areas. At broad scales, these impacts cumulate and define landscape patterns.” Hawbaker, Todd J. Ph.D., Volker C. Radeloff Ph.D., Murray K. Clayton Ph.D., Roger B. Hammer Ph.D., and Charlotte E. Gonzalez-Abraham Ph.D. “Road Development, Housing Growth, and	Primary Science	This article is largely related to road development in rural Wisconsin and associated subsequent habitation/development of roaded areas. The ecological effects of road networks are discussed. While the ecological effects of roads are not refuted, this article does not directly relate to temporary road construct as proposed under the action alternatives. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist’s Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	Landscape Fragmentation In Northern Wisconsin: 1937–1999” Ecological Applications: Vol. 16, No. 3, pp. 1222-1237. http://www.esajournals.org/doi/abs/10.1890/1051-0761%282006%29016%5B1222%3ARDHGAL%5D2.0.CO%3B2?journalCode=ecap		landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/25, page 15, view #25	Dick		
DA-3/26, page 16, view #26	Road Construction Opposing View #26 - "Although disturbance patches are created by peak flow and debris flow disturbances in mountain landscapes without roads, roads can alter the landscape distributions of the starting and stopping points of debris flows, and they can alter the balance between the intensity of flood peaks and the stream network's resistance to change." Jones, Julia A. Ph.D., Frederick J. Swanson Ph.D. Beverley C. Wemple Ph.D., and Kai U. Snyder. "Effects of roads on hydrology, geomorphology, and disturbance patches in stream networks." Conservation Biology 14, No. 1. 2000. http://www.jstor.org/stable/2641906	Primary Science	The article provides a synopsis of the biological and ecological effects of roads, particularly where roads intersect streams. The research was conducted in the H. J Andrews Experimental Forest in Oregon, so it is not directly relevant to this project. The effects disclosed are not refuted, but not all are relevant to the semi-arid Southwest. However, some general monitoring recommendations are provided that could prove useful for detecting adverse effects of roads intersecting perennial streams. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/27, page 16, view #27	In the Pacific Northwest, the two main processes that contribute to sediment production are mass failure and surface erosion from forest roads (Fredriksen 1970, Reid and Dunne 1984). In the	Gray Literature	This is a research note from the Pacific NW Research Station suggesting a method for measuring sediment production from roads. Measuring sediment production from roads is outside the scope of the 4FRI project and does not meet the purpose and need (DEIS chapter

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	Clearwater River basin in the State of Washington, as much as 40 percent of the sediment produced in the watershed was attributed to logging roads (Reid 1980)." Kahklen, Keith. "A Method for Measuring Sediment Production from Forest Roads." Pacific Northwest Research Station, USDA Forest Service. Research note PNW-RN-529, April 2001. http://www.fs.fed.us/pnw/pubs/rn529.pdf		1, page 8) which is to reestablish and restore forest structure and pattern, forest health and vegetation composition and diversity. The need is to increase forest resiliency and sustainability and protect soil productivity and improve soil and watershed function. The DEIS proposes no new permanent road construction (DEIS page 40, p 63, p 81, p 88). The DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area.
DA-3/28, page 17, view #28	Dick		
DA-3/29, page 17, view #29	Dick		
DA-3/30, page 18, view #30	The compaction of forest road soils is known to reduce aeration, porosity, infiltration rates, water movement, and biological activity in soils. Research indicates that soil bulk density, organic matter, moisture, and litter depths are much lower on roads than on nearby forest lands. Macropores, which provide soil drainage and infiltration, have been shown to significantly decrease in size as a result of road construction and use. Reduced infiltration and increased compaction promote soil erosion, especially during the seasonal southwestern monsoon rains (Elseroad 2001)." "Physical disturbances caused by road construction and vehicle use create ideal conditions for colonization by invasive exotic plant species. The use of roads by vehicles, machinery, or humans often aids the spread of exotic plant seeds. Once established, they can have long-term impacts on surrounding		This is a working paper describing the effects to soils from existing and new road construction. The DEIS proposes no new permanent road construction (DEIS page 40, p 63, p 81, p 88).The DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area. The 4FRI project propose about 500 miles of temporary road construction that will be obliterated with appropriate design features and BMPs. Appendix C, page 567 includes design features, mitigation measures and the following Soil and Water BMP's (SW2, SW14, SW16, SW20, SW24, SW30, SW32, T7, T8, RS3) that will be implemented (for temporary road construction) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality and aquatic resources. Chapter 2, page 65 of the DEIS states construction (and decommissioning) temporary roads is an action common to the action alternatives. Page 65 further states reconstructing and improving roads, relocating a minimal number of road miles, and

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	ecosystems and can be difficult to remove." "Roads are known to cause habitat fragmentation. Many create ecological 'edges' with different plant species, light levels, and hiding cover, all of which may alter animal survival, reproductive success, and movement patterns. The introduction of exotic plants can disrupt the availability of native vegetation used by wildlife for food and shelter (Trombulak and Frissell 1999)." "Forest roads often develop a water-repellent soil layer caused by lack of vegetative cover and changes in soil composition. This can substantially influence how runoff is processed. Erosion, the formation of water channels beside the road, and increased sediment loads in nearby streams are common results of this process (Baker 2003)." "Because they provide easier access to many forest tracts, forest roads often allow more human-caused fires to be ignited." Lowe, Kimberly Ph.D., "Restoring Forest Roads." A Northern Arizona University Ecological Restoration Institute publication Working Paper 12. June, 2005. http://www.eri.nau.edu/en/information-for-practitioners/restoring-forest-roads		decommissioning existing roads and unauthorized routes is a common action to action alternatives. Table 15 displays management actions and road adaptive management strategies designed to mitigate effects to soil and water resources and include complete road obliteration, blocking entrance reducing motorized impacts, re-establishing road drainage, removal of culverts, installation of waterbars, protecting against erosion with slash. In addition, (DEIS page 114) alternative B would decommission 496 miles of road in functioning at risk watersheds, and decommission 226 miles of roads located in impaired function watersheds resulting reduced the hydrologic connectivity between roads and streams and improved water quality. BMPs are designed to control and reduce the spread of invasive weeds and is located in DEIS Appendix C, page 586, SW BMP4 The effects of vegetation actions to resources including soils, water, noxious weeds, is located in the DEIS at page 109 to page 126 (soil and water and pages 268-271 (invasive weeds). The soils analysis indicates for all action alternatives, soil design features and best management practices are in place to reduce the potential for erosion (loss of soil productivity). The soils analysis (DEIS, table 32, page 116) shows less than 15% soil disturbance would occur under all action alternatives which is less than 15% soil disturbance threshold identified that would maintain long term soil productivity. Need statement on forest roads causing human fires.
DA-3/31, page 19, view #31	Road Construction Opposing View #31 - "Almost everywhere people live and work they build and use unimproved roads, and wherever the roads go, a range of environmental issues follows." "Among the environmental effects of unimproved roads, those on water quality and	Primary Science	The article provides a brief synopsis of roads-related effects to surface and subsurface hydrology and research methods and opportunities that would improve our understanding of road effects on hydrologic processes. It is a useful reference for hydrologists and roads engineers. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	aquatic ecology are some of the most critical. Increased chronic sedimentation, in particular, can dramatically change the food web in affected streams and lakes." "The nearly impervious nature of road surfaces (or treads) makes them unique within forested environments and causes runoff generation even in mild rainfall events, leading to chronic fine sediment contributions." "If we look at the issue of what we need to learn or the research priorities for forest road hydrology, I would argue that the areas of cutslope hydrology and effectiveness of restoration efforts are perhaps most critical." "At a few sites in the mountains of Idaho and Oregon a substantial portion of the road runoff (80–95%) came from subsurface flow intercepted by the cutslope (Burroughs et al., 1972; Megahan, 1972; Wemple, 1998)." Luce, Charles H. Ph.D., 2002. "Hydrological processes and pathways affected by forest roads: what do we still need to learn?" http://www.fs.fed.us/rm/boise/teams/soils/Publications/Luce%202002%20HP.pdf		addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/32, page 20, view #32	Road Construction Opposing View #32 - "Roads in the watershed contribute to sediment production by concentrating runoff, thereby increasing sediment load to the stream network. Most unimproved (dirt) roads connect either directly or indirectly with streams and, therefore, act as extensions of stream networks by effectively increasing watershed drainage density and subsequently sediment loads to streams. In the South Fork subwatershed of Squaw Creek, road connectivity has resulted in	Scientific Gray Literature	The publication provides a detailed description of a study located northwest of Lake Tahoe, California to improve understanding of the geomorphic processes influencing sediment movement through a subalpine tributary to a 303(d) listed stream (Squaw Creek) by conducting a sediment source assessment. The literature review provides a good synopsis of the adverse effects of roads on hydrology and sediment movement. However, the project was undertaken in a subalpine catchment. There are no treatments proposed in subalpine area as part of this proposed project. The article is therefore not directly relevant to this proposed project. The effects of roads on water quality, including the potential for

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	an increase in effective drainage density of approximately 250%. Throughout the Squaw Creek watershed, it is estimated that dirt roads potentially contribute as much as 7,793 metric tons/year to the watershed sediment budget." Maholland, Becky and Thomas F. Bullard Ph.D., "Sediment-Related Road Effects on Stream Channel Networks in an Eastern Sierra Nevada Watershed." Journal of the Nevada Water Resources Association, Volume 2, Number 2, Fall 2005. http://www.nvwra.org/docs/journal/vol_2_no_2/NWRAjournal_fall2005_article4.pdf		sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/33, page 20, view #33	Road Construction Opposing View #33 - "One of the greatest impacts of roads and (especially motorized) trails is their effect on the hydrology of natural landscapes, including the flow of surface and ground water and nutrients. These hydrologic effects are responsible for changes to geomorphic processes and sediment loads in roaded areas (Luce and Wemple 2001)." (pg. 12) Malecki, Ron W. "A New Way to Look at Forest Roads: the Road Hydrologic Impact Rating System (RHIR)" The Road-RIPorter, Autumn Equinox, 2006 http://www.wildlandscpr.org/files/uploads/RIPorter/rr_v11-3.pdf	Popular Press	This reference is a newsletter that describes, in general terms the effects of roads and what restoration entails. It's a good general information publication and provide some meaningful information on road decommissioning/obliteration and discusses funding mechanisms to facilitate ecological restoration. However, it is not directly relevant to the 4FRI project. The effects of roads discussed in this publication are not refuted. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/34, page 21, view #34	A study was made on 344 miles of logging roads in northwestern California to assess sources of erosion and the extent to which road-related	Gray Literature	This is a paper published in the Journal of Forestry studying the sources of erosion in northwest California. The findings indicate erosion could have been prevented with proper engineering methods

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	erosion is avoidable. At most, about 24 percent of the erosion measured on the logging roads could have been prevented by conventional engineering methods. The remaining 76 percent was caused by site conditions and choice of alignment. On 30,300 acres of commercial timberland, an estimated 40 percent of the total erosion associated with management of the area was found to have been derived from the road system." McCashion, J. D. and R. M. Rice Ph.D. 1983. "Erosion on logging roads in northwestern California: How much is avoidable?" Journal of Forestry 8(1): 23-26. http://www.fs.fed.us/psw/rsi/projects/water/McCashion.pdf		and choice of road alignment. In the 4FRI project, design features, mitigation measures and the following Soil and Water BMP's (SW2, SW14, SW16, SW20, SW24, SW30, SW32, T7, T8, RS3) located in Appendix C, page 567 of DEIS have been developed and will be implemented (for temporary road construction) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p 63, p 81, p 88).The DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area. See response CBD-1 for same response.
DA-3/35, page 21, view #35	Road Construction Opposing View #35 - "Research has shown that roads can have adverse impacts on the water quality on the forest landscape (Authur et al. 1998; Binkley and Brown 1993; Megahan et al. 1991). The forest road system has been identified by previous research as the major source of soil erosion on forestlands (Anderson et. al 1976; Patric 1976; Swift 1984; Van Lear et al. 1997). Furthermore, roads are cited as the dominant source of sediment that reaches stream channels (Packer 1967; Trimble and Sartz 1957; Haupt 1959)." McFero III, Grace, J. "Sediment Plume Development from Forest Roads: How are they related to Filter Strip Recommendations?" An ASAE/CSAE Meeting Presentation, Paper Number: 045015, August 1-4, 2004. http://www.srs.fs.usda.gov/pubs/ja/ja_grace017.	Scientific Gray Literature	This publication describes a study that was undertaken to assess sediment transport distances downslope of forest roads and characterize the factors influencing these distances. The study references sites in Georgia and Alabama, which have distinctly different soil types and precipitation patterns that this region. However, some general BMPs are recommended. BMPs outlined in the DEIS for this project exceed those recommended in the referenced publication. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	pdf		road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/36, page 22, view #36	Dick and Wildlife		
DA-3/37, page 22, view #37	Wildlife		
DA-3/38, page 23, view #38	“Erosion from forest roads can be a large source of sediment in watersheds managed for timber production.” Megahan, Walter F. Ph.D. “Predicting Road Surface Erosion from Forest Roads in Washington State” from a presentation presented at the 2003 Geological Society of America meeting. http://gsa.confex.com/gsa/2003AM/finalprogram/abstract_67686.htm	Popular Press	This is a presentation abstract given at the Geological Society of America meeting in 2003 on a road erosion model used in Washington State. It describes an erosion model tool used to predict erosion from roads. In order for comments to result in improved analysis and decisions, they need to be within the scope of the project, relevant to the project and have a direct relationship to the proposed actions. We could not find meaningful recommendations or comments for the Responsible Official to consider.
DA-3/39, page 23, view #39	Road Construction Opposing View #39 - “Today, addressing the adverse impacts of forest roads is consistently identified as one of the highest watershed restoration priorities in U.S. forests—in many forested watersheds in the western United States there is a greater road density than stream density. It is simply irrational to spend millions of dollars subsidizing further forest road construction when we are simultaneously spending millions of dollars to offset detrimental effects associated with similar actions in the past.” Montgomery, David Ph.D., Statement at a Press Conference with Senator Robert Torricelli about S. 977 and HR 1376), the Act to Save America’s Forests April 28, 1998, U.S. Capitol	Popular Press	The article provides economic justification for not constructing new forest roads, given the density of existing roads networks and the adverse ecological effects, particularly in the Western U.S. This article is relevant to the 4FRI project since the proposed projects includes decommissioning of 904 miles of existing roads, no new construction of permanent roads, and decommissioning of constructed temporary roads upon completion of activities. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist’s Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11,

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	http://www.saveamericasforests.org/news/ScientistsStatement.htm		SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA, 3/40, page 24, view #40	Wildlife		
DA-3/41, page 25, view #41	Wildlife		
DA-3/42, page 26, view #42	Wildlife		
DA-3/43, page 26, view #43	Road Construction Opposing View #43 - "Erosion on roads is an important source of fine-grained sediment in streams draining logged basins of the Pacific Northwest. Runoff rates and sediment concentrations from 10 road segments subject to a variety of traffic levels were monitored to produce sediment rating curves and unit hydrographs for different use levels and types of surfaces. These relationships are combined with a continuous rainfall record to calculate mean annual sediment yields from road segments of each use level. A heavily used road segment in the field area contributes 130 times as much sediment as an abandoned road. A paved road segment, along which cut slopes and ditches are the only sources of sediment, yields less than 1% as much sediment as a heavily used road with a gravel surface." Reid, L. M. Ph.D. and T. Dunne (1984), "Sediment Production from Forest Road Surfaces," Water Resour. Res., 20(11), 1753–1761. http://www.agu.org/pubs/crossref/1984/WR020i	Primary Science	This article presents a road sediment study conducted in NW Washington State on the Olympic Mountains. Soils in the project area are Inceptisols, which are very dissimilar to soils in the project area. Precipitation patterns are also vastly different than those of the Southwestern U.S. The publication is therefore not relevant to this proposed project. However, road sediment research methodologies are presented that would improve understand of the effects of roads on in-stream water quality. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	011p01753.shtml		
DA-3/44, page 27, view #44	Road Construction Opposing View #44 - "Roads are associated with high sediment inputs and altered hydrology, both of which can strongly influence downstream channel habitats. Roads are also important as a source of indirect human impacts and as an agent of vegetation change and wildlife disturbance." "Any ground disturbance increases the potential for erosion and hydrologic change, and roads are a major source of ground disturbance in wildlands. Compacted road surfaces generate overland flow, and much of this flow often enters the channel system, locally increasing peak flows. Localized peak flows are also increased where roads divert flow from one swale into another, and where roadcuts intercept subsurface flows." "Overland flow from the road surface is a very effective transport medium for the abundant fine sediments that usually are generated on road surfaces. Road drainage also can excavate gullies and cause landslides downslope in swales. Cut and fill slopes are often susceptible to landsliding, and road-related landsliding is the most visible forestry-related erosional impact in many areas." Reid, Leslie M. Ph.D., Robert R. Ziemer Ph.D., and Michael J. Furniss 1994. "What do we know about Roads?" USDA Forest Service. http://www.fs.fed.us/psw/publications/reid/4Roads.htm	Scientific Gray Literature	The publication provides a synopsis of the effects of forest roads on a variety of ecosystem functions, which are not unlike those within the project area. It further provides guidance on analytical methods for assessing and inventorying forest road network needs that would facilitate a more sustainable, and ecologically sound road network. This information is not refuted and is relevant to the 4FRI project. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales. Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/45, page	Road Construction Opposing View #45 -	Primary Science	The publication describes a long-term study of the effects of logging

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
28, view #45	"Disturbances from roadbuilding and logging changed the sediment/discharge relationship of the South Fork from one which was supply dependent to one which was stream power dependent, resulting in substantial increases in suspended sediment discharges." "Road construction and logging appear to have resulted in increases in average turbidity levels (as inferred from suspended sediment increases) above those permitted by Regional Water Quality Regulations." Rice, Raymond M. Ph.D., Forest B. Tilley and Patricia A. Datzman. 1979. "Watershed's Response to Logging and Roads: South Fork of Caspar Creek, California, 1967-1976." USDA Forest Service, Research Paper PSW-146. http://www.fs.fed.us/psw/publications/rice/Rice79.pdf		and road building Ft. Bragg, CA. It is not directly relevant to this project, although it does identify increased surface water turbidity as a concern. This concern would also apply within the 4FRI analysis area and is discussed in the EIS. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/46, page 28, view #46	Road Construction Opposing View #46 - "Sediment eroded from gravel roads can be a major component of the sediment budget in streams in this region (Van Lear, et al, 1995)." Riedel, Mark S. Ph.D. and James M. Vose Ph.D., "Forest Road Erosion, Sediment Transport and Model Validation in the Southern Appalachians." Presented at the Second Federal Interagency Hydrologic	Primary Science	The publication presents a study undertaken in the southern Appalachian Mountains in northern Georgia and southern Tennessee. Soil types and precipitation patterns are vastly different than those in the Southwestern U.S. This publication is therefore not relevant to this project. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist's Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	Modeling Conference, July 28 – August 1, 2002. http://www.srs.fs.usda.gov/pubs/ja/ja_riedel002.pdf		88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/47, page 29, view #47	Wildlife		
DA-3/48, page 30, view #48	Wildlife		
DA-3/49, page 30, view #49	Road Construction Opposing View #49 - “The effects of forest roads on hydrology are related to the effects of forest clearing. Most logging requires road access, and the roads often remain after the logging, so there are both short and long-term effects. ⁹⁴ Forest road surfaces are relatively impermeable. Water readily runs over the road surface and associated roadside ditches, often directly to a stream channel, with the net effect of extending channel networks and increasing drainage density. ⁹⁵ In addition to providing conduits for overland flow, forest roads involve slope-cuts and ditching that may intersect the water table and interrupt natural subsurface water movement. ⁹⁶ This diversion of subsurface water may be quantitatively more important than the overland flow of storm water in some watersheds. ⁹⁷ The importance of roads in altering basin hydrology has been underscored in paired-watershed studies and recent modeling studies. ⁹⁸ ” (Pgs. 730 and 731) Shanley, James B. and Beverley Wemple Ph.D. “Water Quantity and Quality in the Mountain Environment” Vermont Law Review, Vol. 26:717, 2002		This publication is generally related to development in mountainous regions, although it does include information related to soil compaction and impervious surfaces and the effects of these areas on water quality and stream habitats. However, it is not directly relevant to the 4FRI project. The effects of roads on water quality, including the potential for sediment delivery are disclosed in the Water Quality and Riparian Area Specialist’s Report, pages 48 and 49, pages 53 and 54, and pages 62 and 63. The DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
DA-3/50, page 31, view #50	Roads are often the major source of soil erosion from forested lands (Patric 1976)." "Generally, soil loss is greatest during and immediately after construction." Swift Jr., L. W. "Soil losses from roadbeds and cut and fill slopes in the Southern Appalachian Mountains." Southern Journal of Applied Forestry 8: 209-216. 1984. http://cwt33.ecology.uga.edu/publications/403.pdf	Gray Literature	This North Carolina study was published in the Southern Journal of Applied Forestry and shows that inclined surfaces of cut and fill slopes are potential sources of large soil loss but these losses can be mitigated by early establishment of grass cover and by design features to control storm water. In the 4FRI project, design features, mitigation measures and the following Soil and Water BMP's (SW2, SW14, SW16, SW20, SW24, SW30, SW32, T7, T8, RS3) located in Appendix C, page 567 of DEIS have been developed and will be implemented (for temporary road construction) to maintain and protect soil productivity, minimize sediment delivery and improve and protect water quality In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p 63, p 81, p 88). No new permanent roads are proposed for construction. The DEIS proposes a reduction of current roads through the proposed decommissioning of 904 miles of road (DEIS @ p41, p 63, Table 18 p 74, p 81, p 88), thus actually decreasing the effects of roads that are currently located within the analysis area. See response CBD-1 for same response.
DA-3/51, page 32, view #51	Wildlife		
DA-3/52, page 32, view #52	Wildlife		
DA-3/53, page 33, view #53	Wildlife		
DA-3/54, page 34, view #54	Wildlife		
DA-3/55, page 35, view #55	Road Construction Opposing View #55 - "According to the DEIS, the Forest now manages a total of 5,914 miles of roads across the Forest. Scientific literature has established that roads have numerous widespread, pervasive and, if left untreated, long-lasting biological and physical impacts on aquatic ecosystems that	Popular Press	These are comments received by the Rogue River-Siskiyou National Forest on the proposed Motorized Vehicle Use Draft Environmental Impact Statement (DEIS). These comments are not relevant to the 4FRI project, although some similar roads-related concerns similar to those found within the 4FRI project area are identified. The effects of roads on water quality, including the potential for

Comment # and Location	Comment or Reference for Attachments	Comment Topic	General Response
	continue long after completion of construction. (Angermeier et al. 2004). Roads increase surface water flow, alter runoff patterns, alter streamflow patterns and hydrology, and increase sedimentation and turbidity. Roads are the main source of sediment to water bodies from forestry operations in the United States. (US EPA 2002). Road construction can lead to slope failures, mass wasting and gully erosion. Road crossings can act as barriers to movement for fish and other aquatic organisms, disrupting migration and reducing population viability. (Schlosser and Angermeier 1995). Chemical pollutants that enter streams via runoff, such as salt and lead from road use and management, compound these impacts. Most of these adverse effects are persistent and will not recover or reverse without human intervention. The techniques for road remediation are well established, agreed upon and readily available. (Weaver et al. 2006).” (Pg. 2) Wright, Bronwen, Policy Analyst and Attorney Pacific Rivers Council Excerpt from a May 11, 2009 letter to the Rogue River-Siskiyou National Forest Travel Management Team http://www.pacificrivers.org/protection-defense/comment-letters/Rogue%20River%20Siskiyou%20TMP%20DEIS.pdf		sediment delivery are disclosed in the Water Quality and Riparian Area Specialist’s Report, pages 48 and 49 and pages 53 and 54. In addition, the DEIS proposes no new permanent road construction (DEIS page 40, p. 63, p. 81, p. 88). The DEIS proposes a reduction of current road mileage within the project area through decommissioning of 904 miles of roads (DEIS page 41, p. 63, Table 18 p. 74, p. 81, p. 88), thus decreasing the adverse effects of roads at both local and landscape scales Appendix C, pages 580 through 590 (SW10, SW11, SW12, SW14, SW16, SW17, SW18, SW20, SW22, SW24, SW30, and SW31) provide specific design features, BMPs, and mitigation measures to protect soils and water quality during and after temporary road construction, decommissioning, and obliteration and permanent road maintenance activities.
DA-3/56, page 36, view #56	Dick		
DA-3/57, page 36, view #57	Wildlife		

