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Environmental Assessment

East Clear Creek Watershed Health Improvement Project

Mogollon Rim Ranger District, Coconino National Forest
Coconino County, Arizona

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SUMMARY

The Coconino National Forest proposes to improve watershed health conditions within the East Clear Creek watershed through a variety of management actions, including prescribed burning, thinning, stream channel and meadow restoration, and road management. The project area is located on approximately 70,000 acres in the East Clear Creek drainage, and is within the Mogollon Rim ranger District, Coconino National Forest, Arizona. This action is needed to achieve the following objectives:

1. Restoring Understory and Overstory Vegetative Health and Diversity,
2. Reducing Potential for Stand-Replacing Wildfire;
3. Restoring Soils, Meadow Systems, and Riparian Areas, and
4. Reducing Effects of Roads on Riparian Areas and Threatened, Endangered, and Sensitive Species Habitat

The proposed action will provide a reduction in the threat of stand-replacing fire through thinning and burning operations, improved meadow and riparian conditions of meadows and of stream courses, designate the open road system, close and obliterate roads that are causing resource damage, and reduce the impacts from recreationists on meadow, riparian, and habitat for threatened and endangered species through stream channel and meadow improvements and fencing of meadows and designating dispersed campsites along the 321C road, and minimize impacts from the open road system. The proposed action will have some potential short-term negative impacts to wildlife habitat, sediment production to streams, and impacts to recreating public from smoke, road decommissioning and road closure.

In addition to the proposed action, the Forest Service also evaluated the following alternatives:

- *No Action Alternative*
- *Alternative 3, the modified proposed action*
- *Alternative 4*

Based upon the effects of the alternatives, The District Ranger may select any of the management alternatives presented here, or may select a management alternative that is different or includes portions of these alternatives. If a watershed recovery alternative is selected, the District Ranger's decision will include the acres treated by fire, the acres thinned, the miles of channel restoration, the acres of meadow restoration and rehabilitation, the designated open road system, the miles of roads closed, the miles of roads decommissioned, the miles of road maintenance, the location of pavement, the acres of area closure, the miles of fencing to mitigate recreation impacts and designation of dispersed camping sites along the 321C road, and the acres of thinning. He will also outline appropriate mitigation measures as well as any potential Forest Plan amendments.

CHAPTER 1 INTRODUCTION

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- *Introduction:* The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Comparison of Alternatives, including the Proposed Action:* This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Environmental Consequences*: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by environmental component. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.
- *Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *Appendices*: The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Mogollon Rim Ranger District Office in the Blue Ridge Ranger Station, Happy Jack, Arizona.

Forest Plan Consistency

This action responds to the goals and objectives outlined in the Coconino National Forest Land and Resource Management Plan (Forest Plan), as amended, and helps move the project area towards desired conditions described in that plan (Coconino National Forest Plan 1987).

Tables 1 and 2 outline the Forest Plan Management Areas within the analysis area and the respective management emphasis for each Management Area outlined in the Forest Plan.

Table 1: Summary of the Management Areas of the Coconino National Forest Plan for the East Clear Creek Watershed Health Improvement analysis area.

Management Area	Description	Acres	% of Analysis Area
MA-3	Ponderosa Pine & Mixed Conifer, < 40% slopes	45,650	65%
MA-4	Ponderosa Pine & Mixed Conifer , > 40% slopes	11,558	16%
MA-5	Aspen	266	0%
MA-6	Unproductive Timber Lands	1,395	2%
MA-7	Pinyon-Juniper Woodland, < 40% slopes	32	0%
MA-9	Mountain Grassland	49	0%
MA-12	Riparian & Open Water	1,606	2%
MA-19	Mogollon Rim	9,533	14%
No Data		512	1%
TOTAL ACRES		70,601	100%

Table 1: Summary of acres for each Management Area within the East Clear Creek Watershed Health Analysis Area. The data was derived from GIS data layer for the ECC Watershed health Analysis Area.

Table 2: Summary of the Management Emphasis from Coconino National Forest Plan for the East Clear Creek Watershed Health Improvement analysis area.

MANAGEMENT AREAS (MA)	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 p117)
4	Emphasize wildlife habitat, watershed condition, and dispersed recreation. Management intensity is low. (FP, amendment 15, replacement p139)
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 p145)
7	Emphasize firewood production, watershed condition, wildlife habitat, and livestock grazing. Other resources are managed in harmony with the emphasized resources. (FP, amendment 12, replacement p148)

MANAGEMENT AREAS (MA)	MANAGEMENT EMPHASIS
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, amendment 15, replacement p158)**
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, amendment 11, replacement p172)**
19	**Emphasize dispersed and developed recreation, visual quality, and wildlife travel corridors across the Rim, generally the heads of major canyons running to the northeast. Dwarf mistletoe is aggressively treated through ISM. (FP, p200)**

Background

The Proposed Action for watershed health actions was originally scoped under the Buck Springs Range Allotment Environmental Impact statement along with range management actions. The reason for this was to examine all of the activities within the watershed under one analysis. The sheer complexity of the analysis as well as the desire to be able to discuss alternatives and actions clearly prompted the ID team to request to the District Ranger that there be two separate Environmental Assessments (EA's) from the original Proposed Action—a solely range management NEPA process, and a watershed health NEPA process.

The action to create two separate NEPA documents was approved by District Ranger Larry Sears in May of 2000 [65][1].

The original analysis area was further modified to delete the Victorine Analysis Area that is in the northeast corner of the area when the Victorine area analysis was initiated in 1999 [69]. The separation of the documents has been done to: 1) make sure the discussion of proposed actions and their effects are as clear as possible, and 2) to simplify an extremely complex analysis. The two actions are not connected actions under NEPA because implementing the two projects is not dependent on each project, and there are different purpose and needs for the two projects. The two projects do have similar areas for cumulative effects analysis, and the Buck Springs project is considered within the cumulative effects of this project.

The East Clear Creek (ECC) watershed has received much scrutiny in recent years. In 1995, a collaborative group comprised of state and federal agencies, local residents,

[1] Source documents from the Project Record are referenced throughout this EA by showing the document number in brackets [#].

interested people, and tribal representatives initiated an Ecosystem Assessment of the East Clear Creek (ECC) Watershed, which includes 96% of the Buck Springs Range Allotment within its boundaries. The Collaborative Team described existing and desired future functioning conditions of the watershed, and developed lists of possible management practices to take the watershed towards desired conditions. The work of the Collaborative Team was taken forward into the analysis of this project.

Acting Blue Ridge District Ranger, Erin Connelly, formally initiated the environmental analysis process for the Buck Springs Range Allotment with a project initiation letter dated June 25, 1998 [2]. An Interdisciplinary Team (Team) of Forest Service resource specialists, and representatives from the Arizona Game and Fish Department (AGFD), US Fish and Wildlife Service (USFWS), Arizona Department of Environmental Quality (ADEQ), and the Allotment Permittee developed a guiding document for watershed recovery before undertaking an analysis of the allotment. They discovered that many factors affect watershed conditions within the allotment, including elk and livestock grazing, recreation, transportation system, and introduced aquatic species. (USDA 1999). In a cooperative effort, the agencies making up the Team developed the *East Clear Creek Watershed Recovery Strategy for the Little Colorado Spinedace and Other Riparian Species* (ECC Strategy) to address many of those factors. Using the document to guide actions proposed for the East Clear Creek Watershed Health project, the Team expanded on existing and desired conditions developed by the ECC Collaborative Team and developed objectives and proposed management practices for the analysis area. These practices included actions specific to the range permit, as well as actions to assist in recovering the watershed.

The original East Clear Creek Watershed Health Project Environmental Assessment was sent out for comments on May 3, 2002 and included three management alternatives for the East Clear Creek Watershed Health Project: Alternative A, the no action alternative; Alternative B, the proposed action; and Alternative C, the modified proposed action which was identified as the preferred alternative. Four public comments were received in response to the EA. Due to difficulties in implementation plans, new forest management direction, and changes in other forest projects, the district re-examined the proposed activities and reinitiated the scoping process for the following reasons.

1. The Forest Service/Arizona Game and Fish Department /Army Corps of Engineers Watershed Recovery Project that was listed in the original EA as a future project was cancelled because the Army Corps of Engineers could not legally partner with the Forest Service on this type of project. This project proposed channel restoration on five stream reaches within the project boundary. We see an opportunity to add these restoration projects into the East Clear Creek Watershed Health Project.

2. The *Draft Environmental Impact Statement (DEIS) for the Cross-Country Use of Motorized Vehicles in Five Arizona National Forests* was recently released and a final decision is expected this year. The project sets forth guidelines for management of cross-country use of vehicles on national forest lands in Arizona. One provision within the DEIS is to designate the open road system for vehicle travel at project-level analyses. We see an opportunity to designate the open road

system within the project area that is adequate for recreational use, yet minimizes impacts to resources.

3. An opportunity arose to implement a trail re-alignment of the Arizona Trail in General Springs Canyon (originally listed in Alternative C of the EA) with the help of volunteers. A separate NEPA analysis for this activity was accomplished, a decision memo was signed, and the project is currently being implemented. This project has been removed from the list of proposed activities.

4. There are approximately 3,200 acres of ponderosa pine and mixed conifer vegetation type that were identified in the Dane 10K analysis in 1992 that were never treated due to a contract default. Because this area is within the East Clear Creek watershed, there is an opportunity to reanalyze these areas for forest health treatment that meets the goals and objectives of this project.

A new Proposed Action that took into account the four actions above was re-scoped to 45 interested individuals on February 17th, 2004. Four comments were received from this scoping opportunity. An additional comment was received with in the summer of 2005 outside of the 45 day scoping period. Additional analysis was added to the EA of approximately 1,100 acres that were proposed for thinning actions under the Miller 10K analysis that had gone stale and the need to create fuelbreaks along major roads within the analysis area.

While these new activities have enlarged the potential acreage of treatments of the original EA, the primary goal of this project is still to restore forest health and improve watershed function and riparian health for the Little Colorado spinedace and other threatened, endangered, and sensitive species in the project area.

Project Location

All proposed actions occur within the approximately 70,000 acre analysis area boundary that occurs on the Mogollon Rim Ranger District of the Coconino National Forest, Coconino County, Arizona. These lands may be described as follows: Township (T) 14 North (N), Range (R) 10 East (E), portions or all of Sections (S) 26, 27, 33, 34,35,36; T14N, R11E, portions or all of S 31-36; T13N, R10E, portions or all of S 1-5, 9-12, 13-16, 23-26, 35, 36; T13N R11E, portions or all of S 1-36; T13N, R12E, S 4-9, 17-20, 29-32; T12N, R10E, portions or all of S 1,2,11,12; T12N, R11E, portions or all of S 1-18, 20-26, 36; and T12N, R12E, portions or all of S 4-9, 16-21, 28-32; Gila and Salt Base Meridian. Please see figure 1 for the location of the analysis area.

Table 3: Existing and desired conditions from the Forest Plan for the East Clear Creek Watershed Health Improvement Project

Existing Conditions	Desired Conditions/Management Direction
Meadow conditions are unsatisfactory resulting in degraded riparian conditions and gully systems in meadows. Kentucky bluegrass, a shallow-rooted, non-native species, dominates meadows. Kentucky bluegrass does not withstand high-flow events well and is not a bank stabilizer.	• Maintain current satisfactory watershed conditions and improve any unsatisfactory conditions to satisfactory by the year 2020 (FLMP[2] p. 74). • Plan and design projects in areas of unsatisfactory or degraded condition to promote channel and streambank stability and to improve the flow and timing of water (FLMP p73). • Maintain existing mountain meadows by removing invading overstory by cutting or other methods, gully stabilization to raise water table, soil scarification, and seeding with appropriate grass and forage species (FLMP Amendment 10, replacement page 160). • Meet Riparian Standards in the Regional Guide for 80 percent of riparian areas above the Rim…by the year 2030 (FLMP Amendment 2, replacement page 174). • Through coordination with other disciplines, maintain or improve, where necessary, riparian vegetation along streams for moderating water temperature and protecting bank stability (FLMP p177). • Our vision is of riparian areas and meadows that are in proper functioning condition with satisfactory soils, so that the result provides the type of ecosystem that will support flora and fauna typical of riparian and wetland meadows (ECC EM project DFC[3]). • Riparian vegetation has a diverse age-class distribution, a diverse composition, and includes species that indicate maintenance of riparian soil moisture characteristics. Streambank vegetation is comprised of plant communities that have root masses capable of withstanding high streamflow events, and has adequate cover to protect banks and dissipate energy during high flows. Riparian plants exhibit high vigor, resist compaction, and where soils are appropriate, provide an adequate source of coarse and/or large woody debris (ECC EM project DFC).
Degraded riparian conditions are resulting in degraded habitat for Threatened and Endangered (T & E) species, especially the Little Colorado spinedace	• Improve T&E and sensitive species habitat. Improvement projects give priority to recovery of the T&E species. Conform to approved recovery plans (FLMP Amendment 11, replacement page 66).

[2] FLMP—Coconino National Forest Land and Management Plan (USDA 1987)
[3] ECC EM project DFC—East Clear Creek Ecosystem Management Project Desired Future Condition (USDA 1996). Please refer to page 2, chapter 1 in the section entitled Relationship to the Forest Plan and Other Relevant Planning Documents for a discussion of this planning document.

Table 3 (continued)

Existing Conditions	Desired Conditions/Management Direction
Roads throughout the watershed are impacting water quality and timing of flows, thus impacting meadows and T & E species habitat	• Coordinate trail management, use, and development with other resource management considerations (FLMP p55). • Roads that exist create minimum effects to meadow and riparian function (ECC EM project DFC). • Meadows and riparian areas are visually attractive and free from evidence of physical, mechanical, or vegetative damage due to recreation activities. Physical impacts to meadows and riparian areas shall be confined to specified road crossings, trail crossings and access points. These structures are designed to minimize damage to meadows and riparian area (ECC EM project DFC). • Manage dispersed recreation sites for public safety, resource protection, compliance checks, and capacity monitoring…Areas damaged due to use are closed and restored as necessary. • The following criteria are used to evaluate the need for future closures to vehicles 1. Riparian areas being threatened or damaged 2. Meadows likely to be or being damaged 3. Habitat for threatened, endangered, or sensitive that is threatened (FLMP p 58-59).
Fuel loadings (both live and dead) have increased over time due to a change in fire regime through fire suppression. The result is an increased threat of large stand-replacing fires that are increasing the risk to watershed condition and T&E species habitat	• Maintain current satisfactory watershed conditions and improve any unsatisfactory conditions to satisfactory by the year 2020 (FLMP p. 74) • Improve T&E and sensitive species habitat. Improvement projects give priority to recovery of the T&E species. Conform to approved recovery plans (FLMP Amendment 11, replacement page 66). • Coordinate fuel treatment plans with other resources with input provided by other resource specialists (FLMP Amendment 1, replacement page 92). • Disturbance agents (includes both natural and human-made disturbance agents), such as fire, insects, and pathogens, occur as natural functions within the ecosystem. Over space and time these agents create a mosaic of vegetative species and structural diversity that is characteristic of these forests (ECC EM project DFC). • To minimize the effects of catastrophic events, we identify and employ appropriate preventative measures to manage disturbances when they threaten desired healthy ecosystem functions or significantly endanger life, property or sensitive resources (ECC EM project DFC).

Table 3 (continued)

Existing Conditions	Desired Conditions/Management Direction
Water tanks located in meadows (Dick Hart.) are drawing animals to the meadow, affecting vegetation and compacting the meadows. The tanks are also altering natural water flow through the meadows system in Dick Hart Draw.	• Maintain current satisfactory watershed conditions and improve any unsatisfactory conditions to satisfactory by the year 2020 (FLMP p. 74). • Plan and design projects in areas of unsatisfactory or degraded condition to promote channel and streambank stability and to improve the flow and timing of water (FLMP p73).

Table 3: Summary of existing conditions and desired conditions/management direction as outlined in the Coconino National Forest Plan and the East Clear Creek EM project for the East Clear Creek Watershed Health Improvement Project Analysis Area. For specific discussion of existing conditions, please refer to specialist reports contained within the Project Record.

Purpose & Need for Action

The purpose of this initiative is to achieve the following objectives:

1. restoring understory and overstory vegetative health and diversity;
2. reducing the potential for stand-replacing wildfire;
3. restoring soils, meadow systems, riparian areas for threatened, endangered, and sensitive (TES) species habitat; and
4. reducing road impacts to watersheds and riparian area habitat.

The following displays the existing condition, the desired condition, and the need for change for each of the four objectives listed above.

Restoring Understory and Overstory Vegetative Health and Diversity

Existing Conditions

Understory vegetation is being shaded and out competed by overstory trees, causing a decrease in the diversity of species in the understory and the ecosystem. Browse species and grasses are missing under the canopy, negatively affecting wildlife habitat. Overstory

Photos 1 and 2: Cuurent stand conditions within the East Clear Creek Watershed Project Area. In each phoito, note the lack of understory vegetation and the prevelance of pine needles. In the second photo, note the competion from young trees to yellow pines.

tree health is also compromised by overstocked conditions that are causing stress to trees from competition for soil moisture and nutrients. This stress is making trees susceptible to insect and disease outbreaks, which are occurring above natural levels in scattered pockets throughout the analysis area. This is especially true for large yellow pines within the site

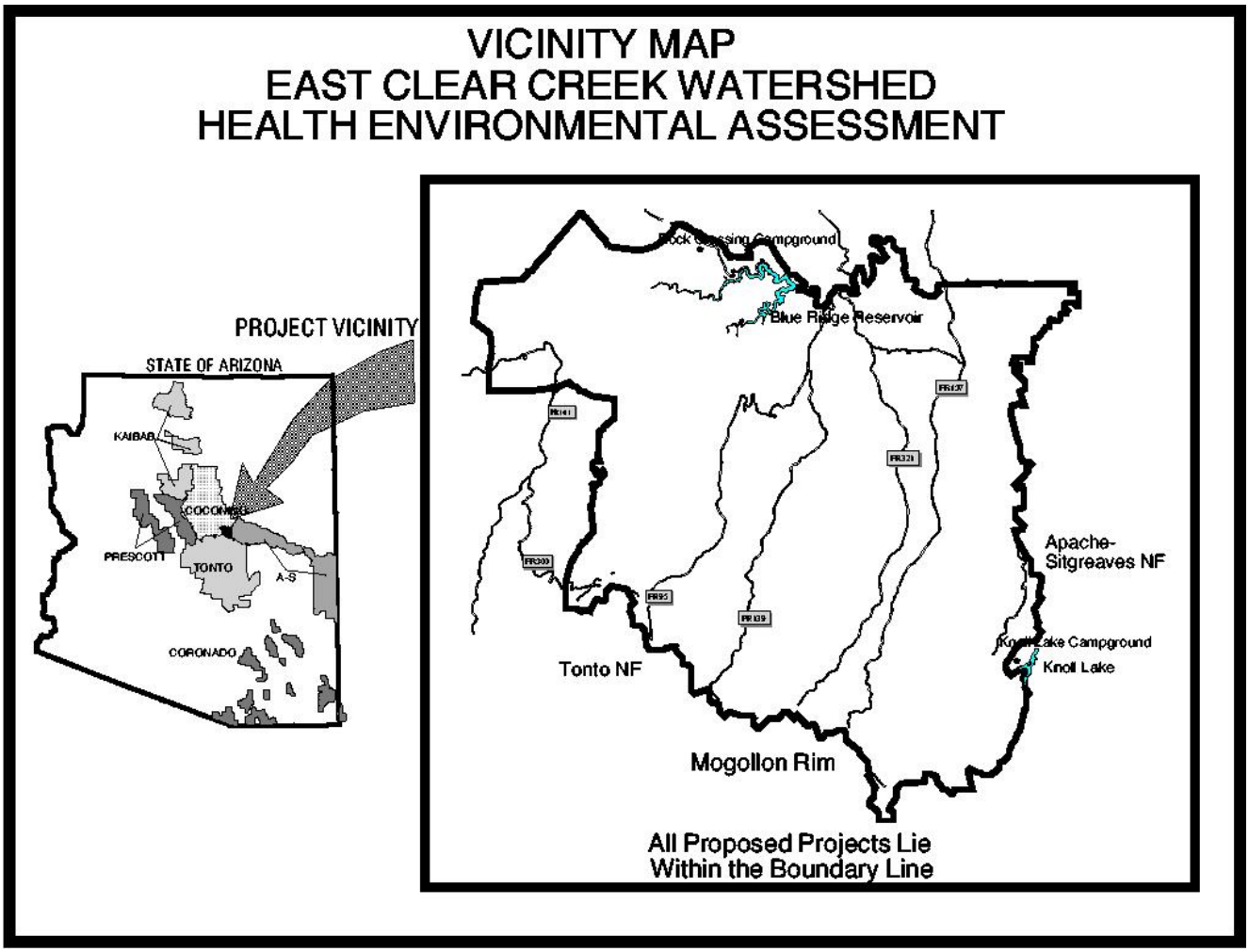

Figure 1. Vicinity Map for the East Clear Creek Watershed Health Improvement Project.

Desired Conditions

Forests are composed of diverse vegetative species and structures, creating a dynamic mosaic in the landscape. A variety of size and age classes exist within each vegetation type. Vegetative diversity and natural successional processes provide for the sustainability of the resource, and provide TES species habitat to aid in their recovery. Disturbance agents (including both natural and human made agents) such as insects and pathogens occur as natural functions within the ecosystem. Vegetation is resilient to these agents. Over space and time, these agents create a mosaic of vegetative species and structural diversity characteristic of these forests.

Need For Change

There is a need for a reduction in competition for soil moisture and nutrients among trees. There is also a need for the restoration of understory vegetation to increase diversity, structure, and resiliency of vegetation types.

Reducing Potential for Stand-Replacing Wildfire

Existing Conditions

The natural fire regime in the East Clear Creek watershed has been altered through fire exclusion over the past half century, mostly through fire suppression. This has resulted in higher fuel loadings for both live and dead fuels (up to 30 tons per acre) and an increase in the number of trees per acre throughout the entire watershed, especially in trees less than 12” in diameter at breast height (DBH). The high fuel loadings are a threat to forest health and watershed conditions within the analysis by increasing the potential for large stand-replacing fires. These fires are a threat to proper forest and watershed condition and TES species habitat.

Desired Conditions

Fuel levels, especially ladder fuels, exist at levels that support fires within the historic fire regime and limit the risk of crown fire.

Need For Change

There is a need for a reduction in live and dead fuel loadings to minimize the potential of future stand-replacing fires and catastrophic insect and disease events.

Restoring Soils, Meadow Systems, and Riparian Areas

Existing Conditions

Historically, meadow systems in East Clear Creek were moist, riparian systems that acted as sponges to hold water. Meadow condition surveys in 1995 displayed a majority of meadow soil conditions as unsatisfactory due to soil compaction. Many meadow areas are currently non-functioning riparian systems due to a lack of proper vegetation and downcutting that has taken place within these systems. Non-functioning water tanks located in Dick Hart Draw are altering natural water flow through the meadows and have caused downcutting and increased erosion in the meadow system. Vegetation has changed from native species to non-native species. For example, Kentucky bluegrass, a shallow-rooted, non-native species, now dominates meadows. Kentucky bluegrass does not withstand high-flow events well and is not a good bank stabilizer. Ungulate grazing and bank trampling is also negatively affecting vegetation throughout riparian systems. Degraded riparian conditions are resulting in degraded habitat for TES species, especially the Little Colorado spinedace. East Clear Creek is designated critical habitat for this species.

Photo 3: Headcut in East Bear Canyon. Note tht the vegetation is also dominated by Kentucky Bluegrass.

Desired Conditions

Riparian areas and meadow systems are in proper functioning condition with satisfactory soils that support flora and fauna typical of riparian and wetland meadows. Riparian vegetation has a diverse age-class distribution and composition, and includes species that indicate proper riparian soil moisture levels. Streambank vegetation is comprised of plant communities that have adequate cover to protect banks and dissipate energy, and root masses capable of withstanding high streamflow events. Threatened, endangered, and sensitive species habitat is sufficient to aid in the recovery of these species.

Need For Change

There is a need for the improvement of water quality, riparian habitat, and proper functioning soil conditions in riparian areas and wet meadow systems. There is also a need for the retention of water and a reduction in erosion in these areas. In addition, there is a need for the reestablishment of native plant communities to stabilize banks and reduce sedimentation.

Reducing Effects of Roads on Riparian Areas and Threatened, Endangered, and Sensitive Species Habitat

Existing Conditions

Roads and corresponding recreational use at specific areas in the watershed are impacting water quality and the timing of flows in meadows through compaction, vegetation loss, and increased water velocity. Roads are negatively affecting TES species through habitat loss and disturbance.

Photo 4: Photo of road in meadow above Pinchot Springs. Note the vegetation loss in the meadow from the road.

Desired Conditions

Roads have minimum negative effects to meadow and riparian function. Meadow and riparian areas are visually attractive and free from physical, mechanical, or vegetative damage due to recreation activities. Physical impacts to meadows and riparian areas are confined to road and trail crossings and access points. Dispersed recreation sites are managed for public safety and resource protection. Damaged areas are restored to maintain proper meadow and riparian area function.

Need For Change

There is a need for a reduction in compaction of vegetation and corresponding habitat loss from the road system to protect and maintain proper meadow and riparian area functions, as well as minimize habitat loss and disturbance to TES species.

This action responds to the goals and objectives outlined in the Coconino Forest Plan, and helps move the project area towards desired conditions described in that plan (Coconino National Forest Land and Resource Management Plan). This action further adheres to guidance set forth from the work of the East Clear Creek Ecosystem Management Analysis that was completed in 1995, as well as the *East Clear Creek Watershed Recovery Strategy for the Little Colorado Spinedace and Other Riparian Species* (ECC Strategy) as a means to improve watershed conditions within the analysis area.

Proposed Action

To best meet the needs and objectives of this project, the following table summarizes the District's Proposed Action for the East Clear Creek Watershed Health Project. Project implementation is expected to take between 10-15 years, depending on a variety of factors including funding and the ability to implement burning prescriptions successfully.

Table 4: Summary of Proposed Action

Treatment	Unit	PA
Prescribed burning to reduce fuel hazard	acres	22,600
Thinning to reduce fuel hazard and improve understory biodiversity	acres	9,600
Commercial thinning to reduce fuel hazard and improve understory biodiversity	acres	670
Remove tanks and rehabilitate site @ Dick Hart	sites	4
Construct elk exclosure fences in East Bear Canyon, Buck Springs, Houston Draw, Dick Hart Draw, Bill McClintock Draw, Lockwood Draw, Kinder Draw, and Barbershop Canyon.	sites	7
Install headcut drop structures(Gen Springs)	sites	12
Natural channel design, layback banks/hydromulch Barbershop Canyon, Houston Draw, Lockwood Draw, East Bear Canyon, Buck Springs, Dick Hart Draw, Kinder Draw, and Bill McClintock Draw meadows	miles	10
Raise culverts to create ponded wetlands Dick Hart and 321C	sites	3
Rehabilitate or remove any stream channel wood structures located in Buck Springs and Houston Draw that are not functioning properly	sites	22
Thin trees up to 16 inches DBH on a total of approximately 83 acres in upland areas above Merritt, McFarland, Limestone Tank and Upper Buck Springs to increase flow duration of springs.	acres	83
Remove encroaching conifers in meadow systems up to 9 inches in Bear Canyon, Houston Draw, Barbershop Canyon, Buck Springs, Bill McClintock Draw, Kinder Draw, East Bear Canyon, General Springs, Holder Cabin, Merritt Draw, Middle Leonard Canyon, West Leonard Canyon, and McClintock Springs meadows. Slash would be lopped and scattered to a 2-foot height across meadows.	acres	330
Designate open road system	miles	347
Reopen currently closed road to create a recreation loop	miles	3.1
Close currently open roads	miles	18.5
Decommission and obliterate currently open roads	miles	17.9
Decommission and obliterate currently closed roads	miles	14.7
Relocate currently open road	miles	.8
Stabilize stream crossings	sites	46
Install pole fence along 321C at meadow sections	miles	1.2

Treatment	Unit	PA
Relocate 643A road w/ semi-permeable fill road	**miles**	**.5**
Convert closed road to trail Dane Springs	**miles**	**.5**
Pave locations on 95/96 roads	**sites**	**4**
Create area closures at Dane Springs and Dines Tank for protection of spinedace habitat	**acres**	**45**

Table 4: Summary of proposed treatments under the proposed action.

Decision Framework

The District Ranger is the Deciding Officer for this project. The District Ranger may select any of the management alternatives presented here, or may select a management alternative that is different or includes portions of these alternatives.

If a watershed recovery alternative is selected, the District Ranger's decision will include the acres treated by fire, the acres thinned, the miles of channel restoration, the acres of meadow restoration and rehabilitation, the designated open road system, the miles of roads closed, the miles of roads decommissioned, the miles of road maintenance, the location of pavement, the acres of area closure, the miles of fencing to mitigate recreation impacts and designation of dispersed camping sites along the 321C road, and the acres of thinning. He will also outline appropriate mitigation measures as well as any potential Forest Plan amendments.

Public Involvement

The proposal was most recently listed in the Schedule of Proposed Actions in January, 2005 (this is available online at http://www.fs.fed.us/r3/coconino/publications/sopa-jan_2005.pdf) The proposal was provided to the public and other agencies for comment during scoping on February 17, 2004. Three comments were received from this scoping effort. Additional scoping was done with the Grand Canyon Wildlands Council on July 28, 2004. In addition, as part of the public involvement process, the District reviewed and considered public scoping comments that were brought forth in the initial NEPA process for the East Clear Creek Watershed Health Improvement Project from the 30 day comment EA that was originally sent out for scoping on May 3, 2002.

Using the comments from the public, other agencies, and tribes (see *Issues* section), the interdisciplinary team developed a list of issues to address.

Issues

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4)

conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" No significant issues were identified during the February to March scoping timeframe.

One significant issue was identified from the comment received from the Grand Canyon Wildlands Council [123]. The issue concerns a comment raised that the Forest Plan standard and Guideline of 2 mile per square mile road designation was not proposed for analysis. The Forest Service agreed that this guideline should be analyzed. This will be used to analyze the difference between the current road system, the road system proposed in the PA, and the Forest Plan guideline of 2 mile per square mile.

Applicable Laws and Executive Orders

Shown below is a partial list of federal laws and executive orders pertaining to project-specific planning and environmental analysis on federal lands. While most pertain to all federal lands, some of the laws are specific to Arizona. Disclosures and findings required by these laws and orders are contained in Chapter 3 of this analysis.

Multiple-Use Sustained-Yield Act of 1960
National Historic Preservation Act of 1966 (as amended)
Wild and Scenic Rivers Act of 1968, amended 1986
National Environmental Policy Act (NEPA) of 1969 (as amended)
Clean Air Act of 1970 (as amended)
Endangered Species Act (ESA) of 1973 (as amended)
Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)
National Forest Management Act (NFMA) of 1976 (as amended)
Clean Water Act of 1977 (as amended)
American Indian Religious Freedom Act of 1978
Archeological Resource Protection Act of 1980
Executive Order 11593 (cultural resources)
Executive Order 12898 (environmental justice)
Executive Order 12962 (aquatic systems and recreational fisheries)
Executive Order 13186 Jan. 11, 2001 (Migratory Bird Treaty Act)

Permits, Licenses, and Certificates

To implement the proposed project as addressed in this EA, various permits must be obtained from federal and state agencies. The following permits will be obtained.

US Army Corps of Engineers

404 Dredge and Fill permit for in-channel treatments.

State of Arizona, Department of Environmental Quality

Air Quality Burn Permits for prescribed burns.

Applicable Legal and Regulatory Requirements and Coordination

Legal Requirements

No further NEPA analysis will be needed. Further environmental reports will be necessary once a decision is arrived at, including a Biological Assessment and Evaluation and Cultural Resource Clearance. These documents must be completed before any activities can be implemented.

Regulatory Requirements

For instream channel activities, State Water Quality Certification and a 404 dredge and fill permit will be required as specified in the Clean Water Act.

Coordination Requirements

Stipulations for coordination of implementation activities will be specified in the Biological Assessment and Evaluation, Cultural Resource Clearance, Best Management Practices for soil and water conservation and 404 permitting procedures.

Project Record Availability

Additional documentation, including more detailed analyses of project area resources, may be found in the project record (PR) located at the Mogollon Rim Ranger District office. These records are available for public review pursuant to the Freedom of Information Act (5 U.S.C. 552). Copies of the EA are available at the Mogollon Rim Ranger District and on the Internet at the following addresses:

Mogollon Rim Ranger District
HC 31 Box 300
Happy Jack, AZ 86024
(928) 477-2255

http://www.fs.fed.us/r3/coconino

For information contact Dick Fleishman at the above address or by email at dfleishman@fs.fed.us.

CHAPTER 2 COMPARISON OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for the East Clear Creek Watershed Health Improvement Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

Alternatives

Alternative 1

No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No East Clear Creek Watershed Health Improvement Projects would be implemented to accomplish project goals.

Alternative 2

The Proposed Action

The following list summarizes the District's Proposed Action for the East Clear Creek Watershed Health Project. Project implementation is expected to take between 10-15 years, depending on a variety of factors including funding and the ability to implement burning prescriptions successfully.

Forest Health and Fuel Treatments

Prescribe understory burns on approximately 22,600 acres over a 10-15 year period to encourage new understory growth, stimulate browse species, reintroduce fire into the landscape, and reduce fuel loadings. After initial burning is completed, ponderosa pine and mixed conifer trees generally up to 12 inches DBH would be thinned-from-below on approximately 9,600 acres within the burned acreages. Thinnings would be variable spaced, creating openings and leaving clumps. Thinnings will NOT be a strict 12 x 12 or 15 by 15 foot spacing. The thinnings will feature protection and removal of small competing trees around individual and clumps of yellow pines, large oaks (10" drc). Thinnings in aspen patches, will remove all small conifers. Opening sizes will vary from ½ acre to 4 acres in size. Slash would be lopped and scattered to a 2-foot height. A second burn would occur in the entire 22,600 acres after thinning to maintain low fuel loads. See Figure 5 in Appendix A for burning and thinning locations, and Appendix B for a specific list of location sites to be treated.

- Thin-from-below and/or uneven-aged prescriptions on approximately 670 acres of ponderosa pine, Douglas-fir, and white fir trees to improve overstory tree health and growth, and improve understory vegetative diversity in trees generally 5-20" dbh,. Trees would be thinned to approximately 40 to 100 basal area. Activity fuels (slash) would be treated with either lop and scatter or machine pile and burn methods. Prescribed burning would occur after treatment (these 670 acres are included in the 22,600 acres listed previously) to encourage new growth, stimulate browse species, re-introduce fire into the landscape, and reduce fuel loadings. See Figure 5 in Appendix A in treatment descriptions and locations and Appendix B for a specific list of location sites to be treated.

Soils, Meadow Systems, and Riparian Area Treatments

See Figure 6 in Appendix A and Appendix D for specific treatment descriptions and areas.

- Use natural channel design or headcut drop structures to stabilize headcuts, lay back vertical stream banks, hydro-mulch disturbed areas, and improve the functioning condition in Barbershop Canyon, Houston Draw, Lockwood Draw, East Bear Canyon, Buck Springs, Dick Hart Draw, Kinder Draw, and Bill McClintock Draw meadows. Total length of treatment would be approximately 10 miles. Culverts would be raised to create ponded wetlands and energy dissipaters would be installed on the outlet side of Dick Hart Draw meadow to improve the functioning condition.
- Remove or rehabilitate four tank sites in the Dick Hart Draw meadow to improve vegetative ground cover and functioning condition.
- Construct elk exclosure fences in Bear Canyon, Buck Springs, Houston Draw, Dick Hart Draw, Bill McClintock Draw, Lockwood Draw, Kinder Draw, and Barbershop Canyon.
- Rehabilitate or remove any stream channel wood structures located in Buck Springs and Houston Draw that are not functioning properly.
- Thin trees up to 16 inches DBH on a total of approximately 83 acres in upland areas above Merritt, McFarland, Limestone Tank and Upper Buck Springs to increase flow duration of springs.
- Remove encroaching conifers in meadow systems up to 9 inches DBH on approximately 330 acres in Bear Canyon, Houston Draw, Barbershop Canyon, Buck Springs, Bill McClintock Draw, Kinder Draw, East Bear Canyon, General Springs, Holder Cabin, Merritt Draw, Middle Leonard Canyon, West Leonard Canyon, and McClintock Springs meadows. Slash would be lopped and scattered to a 2-foot height across meadows.

Designating Open Roads and Reducing Impacts to Riparian Resources and Wildlife Habitat from Roads

Under this proposal, roads would be designated to provide recreation and administrative access and minimize impacts to riparian areas and TES species habitat. See appendix B for a list of specific road segments to be re-opened, closed, and/or decommissioned. The proposed action would:

- Designate 347 miles of open roads;
- Reopen 3.1 miles of currently closed road to create a recreation loop;
- Close 18.5 miles of currently open roads;
- Decommission and obliterate 17.9 miles of currently open roads;
- Decommission and obliterate 14.7 miles of currently closed roads; and
- Relocate .8 miles of currently open road.

Table 5 – Current and Proposed Road System in Miles

Road Designation	Current Road System	Proposed Road System
Open	**380**	**347**
Closed	**80**	**81**
Decommissioned/Obliterated	**2**	**34**

The following is a list of specific activities in the project area aimed at reducing impacts of roads and vehicular access to riparian resources. See Figures 7-9 in Appendix A for proposed activity descriptions and locations.

- Stabilize stream crossings and install or maintain proper drainage and energy dissipaters to minimize sediment production and mitigate flows to streams on 16 roads and 46 stream crossing sites.
- Decommission forest system roads to maintain a natural flow regime and minimize sedimentation and headcutting on previously obliterated roads. Decommissioning would include removing the old roadbed and shaping it to the natural contour, replanting the area, and blocking the front of the road to discourage use.
- Pave the following locations (approximately 100 feet on both sides of crossings) and install energy dissipaters on leadouts to minimize sediments from entering into streams: (1) FR 95 and 96 at East Clear Creek and Barbershop Canyons; (2) FR 95 at Bear Canyon; (3) FR 95 at Houston Draw; and (4) FR 96 at Yeager Canyon.
- Create an area closure to vehicular traffic on approximately 30 acres at Dane Springs. The closed road at Dane Springs would be converted to a trail and the area closure would be signed at the trailhead.
- Create a 15-acre vehicular closure at Dines Tank/Leonard Canyon crossing. The road to Dines Tank and Leonard Canyon Convert would be converted to a footpath and drained to minimize sediment entry into Dines Tank and Leonard Canyon. An unpaved parking lot would be created for recreationists. A walk-through fence would be built to access the footpath to Dane Springs.
- Maintain FR 643A by adding 4 rolling dips. One hundred yards of pole fence would be constructed at the edge of the meadow at Holder Cabin to minimize access across the meadow by vehicles. Approximately 0.3 miles of semi-permeable fill road would be constructed with raised culverts at the north end of the meadow to create a ponded wetland and provide access to the recreational sites.
- Maintain areas around FR 321C to minimize impacts from vehicular traffic to the meadow system and minimize impacts from the road to the aquatic system.

Maintenance would include constructing approximately 500 yards of pole fences and walk-throughs along pullouts and spur roads to limit vehicular access to meadows, and creating a dispersed recreation and camping site.

Alternative 3

The Modified Proposed Action

A potential opportunity arose since the original scoping and the production of this document. The NEPA document for improved Forest Health activities on the Miller 10K (which is contained within this analysis area) was proposed for re-analysis on the Mogollon Rim District in Fiscal Year (FY) 2005 (October 1, 2004-September 30, 2005) at the time of the original scoping of this project (February to March, 2004). The original analysis of this project was begun in 1992 and did propose treatments in overstory component in trees generally 5-18" dbh on approximately 1,100 acres, but was not implemented and the original NEPA has become stale. The initial budget for FY 2005 did not contain enough money allocated to NEPA analysis to complete the analysis for Forest Health activities as scheduled for FY 2005. Therefore, this action ws added to the analysis.

In addition, this Alternative will include approximately 1,250 acres of thinning along FR 95, FR 96, FR137, FR 321, FR 295, FR 751, FR300 and FR 139 to create fuelbreaks approximately 100 feet either side of these roads. This action was identified by District fire suppression personnel as a safety measure for potential burnout operations along these roads in the case a large wildfire were to occur within this analysis area.

The modified proposed action includes all treatments proposed in Alternative 2, plus an additional 1,052 acres of thinning of trees generally 5-18" dbh to reduce long-term fire risk, improve understory biodiversity, and improve tree growth. Fuel treatment on these acres will be broadcast burning after tree removal, with machine piling at landings. Proposed treatments include thinning from below on 650 acres and uneven-aged prescriptions on 402 acres. The modified proposed action will also include the approximately 1,250 acres of fuelbreaks along major roads in the analysis area. The thinnings within the fuelbreak will be a variable spacing thinning, feathering with more opening near the road, feathering back to more dense conditions. Brushing to restore right-of-ways only (no thinning to 100 feet) will occur where PAC's, PFA's, existing designated wildlife corridors occur, and designated old growth stands intersect the roads. Fuel treatment will be either lop and scatter or handpile. Figure 10 in Appendix A displays the additional tree removal projects proposed under this alternative.

Additional input from scoping noted that there were additional roads that had risks identified and did not have access issues that could be included to reduce the risk from roads to either aquatic species or threatened and endangered species, or both. This resulted in some additional closures proposed to reduce the risk from roads. Under this proposal, roads would be designated to provide recreation and administrative access and minimize impacts to riparian areas and TES species habitat. See appendix B for a list of specific road segments to be re-opened, closed, and/or decommissioned. Specifically the proposal would:

- Designate 322 miles of open roads;
- Reopen 3.1 miles of currently closed road to create a recreation loop;
- Close 36.7 miles of currently open roads;
- Decommission and obliterate 30.9 miles of currently open roads;
- Decommission and obliterate 14.7 miles of currently closed roads.

Table 6 – Current and Proposed Road System in Miles for Alternative 3

Road Designation	Current Road System	Proposed Road System
Open	**384**	**322**
Closed	**80**	**98**
Decommissioned/Obliterated	**2**	**46**

On December 9, 2004, District Ranger Larry G. Sears authorized the inclusion of new tree removal projects and the new road management scenario for Alternative 3 [123]. Figures 10, 11, and 12 in Appendix A display the proposed road management scenarios for this alternative.

Alternative 4

During comments to the proposed action, it was noted that the Forest Plan guideline of 2 miles per square mile was not being addressed in the analysis, and that the Proposed Action had an open road density of just over 3 miles/square mile. Alternative 4 is designed to address this issue. Alternative 4 has the same Forest Health and Fuel Treatments and Soils, Meadow Systems, and Riparian Area Treatments as Alternative 3, but the proposed road treatments have a final open road density of 2 miles/square mile of road. Under this proposal, roads would be designated to provide recreation and administrative access and meet the Forest Plan guideline of 2 miles/square mile of road for the analysis area. Specifically, the proposal would:

- Designate 225 miles of open roads;
- Close 125.4 miles of currently open roads;
- Decommission and obliterate 36.7 miles of currently open roads;
- Decommission and obliterate 14.7 miles of currently closed roads.

Table 7 – Current and Proposed Road System in Miles for Alternative 4

Road Designation	Current Road System	Proposed Road System
Open	384	225
Closed	80	186
Decommissioned/Obliterated	2	53

On December 9,2004 District Ranger Larry G. Sears authorized the inclusion of this road management option in this Alternative [123]. Figures 13, 14 and 15 in Appendix A outline the proposed road management scheme.

Mitigation Measures Common to All Alternatives _

To minimize resource impacts, mitigation measures are an integral part of the proposed action. The environmental effects described in Chapter 3 are predicted with the assumption that these measures would be implemented. Mitigation measures included are based on Best Management Practices (BMPs) found in the USFS Southwestern Region's Soil and Water Conservation Handbook (FSH 2509.22), the Coconino Forest Plan, and site-specific needs. The following mitigation measures listed in Table 8 apply to all action Alternatives.

In Table 8, the **Effectiveness** column is included to give the reader an idea of how well these mitigation measures work from past experiences and/or research. The numbers correspond to the following results:

1. Almost always reduces impacts significantly. Almost always done in this situation.
2. Usually reduces significant impacts. Often done in this situation.
3. Effectiveness monitoring will be conducted during project implementation & other appropriate times.

BMP's referenced within the mitigation text are BMP's outlined in the Region 3 USFS Soil and Conservation Handbook ((R3)FSH 2509.22.

Table 8 -- Mitigation Measures for Action Alternatives

ID#	BMP #	Mitigation	Why	Effectiveness
SW1	BMP #1	On areas to be prescribed burned, fire prescriptions should be designed to minimize soil temperatures over the entire area. High intensity fire should occur on 10% or less of the entire area. Fire prescriptions should be designed so that soil and fuel moisture temperatures are such that fire intensity is minimized and soil health and productivity are maintained.	To maintain long-term soil productivity.	1
SW2	BMP #2	On areas to be prescribed burned, retain 5-10 tons/acre of course woody debris in ponderosa pine and 10-15 tons/acre of course woody debris in mixed conifer be left on-site after the prescribed burns to maintain long-term soil productivity on areas to be burned outside of the buffers around private land in.	To maintain long-term soil productivity.	1

ID#	BMP #	Mitigation	Why	Effectiveness
SW3	BMP #3	On areas to be prescribed burned, establish filter strips averaging 1 chain (66 feet) buffer on each side of riparian streamcourses and an average of ½ chain (33 feet) buffer on each side of non-riparian streamcourses to filter sediments that will occur from the burn. Do not ignite fuels within this buffer area. Some creep may occur into the buffer, but an average of width by stream type will be maintained.	To minimize sediment and/or ash delivery into drainages and maintain water quality.	1
SW4	BMP #4	Do not operate equipment in filter strips of riparian and non-riparian drainages. The prescribed width is 1 chain (66 feet) on either side of the riparian drainages and ½ chain (33 feet) on either side of the non-riparian drainages throughout the analysis area. Exceptions to this include stream channel restoration in Houston Draw, Kinder Draw, Lockwood Draw, Dick Hart Draw, Barbershop Canyon, Buck Springs Canyon, and stream channel shaping on previously obliterated roads and road closure activities.	To minimize sediment delivery into drainage.	1
SW5	BMP #5	Do not operate equipment when ground conditions are such that soil compaction can occur.	To minimize soil compaction, soil detachment & sediment transport. To maintain long-term soil productivity.	1
SW6	BMP #6	Site rehabilitation on upland sites: Seed at 5 pounds/acre with native seed mix. Potential vegetation for individual sites should utilize the Coconino National Forest Terrestrial Ecosystem Survey to identify species to be utilized. Protect site with slash spread across the disturbed area to create microclimates and protect from grazing ungulates.	To minimize soil erosion and minimize noxious weed spread.	1

ID#	BMP #	Mitigation	Why	Effectiveness
SW7	BMP #7	Site rehabilitation on riparian sites: Seed at 5 pounds/acre with native seed mix to rehabilitate the site and minimize impacts of noxious weeds. Potential vegetation for individual sites should utilize the Coconino National Forest Terrestrial Ecosystem Survey to identify species to be utilized. Protect site with temporary 8' high ungulate proof fence until plants are established.	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.	1
SW8	BMP #8	Install silt fences 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.	1
SW9	BMP #9	Install erosion mat on disturbed soils in meadow restoration sites on all sites as needed.	To comply with State and Federal water quality standards by minimizing sediment delivery to drainages and to create microclimate for regeneration of grass/forb community and minimize noxious weed spread.	1
SW10	BMP #10	Bring rock material from an upland site for drop structure construction in Houston Draw and Lockwood Draw.	To minimize disturbance in drainage systems and minimize sediment production within channel.	1

ID#	BMP #	Mitigation	Why	Effectiveness
SW11	BMP #11	Site rehabilitation on disturbed sites at Houston Draw, Kinder Draw, Lockwood Draw, Dick Hart Draw, Barbershop Canyon, and Buck Springs Canyon; and stream channel shaping on previously obliterated roads: Site rehabilitation consists of several revegetation methods, such as: 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 # 6 above) Where it is physically possible, hydromulch of seed is the preferred application method. Due to the remoteness of some of the proposed sites, this may not be possible; 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) use using mycorhizal inoculum on severely disturbed sites where no topsoil is left.	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.	1
SW12	BMP #12	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.	1
SW13	BMP #13	Use riprap or velocity checks to stabilize or disperse outfall on road maintenance projects. Do not use lead in or lead out ditches without velocity checks.	To minimize sediment delivery into drainage.	2
SW14	BMP #14	Plant plugs of rushes, sedges, and spike rushes at Houston Draw, Dick Hart Draw, and Buck Springs Canyon 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.	2
SW15	BMP #15	On areas that have had roads previously obliterated and the remaining roadbed will be removed, add slash/or erosion mat	To add surface roughness a To comply with State and	1

ID#	BMP #	Mitigation	Why	Effectiveness
		and seed to the disturbed areas.	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.	
SW16	BMP #16	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.	2
SW17	BMP #17	On areas where poles will be harvested for pole fences, do not skid across meadows or riparian streams. If skidding has to occur across a non-riparian streamcourses\, designate any crossing prior to skidding.	To minimize impacts to streams and soils in meadows from tree harvesting operations.	1
SW18	BMP #18	Skid trails and obliterated roads will have slash placed on the trail or cross-ditched (waterbarred) to break the energy flow of water. Slash will be placed by hand on skid trails. This is the preferred method to dissipate the energy flow of water.	To minimize soil erosion.	1
SW19	BMP #19	Landing and pole peeling locations will be in upland positions and out of riparian and non-riparian filter strips stated in BMP #4.	To minimize sediment delivery into drainage.	1
SW20	BMP #20	Install straw waddles and erosion cloth barriers on either side of the culvert reconstruction to minimize concrete and sediment entry into Dick Hart Draw, Houston Draw on Forest Road 95 and Crackerbox Canyon on Forest Road 123 and 300.	To minimize sediment delivery into drainage.	1

ID#	BMP #	Mitigation	Why	Effectiveness
SW21	BMP #21	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.	1
SW22	BMP #22	Clean all equipment prior to entry on site with a high pressure washer to remove mud and vegetative material from the equipment.	To minimize the spread of noxious weeds.	1
SW23	BMP #23	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.	1
SW24	BMP #24	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.	1
SW25	BMP #25	Complete all required permitting (404 permits) and Water Quality Certification (if necessary), prior to project implementation.	To comply with Clean Water Act provisions.	1
SW26	BMP #26	Designated skid trails and log landings will be required within the Timber Sale Contract (**BT6.422, CT6.4# and BMP 24.18**) on all cutting units. Skid trail design should not have long, straight skid	To minimize the number of acres disturbed.	1

ID#	BMP #	Mitigation	Why	Effectiveness
		trails that would direct water flow. Skid trails should also be located out of filter strips (exceptions are at approved crossings).		
SW27	BMP #27	Felling to the lead will be required within the Timber Sale Contract (TSC) to minimize ground disturbance from skidding operations (**CT6.4# and BMP 24.18**).	Felling of timber should be done to minimize ground disturbance from skidding operations.	1
SW28	BMP #28	The TSC outlines the timing and application of erosion control methods in **BT6.31, BT6.6, BT6.63, BT6.64, BT6.65, CT6.6, CT6.601#, and CT6.602** 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: Arizona fescue (Festuca arizonica) Screwleaf muhly (Muhlenbergia virescens) Western wheatgrass (Elymus smithii) Mountain muhly (Muhlenbergia Montana) Purple geranium (Geranium caespitosum) Western yarrow (Achillea millefollium) Pussytoes (Antennaria marginata) Arizona peavine (Lathyrus arizonicus) Fringed sagebrush (Artemisia frigida) The seed mix can contain a mixture of all or some of these suggested species, but should not contain all of these species and should include at least 1 grass species. The seed mix depends on the availability of these species. Corresponding BMP's to minimize soil loss and sedimentation of include **24.13, 24.21, 24.22, 24.23, 24.24, and 24.25**. Erosion control 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), removing berms, seeding, mulching and cross-ripping. Erosion control after skidding operations must be timely to minimize the	Minimize soil loss and sedimentation of streamcourses from skidding operations.	1

ID#	BMP #	Mitigation	Why	Effectiveness
		effects of log skidding.		
SW29	BMP #29	Road drainage is controlled by a variety of methods (**BMP 41.14**), including rolling the grade, insloping outsloping, crowning, water spreading ditches, an contour trenching. Sediment loads at drainage 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 Timber Sale Contract, Table 1, and T-specs.	To minimize soil movement and maintain water quality.	1
SW30	BMP #30	Road maintenance (**BMP 41.25 and BT5.4)** through the **TSC** should require prehaul and post haul maintenance on all roads to be used for haul.	To minimize soil movement and maintain water quality.	1
SW31	BMP #32	The designation of filter strips also 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 **Sale Area Map (SAM)** and will be designated with a protected streamcourse designation (**BT6.5**). The following are recommendations to protect streamcourses within the proposed tree harvest units. The guidelines for filter strip designation are as follows: EROSION HAZARD/ FILTER STRIP SLOPE DISTANCE Severe/ 1.5 chains on each side of streamcourse. Moderate/ 1.0 chains on each side of streamcourse. Slight / 0.5 chains on each side of streamcourse. Accepted harvest activities within nonriparian filter strips include limited skidding and tree felling. Landings, decking areas, machine piles, skid trails, and roads (except at designated crossings) are planned outside of nonriparian filter strips.	Filtering sediment and/or providing bank stability.	1
SW32	BMP #32	A minimum of 5 to 10 tons per acre in ponderosa pine sites and	To promote long-term soil	1

ID#	BMP #	Mitigation	Why	Effectiveness
		10 to 15 tons per acre in mixed conifer sites will be left on-site on all cutting unit sites. This will be accomplished through "rough piling" on (using TSC contract clause **#CT6.7 and on the sale area map with the "Mplile/lop" designation** or through lop and scatter. This will be designated through **#CT6.7 and on the sale area map with the "Lop" designation.**	productivity.	
SW33	BMP #33	Mechanical fuel treatments will not occur on slopes greater than 25% slope. To accomplish this, fuel treatments will be designated within the TSC through **#CT6.7 and on the sale area map with the "Mplile/lop" designation.**	To reduce ground disturbance.	1
SW34	BMP #34	Mechanical crushing of lopped slash can only occur on 0-15% slopes.. This will occur in the area identified on the SAM with **"Lop"** designation and must be approved prior to implementation by the Purchaser and the Forest Service as per **#CT6.7.**	To incorporate slash into the soil to promote long-term soil productivity.	1
V1	BMP #35	Identify staging area for heavy equipment on sites that have little impact to existing vegetation.	To protect existing vegetation surrounding project sites from damage during construction activities.	1
V2	BMP #36	The thin from below treatment activities will be scheduled between July and December. Minimize creation of green slash between January and June, and monitor the green slash following creation so that if a serious infestation develops it can be treated.	To reduce *Ips* spp. infestation.	2
V3	BMP #37	Do not operate equipment when ground conditions are such that soil compaction can occur.	To maintain long-term site productivity.	1
V4	BMP #38	Designated skid trails and log landings will be required within the Timber Sale Contract (**BT6.422, CT6.4# and BMP 24.18**) 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.	1

ID#	BMP #	Mitigation	Why	Effectiveness
V5	BMP #39	Felling to the lead will be required within the Timber Sale Contract (TSC) to minimize ground disturbance from skidding operations (**CT6.4# and BMP 24.18**).	Felling of timber should be done to minimize ground disturbance from skidding operations.	1
V6	BMP #40	The TSC outlines the timing and application of erosion control methods in **BT6.31, BT6.6, BT6.63, BT6.64, BT6.65, CT6.6, CT6.601#, and CT6.602** 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: Arizona fescue (Festuca arizonica) Screwleaf muhly (Muhlenbergia virescens) Western wheatgrass (Elymus smithii) Mountain muhly (Muhlenbergia Montana) Purple geranium (Geranium caespitosum) Western yarrow (Achillea millefollium) Pussytoes (Antennaria marginata) Arizona peavine (Lathyrus arizonicus) Fringed sagebrush (Artemisia frigida) The seed mix can contain a mixture of all or some of these suggested species, but should not contain all of these species and should include at least 1 grass species. The seed mix depends on the availability of these species. Corresponding BMP's to minimize soil loss and sedimentation of include **24.13, 24.21, 24.22, 24.23, 24.24, and 24.25**. Erosion control 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), removing berms, seeding, mulching and cross-ripping. Erosion control after skidding operations must be timely to minimize the effects of log skidding.	Minimize noxious weed spread and re-establish native vegetation.	1
N1	BMP #41	Minimize disturbance to the existing native plant population during project implementation, and take care not to introduce	To minimize the spread or introduction of noxious weeds.	1

ID#	BMP #	Mitigation	Why	Effectiveness
		seeds of unwanted plants. To minimize rates of spread, clean vehicles, equipment and personal gear if they have been in an infested area. Use only certified, weed free seed to re-vegetate areas, and weed free hay if hay is used as mulch for projects. On high-intensity burn sites near noxious weed sites, shovel non-infected soil from adjacent sites to speed recovery of these sites. Conduct post-project implementation monitoring to insure no noxious weeds were introduced or become established. Control or eliminate established populations of noxious weeds as allowed on the Coconino National Forest.		
N2	BMP #42	Ground disturbing activities in Buck Springs meadow should be timed after the elk-proof fenced construction at the Buck Springs meadow is completed so the vegetative community is stabilized before these construction activities. Also, before any ground disturbing construction activities are to occur, the bull thistle community in the Buck Springs meadow should be re-inventoried and treated if necessary prior to construction.	To minimize the spread of bull thistle at Buck Springs meadow.	1
N3	BMP #43	Site rehabilitation on upland sites: Seed at 5 pounds/acre with native seed mix. Potential vegetation for individual sites should utilize the Coconino National Forest Terrestrial Ecosystem Survey to identify species to be utilized. Protect site with slash spread across the disturbed area to create microclimates and protect from grazing ungulates.	To minimize soil erosion and minimize noxious weed spread.	1
N4	BMP #44	Clean all equipment prior to entry on site with a high pressure washer to remove mud and vegetative material from the equipment.	To minimize the spread of noxious weeds.	1
W1	BMP #45	Consult with US Fish and Wildlife Service (FWS) on the impacts of the preferred alternative on T&E wildlife, fish or plant species, and any appropriate mitigation measures prior to selecting a final management alternative. Specific recommendations include the	To mitigate activities that may affect Threatened and Endangered species.	1

ID#	BMP #	Mitigation	Why	Effectiveness
		following: • Implement soil and water Best Management Practices (BMP's) to mitigate erosion from entering streams when working at stream crossings (see soil and water BMP list). • Construction activities that occur within a Little Colorado spinedace stocked stream should occur in the fall to minimize impacts to the spinedace. Sediment reduction BMP's must also be implemented on these projects. • Survey riparian habitats prior to tank removal, channel re-shaping, or road crossings on riparian streams for Chiricahua leopard frogs and sensitive riparian associated insects or plants. • Survey suitable southwestern willow flycatcher habitat prior to actions within that habitat. If flycatchers are found, implement the projects outside of the breeding season.		
W2	BMP #46	Survey aquatic and riparian habitats for Chiricahua and northern leopard frogs; Arizona toad and narrow-headed gartersnake; Little Colorado spinedace, round-tail chub, and Little Colorado sucker prior to actions that could affect these species. Measures would be taken to remove the animals and to hold them in a safe area until the project is completed, if project activities would adversely affect these species..	To remove the sensitive species during activities that may result in mortality.	1
W3	BMP #47	Northern Goshawk: Nest stands will not be burned during the breeding season. Burns in other portions of the PFAs may occur in the breeding season. Thinning in the PFA will not occur during the breeding season.	To minimize disturbance to nesting goshawks during project.	1
W4	BMP #48	Mexican spotted owl: Implement a breeding season restriction for any project occurring within ½ mile of a PAC, if the current nest location is unknown, or within ½ mile of a nest if the location is known. Greater measures would be taken within protected, target-threshold, or restricted MSO habitat than in unrestricted	To avoid disturbance of a nest during project activities.	1

ID#	BMP #	Mitigation	Why	Effectiveness
		habitat, to protect the constituent elements, and to remain within the predicted losses of those elements.		
W5	BMP #49	Design burning prescriptions to maintain 90% of snags in Protected habitat (mso), target-threshold habitat (mso), and in old-growth stands; 80% of snags in restricted habitat (mso), and 75% in other habitats.	To protect snags for TES species.	1
F1	BMP #50	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 Coconino National Forest Zone Dispatch Center and the Prescribed Burning Boss.	To ensure that smoke management objectives are met.	1
F2	BMP #51	In thin and pile areas: pile slash in openings, outside drip lines of retained trees whenever possible.	To minimize potential damage to roots, stems, and crowns of retained trees from pile burning.	1
F3	BMP #52	Control the duration of heavy smoke conditions (1-3 days). The following guidelines will be initiated when heavy smoke conditions are occurring. • Burning will be conducted early in the day or at night to allow heavy materials time to be consumed, and give smoke most of the day to disperse.	To minimize impacts to residents of the Blue Ridge area, the Verde Airshed and to recreationists caused by heavy smoke conditions from prescribe burning To minimize the duration of substantial smoke impacts to affected areas. To lessen the potential impacts of smoke from nighttime inversions.	1
H1	BMP #53	Conduct heritage surveys on the analysis area in consultation with the State Historic Preservation Office (SHPO) & locate all areas not to be disturbed.	To protect & preserve heritage resources in the analysis area.	1

ID#	BMP #	Mitigation	Why	Effectiveness
H2	BMP #54	If any heritage resource sites are discovered during construction and clearing, stop all operations immediately and contact the COR	To protect & preserve heritage resources in the project area.	1
H3	BMP #55	During construction, post traffic caution signs at critical locations.	To protect and caution the traveling public of heavy equipment in the area.	1

Table 8: Mitigation measures outlined for the East Clear Creek Watershed Health Improvement Project Analysis. The table identifies the mitigation ID #, the BMP #, a description of the mitigation measure, the need for the mitigation measure and the relative effectiveness of the mitigation measure.

Comparison of Alternatives

This section provides a summary of the features of each alternative. Information in the table is focused on activities or outputs that can be distinguished quantitatively or qualitatively among alternatives.

Table 9. Comparison of Alternatives-East Clear Creek Watershed Health Improvement Project

Treatment	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Prescribed burning to reduce fuel hazard	0	22,600	23,040	23,040
thinning to reduce fuel hazard and improve understory biodiversity	0	9,600	9,600	9,600
Commercial thinning to reduce fuel hazard and improve understory biodiversity	0	670	1,722	1,722
Remove tanks and rehabilitate site @ Dick Hart	0	4	4	4
Construct elk exclosure fences in East Bear Canyon, Buck Springs, Houston Draw, Dick Hart Draw, Bill McClintock Draw, Lockwood Draw, Kinder Draw, and Barbershop Canyon.	0	7	7	7
Install headcut drop structures(Gen Springs)	0	12	12	12
Natural channel design, layback banks/hydromulch Barbershop Canyon, Houston Draw, Lockwood Draw, East Bear Canyon, Buck Springs, Dick Hart Draw, Kinder Draw, and Bill McClintock Draw meadows	0	10	10	10
Raise culverts to create ponded wetlands Dick Hart and 321C	0	3	3	3
Rehabilitate or remove any stream channel wood structures located in Buck Springs and Houston Draw that are not functioning properly	0	22	22	22
Thin trees up to 16 inches DBH on a total of approximately 83 acres in upland areas above Merritt, McFarland, Limestone Tank and Upper Buck Springs to increase flow duration of springs.	0	83	83	83
Remove encroaching conifers in meadow systems up to 9 inches in Bear Canyon, Houston Draw, Barbershop Canyon, Buck Springs, Bill McClintock Draw, Kinder Draw, East Bear Canyon, General Springs, Holder Cabin, Merritt Draw, Middle Leonard Canyon, West Leonard Canyon, and McClintock Springs meadows. Slash would be lopped and scattered to a 2-foot height across meadows.	0	330	330	330
Designate open road system	0	347	322	225
Reopen currently closed road to create a recreation loop	N/A	3.1	3.1	0
Close currently open roads	0	18.5	36.7	125.4

Treatment	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Decommission and obliterate currently open roads	0	17.9	30.9	36.7
Decommission and obliterate currently closed roads	0	14.7	14.7	14.7
Relocate currently open road	0	.8	.8	0
Stabilize stream crossings	0	46	46	46
Install pole fence along 321C at meadow sections	0	1.2	1.2	1.2
Relocate 643A road w/ semi-permeable fill road	0	.5	.5	.5
Convert closed road to trail Dane Springs	0	.5	.5	.5
Pave locations on 95/96 roads	0	4	4	4
Create area closures at Dane Springs and Dines Tank for protection of spinedace habitat	0	45	45	45

Table 9: Summary of proposed activities under each alternative.

CHAPTER 3 ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for the comparison of alternatives presented in the chart above.

Description Of Relevant Past, Present, And Foreseeable Future Actions Not Part Of The Analysis

Past Actions

Past actions that have taken place within the analysis area include livestock grazing, fire suppression, wood product harvesting (pulpwood, sawlogs, and firewood), road construction to harvest wood products, the introduction of elk, water tank building, prescribed burning, recreation use and reservoir construction. Tables 10 and 11 list past timber sale and fire related projects that have occurred within the analysis area and 5th code watershed area.

Table 10: List of Past Tree Harvest Actions Occurring Within the Analysis Area

Project Name	Forest	Year Completed	Acres
Barber T.S.	Coconino	1995	1,308
Grama T.S	Apache-Sitgreaves	1994	7,869
Hospital T.S	Coconino	1994	1,065
Leonard T.S	Coconino	1994	2,354
Limestone T.S	Coconino	1996	1,342
Lockwood T.S	Coconino	1995	1,644
Merritt T.S	Coconino	1995	1,479
U-Bar T.S	Coconino	ongoing	1,889
Wiggins T.S	Apache-Sitgreaves	ongoing	2,550
Blue Ridge Urban Interface PCT	Coconino	ongoing	5,391
M-C Multiproduct Sale	Coconino	ongoing	580
Pack Rat Salvage Sale	Coconino	ongoing	550
Maple Draw Restoration Project	Coconino	2004	34
Grand Total			28,055

Table 11: Past Wildfire and Prescribe Burns, 1992-present

Event [4]	Year	Acres
Buckhorn Prescribe Burn	**1992**	**2,000**
East Blue Ridge Prescribe Burn	**1997**	**300**
Pack Rat Wildfire	**2002**	**1,300**
TOTAL ACRES		**3,600**

Table 11 displays the past fuel treatments and wildfires within the East Clear Creek Watershed. Wildfires listed are limited to fires greater than 100 acres in size. There have been numerous smaller wildfires within the analysis area.

Table 12: Past Riparian area improvement projects within the Upper Clear Creek Watershed

Project Name	Forest	Year Completed	Acres
General Springs Habitat Improvement Project	Coconino	2001	5
Merritt Springs Watershed Improvement Project	Coconino	2001	3
McClintock Spring Watershed Improvement Project	Coconino	2004	5
Whistling Springs Watershed Improvement Project	Coconino	2002	2
McClintock Spring Watershed Improvement Project	Coconino	1998	2
Lockwood Draw Watershed Rehabilitation Project	Coconino	1999	5
Immigrant TS KV project (Coldwater Springs riparian fence)	Coconino	1995	10

Present Actions

Present actions that are occurring within the analysis area include cattle grazing within the Buck Springs Range Allotment, developed and dispersed recreation, timber sales, road maintenance, fire suppression, permitted hunting, prescribed burning, timber stand improvement, electrical generation and special uses. Specific projects that are ongoing are listed within Table 12.

Table 13: List of Present Actions Occurring Within the Analysis Area

Project Name	Type of Activities
Blue Ridge Urban Interface Project	**Prescribed burning and timber stand improvement (thinning of small ponderosa pine).**
Buck Springs Range Allotment	**Cattle grazing**
Blue Ridge Reservoir	**Pump of water off rim (off-analysis area) to generate electricity**

[4] All fires shown, both prescribe burns and wildfires, were low-intensity fires, i.e. the majority of the fuels that were consumed were dead/down fuels. Tree canopies and live fuels were impacted very little with very few openings occurring that were 5 acres or larger. The pack rat Salvage fire is an exception to this.

Hunting/Fishing	Under permits issued by Arizona Game and Fish
Supplemental stocking	Supplemental stocking of Little Colorado spinedace
Developed Recreation	Developed campsites at Knoll Lake.
Maple Draw Restoration	Fencing of maple draw areas to protect regeneration of maple draws
Annual Road Maintenance	Road blading and maintenance on FR 95, 96, 300, 321, 139, and 137 road.
Lockwood Pit Rock Crushing	Rock crushing for road maintenance at Lockwood Pit.
U-Bar Timber Sale	Tree removal project.
M-C Multiproduct Sale	Tree removal project.

Table 13: List of present actions that are currently operating within the approximately 70,000 acre East Clear Creek Watershed Health Project.

Reasonably Foreseeable Future Actions

Table 13 lists the reasonable and foreseeable future actions that may take place within the analysis area. Additional discussion of current activities can be found in the Cumulative Effects Analysis for each resource area.

Table 14: List of Reasonable and Foreseeable Future Actions

Project Name	Type of Activities
Victorine Wildland Urban Interface Project	Prescribed burning and timber stand improvement (thinning of small ponderosa pine)
Buck Springs Range Allotment	Cattle grazing
Crackerbox Timber Sale	Multi-product pulp and sawlog timber sale
Blue Ridge Reservoir	Pump of water off rim (off-analysis area) to generate electricity
Hunting/Fishing	Under permits issued by Arizona Game and Fish
Supplemental spinedace stock	Supplemental stocking of Little Colorado spinedace
Arizona OHV Forest Plan Amendment - For Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests	Limit off-road driving
Noxious Weeds (Four Forest Assessment)	Treatments to limit the spread and control of noxious weeds
Developed Recreation	Developed campsites at Knoll Lake.
Annual Road Maintenance	Road blading and maintenance on FR 95, 96, 300, 321, 139, and 137 road.

Table 14: List of reasonable and foreseeable actions that are expected to occur within the East Clear Creek Watershed Health analysis area.

Fire, Fuels and Air

Fire and Fuels Affected Environment

Dead and Down Fuels
Dead and down fuel loadings (surface fuels) range across the analysis area from a low of 3 tons per acre to a high of 30+ tons per acre. Surface fuels are comprised of slash from past forest management activities (logging, pulping, and pre-commercial thinning), and from normal annual fuel accumulation (tree blow-downs, tree breakage, conifer litter, and herbaceous litter, etc.).

Live Fuels
Live fuels are primarily comprised of conifer tree crowns, shrubs and grasses. Historically, most of the analysis area consisted of stands of generally large diameter ponderosa pine (likely averaging 30-50 basal area per acre) with scattered large Gambel oak, and a well-developed herbaceous understory. Today, the overstory is dominated by small diameter ponderosa pine stands, with sites exceeding 100ft^2/acre basal area occurring over 35,000 acres of the analysis area (McHugh, 1999). There are also scattered Gambel oak of all sizes throughout the analysis area, and an understory consisting more of pine needles and duff and much less grass than historically occurred.

High stocking levels of small diameter ponderosa pine result in canopy cover, canopy fuel loads, and vertical fuel continuity (ladder fuels) that exceed historic values. As a by-product, this additional biomass produces a substantial increase in persistent surface fuel accumulation. This is due primarily to the very slow annual decomposition rate of ponderosa pine litter relative to the annual rate of accumulation (Brown and Smith, 2000).

Three primary factors, ground to live crown base height (GLCB), surface fire intensity (flame length), and live foliar moisture content, determine whether or not a surface fire will transition to a crown fire. Crown bulk density (CBD, typically described as weight per given unit volume) and continuity (percent canopy cover) are stand characteristics contributing to propagation of fire through the canopy (Alexander 1988, VanWagner, 1977) and are in general positively related to one another. Surface fire intensity and GLCB combined contribute significantly to crown fire initiation. Currently, much of the analysis area is comprised of stands with one of or a combination of the following stand characteristics that contribute to moderate or high crown fire hazard:

- Low ground to live crown base height,
- High canopy cover
- High surface fuel loading

Current crown base heights of 5 foot or less occur on approximately 39,100 acres (see figure 2), or nearly 55% of the analysis area (McHugh, 1999). Crown base heights of 8 foot or less occur on approximately 50,455 acres, or just over 75% of the area.

Figure 2: Current Crown Base Height

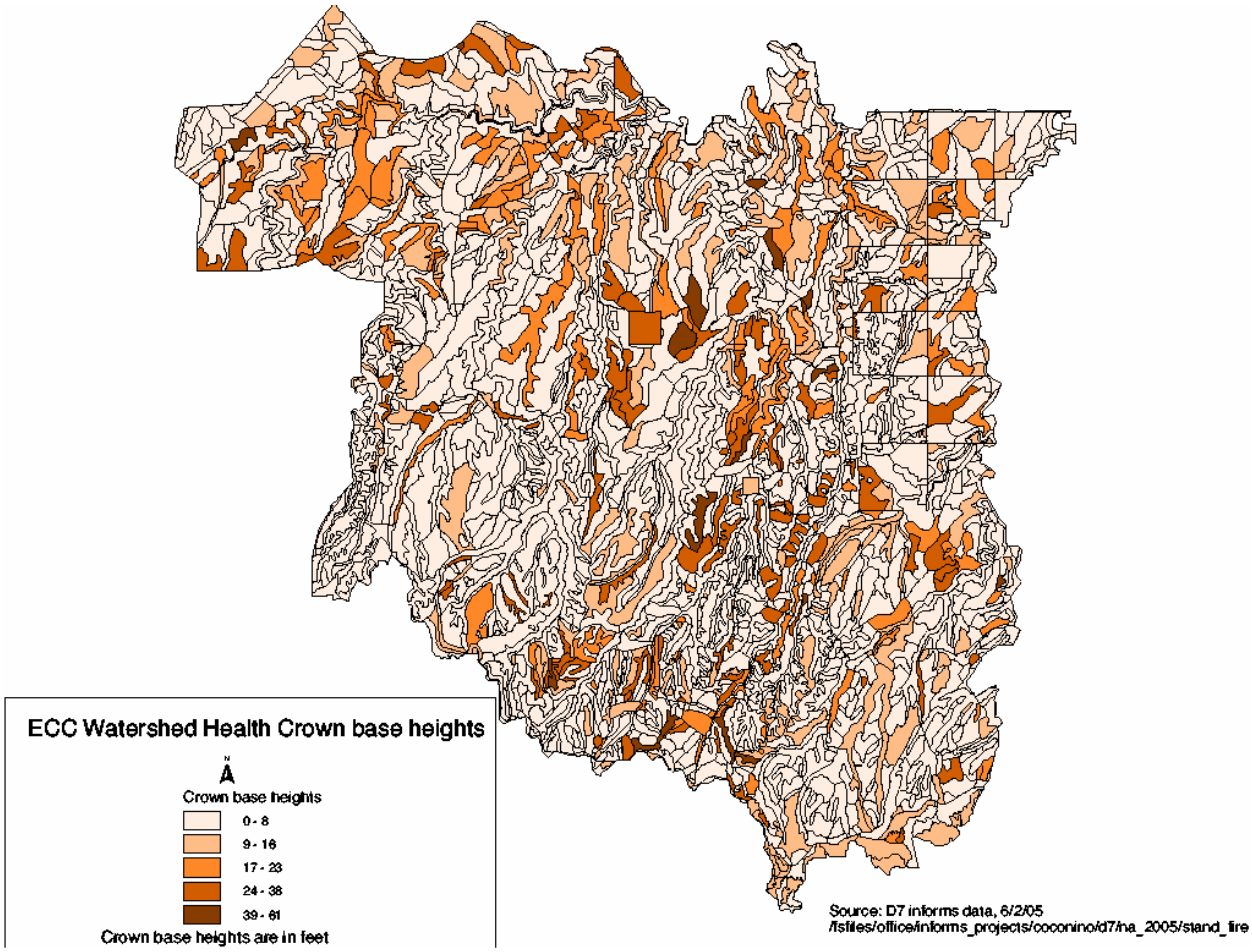

Figure 2: Current crown base height on a stand basis. Source of data is from Mogollon Rim Ranger District INFORMS data layers. Data is derived from stand exam and most similar neighbor analysis.

Another measure of the density of the canopies is crown bulk density. Crown bulk density, is a measure of the mass of crown fuel, including needles, fine twigs, lichens, etc., per unit of crown volume. Figure 3 displays crown bulk densities of greater than .10 kg/cubic meter occur over 20% of the analysis area.

The ability to initiate a crown fire can be predicted with the combination of crown base height and crown bulk densities. The general rule is with low crown base heights and high crown bulk density there is a high potential to initiate a crown fire. As crown base heights increase, the chance to initiate a crown fire decreases. Figure 4 displays the crown fire initiation potential for the analysis area as modeled by the INFORMS model. This displays that approximately 58% (about 41,000 acres) of the area has a high to extreme potential to initiate crown fire.

Figure 3: Current Crown Bulk Density

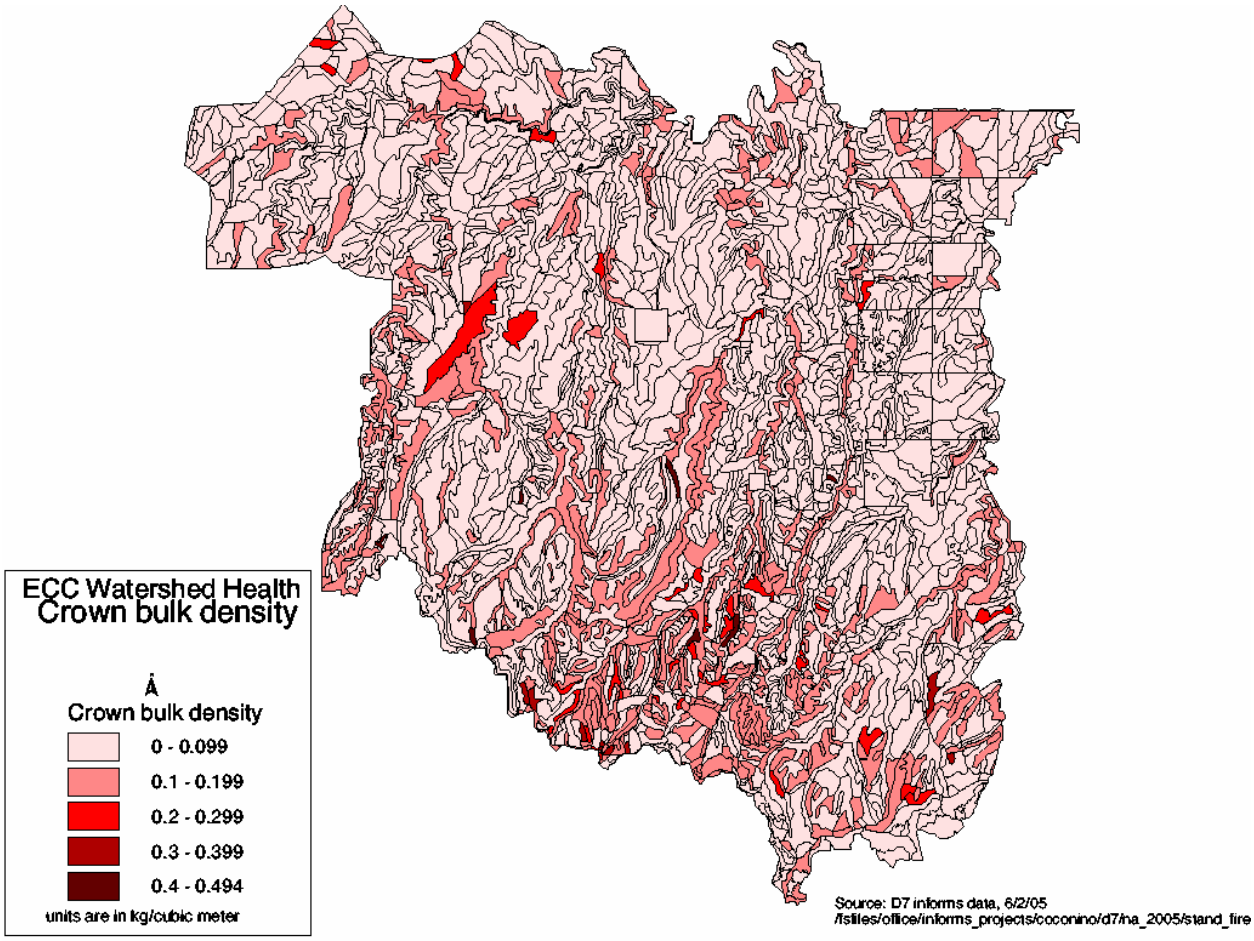

Figure 3: Current crown bulk density on a stand basis. Source of data is from Mogollon Rim Ranger District INFORMS data layers. Data is derived from stand exam and most similar neighbor analysis.

Air Affected Environment

The analysis area is located within the Little Colorado River airshed. Prevailing southwest winds and the topographical nature of the analysis area typically cause smoke from burns in this area to carry north and east into the Little Colorado airshed and away from communities and non-attainment areas located in the Verde River airshed to the south.

Figure4: Predicted Crown Fire Initiation Potential

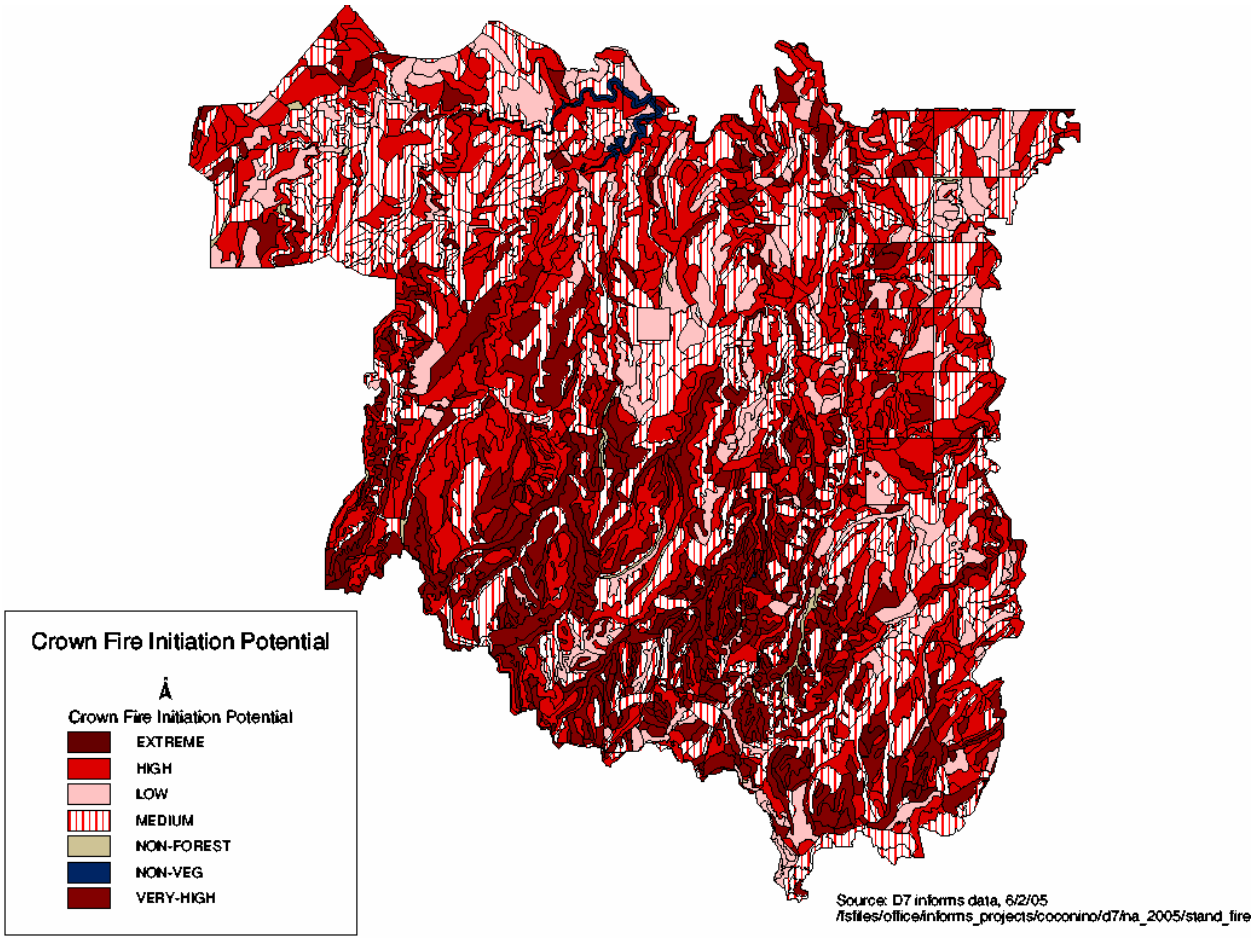

Figure 4: Predicted crown fire initiation for the East Clear Creek Watershed Health analysis area. . Source of data is from Mogollon Rim Ranger District INFORMS data layers. Data is derived from stand exam and most similar neighbor analysis.

Fuels, both live and dead/down, within the analysis area will not be affected. If a wildfire occurs during extreme fuel and weather conditions, the potential exists to eliminate much of the dead/down fuels within the fire's perimeter and to eliminate many of the live fuels through stand replacement crown fire. Areas that do experience crown fire will lose much of their live fuel loading and dead/down surface fuel loading. Fire killed trees will deteriorate due to rotting, eventually falling and becoming dead/down surface fuels.

Fuel loadings will continue to increase over time because the existing live and dead/down fuels are not treated, increasing the potential surface fire intensity, surface fire severity, and crown fire potential. The number of acres that may be affected by a high intensity, high severity fire will also increase due to increasing homogeneity of surface and aerial fuels across the entire project area. This is the result of growth of all trees that presently exist within the analysis area and establishment of conifer regeneration. Growth and regeneration will cause an increase in the average amount of woody biomass (limbs, twigs, pine needles, leaves, etc.) produced on every acre, contributing to increased surface fire intensity and severity over time. Growth will also

increase average percent canopy closure, increasing the likelihood of a crown fire, once initiated, to advance through the forest canopy continuously. Potential for transition of surface fire to crown fire increases as surface fire intensity increases. Potential for wide spread overstory and understory mortality due to root and cambial injury increases as potential fire severity increases. Soil sterilization, soil seed bank destruction, and soil erosion also increases as potential fire severity increases.

Cumulative Effects

For the past 100+ years, it has been the policy and decision to control wildfires and prescribed burning has been limited to primarily burning of slash piles until about 10 years ago when broadcast burning began to be used on small portions of the analysis area. The cumulative effect has been an increase in dead/down fuel loadings (from an estimated range and average of 1-4 tons per acre historically to 3-30+ tons per acre currently). There has also been an increase in live fuel loadings where thinning and harvesting has not occurred recently (from an average of 30-50 basal area per acre to an average of 100+ basal area per acre). The live fuel loadings contribute significantly on an annual basis to levels of dead/down fuel loading through needle cast, self-pruning, etc. Without some attempt to reduce live and dead fuel loadings on a controlled basis, potential for high intensity, high severity wildfire occurrence will increase on an increasing amount of acreage over time (Covington et al. 1994).

Alternative 2

Direct and Indirect Effects

Only activities that will affect fire and fuels will be discussed for effects.

Prescribed Burning

Prescribed burning is the application of fire to a landscape or portion of a landscape within a specific set of wind, temperature, humidity, and fuel moisture parameters that make up a “prescription” within which fire behavior and effects are predictable. Prescribed burning is used to meet specific management objectives. Prescribed burning is proposed to occur on approximately 22,600 acres in this Alternative. Burning is proposed primarily to reduce the fire hazard of existing surface fuel loads and fire hazard resulting from proposed thinning activities.

Prescribed burning will consume naturally accumulated forest litter, duff, and fine fuels in slash generated by thinning activities. Some logs, snags, and stumps will also be consumed during broadcast burning. Prescribed fire intensity is generally low except for the burning of fuel concentrations typically comprised of decomposing logs and/or stumps greater than 9 inches diameter. High severity burning, which involves the discoloration and sterilization of soils and the possible formation of hydrophobic soil layers, will be limited specifically to locations where heavy fuels (ie: stumps, logs, or other fuel concentrations) are consumed and will not affect substantial acreage.

Prescribed burning will reduce some aerial fuel loading in addition to reducing surface fuel loading. There will be some crown scorch and limited mortality of trees of all species. Mortality will be restricted primarily to seedling and sapling trees less than 5 inches DBH. Some mortality

will occur in trees greater than 5 inches DBH where concentrations of dead/down fuels exist near such trees. Fuel concentrations will generate localized high fire intensity that can scorch or consume crowns of nearby and overhanging trees and damage cambium layers and roots of immediately adjacent trees. Pockets of mortality will result in canopy openings of irregular size and shape that are generally less than ¼ acre in size. Overall, less than 1-5% of any prescribed burn area should burn at this intensity and have high severity soil effects. Trees with basal scars at ground level may be killed by catching fire in exposed scars and burning at the base enough to cause the them to fall over or to damage enough cambium to result in mortality. Trees killed but not felled by prescribed burning will eventually fall, contributing to future course woody surface fuel loading. Small diameter fire killed trees tend to fall within 5 – 10 years after death. As a result post-burn down woody fuel loading (greater than 3" diameter) may exceed pre-burn levels in locations where prescribed burning causes localized moderate to high tree mortality. Post treatment surface fuel loads are expected to range from 3 – 10 tons per acre in the maintenance burn treatment areas and 5 – 15 tons per acre on average in all other treatment areas that receive prescribed burning.

Consumption of litter and duff layers will stimulate growth of sprouting species such as Gambel oak, *Quercus gambellii*, New Mexico locust, *Robinia neomexicana*, and lupine, *Lupinus spp*., and will prepare a seedbed that is more conducive to herbaceous and conifer seed germination than currently exists. Prescribed burning will also stimulate germination of certain plant seeds such as buckbrush, *Ceanothus fendleri*, which require heat scarification to induce germination (Brown and Smith, 2000). This will result in an increase in ground cover of grasses, herbs, and forbs, shrubs, and tree seedlings and sprouts after burning. Growth of tree seedlings and canopy growth of surrounding trees will eventually close or reduce the size of openings created by prescribed burning assuming no future disturbance such as fire or thinning. Prescribed burning will improve ecosystem functionality primarily by cycling nutrients from herbaceous and forest litter back into the soils and by encouraging herbaceous establishment where it currently does not exist because of deep duff and litter layers over mineral soil.

Thinning

Thinning, under this proposal, includes multiple proposed projects. The first is the cutting of trees generally up to 12 inches diameter at breast height (DBH) with residual stand density targets falling within the range of 40-100 square feet of basal area will occur on approximately 9,600 acres. Additional tree thinning will occur on approximately 670 acres on trees generally 5-20" dbh with a thin from below prescription to a target basal area of 40 to 100 square feet of basal area. Thinning will also occur on approximately 83 acres in and around spring sites on trees generally less than 16 inches DBH. Thinning in meadows on approximately 330 acres will target all trees under 9 inches DBH. One to two acres of thinning will also be done on the 643A and 321C road proposed activities to create poles for pole fences and to created two dispersed recreation sites along the 321C road.

Thinning of young pine trees with primarily understory and intermediate canopy position reduces aerial fuel loading (crown bulk density) and canopy cover (percent). The proposed thinnings occur almost exclusively on stands where the average crown bulk density exceeds .1 lbs/ft^3 (98% of the stands proposed for thinning). The treatments are expected to drop crown bulk density below .1lbs/ft^3. The smallest trees in southwestern ponderosa pine forests typically form much

of the lowest portion of the forest canopy. Therefore, understory thinning, the cutting down of small trees, eliminates some of the lower portion of the forest canopy increasing the average height of the residual forest canopy above the ground or surface fuel layer. Of the proposed thinnings, approximately 71% of the area proposed for thinning has a crown base height of 10 feet or less. Thinnings should increase the crown base height throughout the analysis area. Increasing ground to live crown base height (GLCB) reduces the potential for surface fires to transition into the forest canopy by increasing the distance between surface fires and the aerial fuel layer, thereby increasing the surface fire intensity required to ignite the crowns. Decreasing aerial fuel loading and canopy cover reduces the ability of fire to spread horizontally through the forest canopy if it does transition from the surface layer into the aerial layer.

Thinning rearranges live aerial fuels into dead /down surface fuels resulting in a potentially substantial increase in surface fuel loading, fuel bed depth, and fuel bed continuity. Slash fuel beds produce higher fire intensities and longer flame lengths, than the existing pine litter fuel bed under constant atmospheric conditions. Therefore, the increase of GLCB gained through thinning may be ineffective in reducing the ability of a surface fire to transition into the crowns until the fine fuels are removed from the aerial portion of the slash layer.

An indirect effect of thinning is increased insolation. This occurs because of the reduction of canopy cover, allowing sunlight to reach more of the forest floor for longer periods of time. Forest floor air temperature will increase and relative humidity will decrease relative to pretreatment conditions. Eye-level, or mid-flame, wind speeds will also increase because of the reduction of canopy cover relative to pretreatment conditions. These factors combined will decrease dead/down fuel moisture content, increase rates of spread, and potentially increase probability of ignition within the treated stands.

Reduction of canopy cover increases the amount of winter snow reaching the ground surface and reduces evaporative loss of snow (sublimation). Increasing snow accumulation will increase the amount and duration of soil water through the spring growing season. Reducing leaf area available for transpiration may also contribute to increased availability of soil water. Aerial fuel moisture content will remain high for longer periods of time due to soil water availability. Surface fuels will tend to convert to herbaceous fuels in openings, which burn with less residence time than pine litter, reducing potential fire severity. High aerial fuel moisture content increases the surface fire intensity required for crown fire ignition and although herbaceous fuels may produce high flame lengths (intensity) they are short lived and have less chance of igniting crowns than similar flame lengths from pine litter. Thinning will improve ecosystem functionality primarily by reducing tree densities, increasing average tree diameter, and by creating an open, clumpy stand structure that more closely resembles the historic stand structure and provides ample growing space for the herbaceous understory layer. Annual tree and stand growth rates will increase, resulting in quicker attainment of large trees within thinned stands. The effects of thinning described above are applicable to all stands proposed for thinning under Alternative 2

Cumulative Effects

The geographic setting for the fire and fuels cumulative effects analysis will include the past present and future timber sales and thinning activities that have or may effect the distribution of

course woody debris within the ECC 5th code watershed. The geographic setting for the air quality cumulative effects analysis includes the Little Colorado Airshed for activities affecting air quality. The timeframe for past actions is 10 years based on the timeframe of the decision, as well as the timeframe where canopy treatments begin to re-occupy the site.

The eleven past timber sales (Table 10) and ongoing timber sales reduced aerial fuel loading and canopy cover, reducing crown fire hazard on most of the close to 28,000 treated acres. The Victorine project and the Buck Springs project will add an additional 11,000 acres of thinning within the East Clear Creek watershed. This project proposes to add approximately 10,000 acres of thinning, for a total of about 49,000 acres of past, present, and foreseeable thinning treatments within the East Clear Creek watershed (about 20% of the watershed). Natural ponderosa regeneration within the eleven timber sales is rapidly filling in lower portions of the aerial fuel layer and will increase crown fire hazard over time. Many of the 10,000 acres proposed for thinning are aimed at reducing regeneration in past timber sale areas.

Past burning of activity fuels on timber sales was mostly limited to burning of machine piles. For this analysis, we will assume that this occurred on 1-5% of the treated areas in timber sales, or about 200 to 1,100 acres. The Blue Ridge Urban Interface project has prescribed burned approximately 5,400 acres within the past 3 years. The proposed Victorine project will prescribe burn and additional 8,200 acres of the East Clear Creek Watershed, for a total of 13,800 to 14,700 acres of past, present, and foreseeable prescribed burning. Alternative 2 will add an additional 22,600 acres of prescribed burning timber sales, for a total of 36,400 to 37,300 acres of prescribed burning in the analysis area (about 18% of ECC watershed).

Prescribed burning of low and moderate crown fire hazard areas and prescribed burning and thinning of moderate and high crown fire hazard areas will improve or maintain crown fire hazard at acceptable levels. Currently there are no foreseeable future timber sales within the East Clear Creek Watershed Health Improvement project analysis area. Overall, the proposed tree thinning and burnings proposed within the East Clear Creek Watershed Health Improvement project analysis area are expected to reduce the risk of stand replacing fires within the watershed from current conditions.

Alternative 3

Direct and Indirect Effects

Only activities that will affect fire and fuels will be discussed for effects

Prescribed Burning

Prescribed burning is the application of fire to a landscape or portion of a landscape within a specific set of wind, temperature, humidity, and fuel moisture parameters that make up a “prescription” within which fire behavior and effects are predictable. Prescribed burning is used to meet specific management objectives. Prescribed burning is proposed to occur on approximately 23,000 acres in this Alternative. Burning is proposed primarily to reduce the fire hazard of existing surface fuel loads and fire hazard resulting from proposed thinning activities. The effects are the same as Alternative 2, only these occur on about 400 more acres than Alternative 2.

Thinning

Thinning, under this proposal, includes multiple proposed projects. The first is the cutting of trees generally up to 12 inches diameter at breast height (DBH) with residual stand density targets falling within the range of 40-100 square feet of basal area will occur on approximately 9,600 acres. Additional tree thinning will occur on approximately 670 acres with a thin from below prescription to a target basal area of 40 to 100 square feet of basal area. Thinning from below on 650 acres and uneven-aged prescriptions on 402 acres are added to this Alternative.

In addition, this Alternative will include approximately 1,250 acres of thinning along FR 95, FR 96, FR137, FR 321, FR 295, FR 751, FR300 and FR 139 to create fuelbreaks approximately 100 feet either side of these roads. Thinning will also occur on approximately 83 acres in and around spring sites on trees generally less than 16 inches DBH. Thinning in meadows on approximately 330 acres will target all trees under 9 inches DBH. One to two acres of thinning will also be done on the 643A and 321C road proposed activities to create poles for pole fences and to create two dispersed recreation sites along the 321C road. The effects for Alternative 3 are the same, only they occur on a larger amount of acres.

Cumulative Effects

The geographic setting for the fire and fuels cumulative effects analysis will include the past present and future timber sales and thinning activities that have or may effect the distribution of course woody debris within the ECC 5th code watershed. The geographic setting for the air quality cumulative effects analysis includes the Little Colorado Airshed for activities affecting air quality. The timeframe for past actions is 10 years based on the timeframe of the decision, as well as the timeframe where canopy treatments begin to re-occupy the site.

The eleven past timber sales (Table 10) reduced aerial fuel loading and canopy cover, reducing crown fire hazard on most of the close to 28,000 treated acres. The Victorine project and the Buck Springs project will add an addition 11,000 acres of thinning within the East Clear Creek watershed. This project proposes to add approximately 10,000 acres of thinning, for a total of about 49,000 acres of past, present, and foreseeable thinning treatments within the East Clear Creek watershed (about 21% of the watershed). Natural ponderosa regeneration within the eleven timber sales is rapidly filling in lower portions of the aerial fuel layer and will increase crown fire hazard over time. Many of the 12,000 acres proposed for thinning are aimed at reducing regeneration in past timber sale areas.

Past burning of activity fuels on timber sales was mostly limited to burning of machine piles. For this analysis, we will assume that this occurred on 1-5% of the treated areas in timber sales, or about 200 to 1,100 acres. The Blue Ridge Urban Interface project has prescribe burned approximately 5,400 acres within the past 3 years. The proposed Victorine project will prescribe burn and additional 8,200 acres of the East Clear Creek Watershed, for a total of 13,800 to 14,700 acres of past, present, and foreseeable prescribed burning. Alternative 2 will add an additional 22,600 acres of prescribed burning timber sales, for a total of 36,400 to 37,300 acres of prescribed burning in the analysis area (about 18% of ECC watershed).

Prescribed burning of low and moderate crown fire hazard areas and prescribed burning and thinning of moderate and high crown fire hazard areas will improve or maintain crown fire hazard at acceptable levels. Currently there are no foreseeable future timber sales within the East Clear Creek Watershed Health Improvement project analysis area. Overall, the proposed tree thinning and burnings proposed within the East Clear Creek Watershed Health Improvement project analysis area are expected to reduce the risk of stand replacing fires within the watershed from current conditions through a increase in crown base height, a reduction of crown bulk density and canopy cover, and a reduction of ground fuels over time..

Alternative 4

The thinning activities and burning activities proposed within this Alternative are the same as Alternative 3 , therefore the effects the same. This Alternative does have an ambitious road closure component that will not affect the fuel loadings or canopies attributes, but will have an affect on fire suppression apparatus to be able to access potential fire starts. This may have an effect on the ability to stop a fire when it is small, thus having a negative indirect effect to overall stand conditions if a large wildfire were to occur.

Cumulative Effects

The geographic setting for the fire and fuels cumulative effects analysis will include the past present and future timber sales and thinning activities that have or may effect the distribution of course woody debris within the ECC 5th code watershed. The geographic setting for the air quality cumulative effects analysis includes the Little Colorado Airshed for activities affecting air quality. The timeframe for past actions is 10 years based on the timeframe of the decision, as well as the timeframe where canopy treatments begin to re-occupy the site. The cumulative effects are the same for Alternative 4 as they are for Alternative 3.

Air Environmental Consequences

Alternative 1

Direct and Indirect Effects

There will be no direct changes in short-term or long-term affects to air quality as a result of a No Action alternative. However, this alternative does increase the long-term potential for a high intensity surface fire in the existing high intensity burn areas within the analysis area. This alternative also increases the long-term potential for crown-replacing wildfire in the low and moderate intensity burn areas within the analysis area. Both types of fire will generate considerable amounts of smoke and airborne particulates, but these wildfires generally occur during unstable atmospheric conditions when optimal smoke dispersal conditions exist.

Cumulative Effects

Because there are no actions proposed, this action will not add a direct cumulative effects from smoke.

Action Alternatives (Alternatives 2,3, and 4)

Direct and Indirect Effects

Because the effects of both prescribed broadcast and pile burning on air quality are similar to one another and similar between Alternatives 2,3, and 4 they will be discussed together here as one effects analysis.

Broadcast and/or pile burning will generate smoke and airborne particles, decreasing air quality on a *short-term* basis but will not exceed air quality standards. Some of these impacts can be reduced (see Mitigations) through timing of the burn and scheduling the burn to be completed during periods of favorable atmospheric conditions. Impacts will be greatest on the day of ignition with decreasing impacts lasting 2-4 days following a single days ignition, and up to 1-2 weeks following multiple day ignitions.

Much of the smoke that is generated by broadcast burning in the East Clear Creek Watershed Health Improvement analysis area will pass over East Clear Creek during the daytime with winds that are predominately out of the southwest. Nighttime flows of smoke are usually downhill, down stream into East Clear Creek. This will result in potentially heavy concentrations of smoke at the bottom of East Clear Creek with moderate to light concentrations at higher elevations. Residents in the Blue Ridge area north of the analysis area may receive some nighttime smoke impacts. Nighttime impacts of burning are mitigated (see Mitigations) by conducting ignitions during the early portion of the day. This provides maximum consumption time and smoke dispersion before nighttime inversions develop.

Cumulative Effects

Cumulative effects of smoke from prescribe burning will be short-term, but will increase in magnitude as the number of treatment acres increase for any given day of ignitions or multiple days of ignitions. These impacts can also be magnified by emissions from prescribed burning on adjacent areas including Apache-Sitgreaves N.F., Tonto N.F., Fort Apache Reservation, state lands and private property. Approval for daily prescribed burning activities must be requested from and approved by the Arizona Department of Environmental Quality (ADEQ). The ADEQ will approve the requested acreage, reduce the approved acreage from that requested, or not approve prescribed burning depending upon a variety of factors including cumulative effects of smoke emissions from multiple jurisdictions thereby mitigating most of the potential for severe smoke impacts to the entire Little Colorado Airshed.

Soil and Water

Soil and Water Affected Environment

The following is a brief discussion of existing soil conditions within the analysis area. A map of the life zones and soil condition is included in Appendix J.

Mixed Conifer Forest Life Zone This life zone consists of ecological units 650, 651, and 652. Soil condition is generally satisfactory. Total acres of satisfactory soil condition within the mixed conifer life zone are approximately 23,541. There are pockets of ecological unit 650 identified as being impaired signifying a reduction of soil quality and occur on approximately 5% of the land unit (approximately 300 acres). The road system within this life zone displays unsatisfactory soil conditions [22,22b,126].

Ponderosa Pine Forest Life Zone This life zone consists of ecological units 546, 549, 550, 555, 567, 578, and 584 and soil condition is generally satisfactory. Total acres of satisfactory soil condition within the ponderosa pine life zone are approximately 39,590. There are pockets of ecological unit 546 identified as being impaired signifying a reduction of soil quality and occur on approximately 5% of the land unit (approximately 1,700 acres). The road system within this life zone displays unsatisfactory soil conditions [22,22b, 126].

Meadow Life Zone Ecological unit 53 is the Meadow Life zone. Unsatisfactory soil condition exists in a majority of the unit due to soil compaction resulting in a loss of organic matter in the soil surface A horizon on the dominant plant community within the unit, namely the Poa dominated grass community. Exceptions to this are in total ungulate exclosure areas within Buck Springs, Merritt and Houston Draws, where soil conditions are satisfactory. Total acres of unsatisfactory soil condition, which exist within ecological unit 53, are 412 [22,22b,126].

Water quality assessments for the East Clear Creek watershed area all display the water quality is within water quality standards (ADEQ 1994, 1996, 1998, 2000). East Clear Creek reaches 15020008-009 (ECC hdwt-Yeager Canyon), 15020008-008 (ECC, Yeager-Willow), and 1502008-009off4 (Barbershop Canyon, hdwt-ECC) are in full compliance for all designated uses. The designated uses for East Clear Creek reaches, include the following: 1) aquatic and wildlife; 2) Full Body Contact; 3) Fish Consumption; 4) Agricultural Irrigation Watering; and 5) Agricultural Livestock Watering.

Soils Environmental Consequences

Effects of Alternative 1

Soil resources are not expected to improve with Alternative 2. None of the objectives for soil and water resources will be met with this alternative. Table 16 displays the summary of effects to soil resources for this alternative and a more thorough discussion of the effects of Alternative B can be found in the Soil and Water Effects Analysis [104 and 126].

Effects of Alternative 2

All of the treatments involve some amount of ground disturbance (except the designation of area closures at Dane Springs and Dines Tank), and as such, provide short-term direct negative effects to soil because it affects the soils ability to resist degradation (erosion). As such, all of the treatments have Best Management Practices (BMP's) applied to mitigate any negative adverse impacts. A list of the Best Management Practices germane to soil resources can be found in the mitigation section of this EA (Chapter 2, Table 8).

Positive effects from the proposed treatments include improved soil condition, improved riparian functioning condition, and maintenance of current water quality. Table 16 displays a summary of effects to soil and water measures by treatment type.

Indirect effects of the proposed treatments to soil and water resources are short term and relate to soil erosion from disturbed sites that can move off-site. This indirect effect can negatively affect water quality. This potential affect is mitigated through best management practices.

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project to soils will include timber sales and thinning that can effect the distribution of course woody debris, primarily through fuel treatments. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code). The timeframe for past actions is 10 years. The ten year time frame is used because vegetation has been re-established for many years on these sites, and course woody debris has naturally accumulated on-site from breakage and mortality within this time frame.

Upper Clear Creek

Tables 10-14 above displays the past, present and future and ongoing timber sale and precommercial thinning projects that occur within the Upper Clear Creek watershed. Table 15 above displays the future and foreseeable timber sale and precommercial thinning projects within the Upper Clear Creek watershed.

Within the past timber sale projects (approximately 22,000 acres), a majority of the projects were machine piled (Pack Rat Salvage did not have machine piling, but will still be included in this portion of ground disturbance for the watershed), therefore, we will assume 50% of the timber sale project area received ground disturbance. The skidding and hauling of timber disturbed approximately 15-20% of the sale area, however, the machine piling areas are the same acres. Therefore, the analysis will look at the machine pile disturbance only. Past actions have ground

Table 15: Summary of Effects to Soil and Water Resources—All Alternatives

ACTIVITY	CHANGE IN EFFECTIVE GROUND COVER	CHANGE IN WETTED PERIMENTER	CHANGE IN VEGETATIVE SPECIES COMPOSITION	IMPROVEMENT PFC/SOIL CONDITION	WATER QUALITY
No Watershed Health Actions (Alternative 1)	No improvement. Indirect effect will increase needlecast and brakeage component over time. Is potential for decrease if large wildfire occurs.	Potential decrease in wetted area as headcuts advance and roads add water.	No improvement, decrease in understory as overstory canopy increases.	Potential PFC decrease as headcuts advance. Soil condition stable or improves as overstory increases. Is potential for decrease if large wildfire occurs.	Remain the same, however, is potential for major water quality effects form large wildfire.
Prescribed burn 22,600 acres to reduce fuel hazard (Alternative 2).	Short term decrease in Alternative 2 of about 205 to 1,110 acres of ground disturbance and high intensity burn acres. Greater negative effect as burn intensity increases (up to 1,100 acres). Can improve long-term through nutrient flush and seed bed establishment.	No direct effects—are all upland treatments.	Positive and negative, depends on burn intensity and overstory condition. Lower the burn intensity and canopy greater the positive effects. Higher intensity burns will set back succession on approximately 200 to 1,100 acres. Fire dependent species will improve distribution.	No direct effect to PFC, short term decrease as ground cover is removed, but can improve through nutrient flush. The higher the intensity of the burn, the greater the negative effect.	No direct effect due to BMP's.
Prescribed burn 23,000 acres to reduce fuel hazard (Alternative 3 and 4)	Short term decrease in Alternative 2 of about 205 to 1,110 acres of ground disturbance and high intensity burn acres. Greater negative effect as burn intensity increases. Can improve long-term through nutrient flush and seed bed establishment.	No direct effects—are all upland treatments.	Positive and negative, depends on burn intensity and overstory condition. Lower the burn intensity and canopy greater the positive effects. Higher intensity burns will set back succession.	No direct effect to PFC, short term decrease as ground cover is removed, but can improve through nutrient flush. The higher the intensity of the burn, the greater the negative effect.	No direct effect due to BMP's.
Thin to reduce fuel hazard on 9,600 acres generally up to 12" and improve understory biodiversity (Alternative 2,3, and 4)	Improves through slash overall, but will have ground disturbance on approximately 1,000 to 1,870[5] acres that will minimize effective ground cover on these sites	No direct effect.	Improves through opening the canopy, allowing for understory vegetation to compete. Early successional species have the potential to occupy ground disturbance sites on approximately 1,000 to 1,870 acres.	Improves soil condition through slash, no effect to PFC.	No direct effect due to BMP's.
Commercial thin trees generally 5-20" dbh on 670 acres to reduce fuel hazard and improve understory biodiversity (Alternative 2,3,and 4)	Decrease at ground disturbed portion from harvest (skid trail/landings—approximately 100-170 acres), overall, improves through slash on 550 to 580 acres.	No direct effect.	Improves through opening the canopy, allowing for understory veg to compete.	Soil condition impaired on skid trails/landings (100-170 acres), but overall improves soil condition through slash on 550-580 acres, no effect to PFC.	No direct effect due to BMP's.
Commercial thin trees generally 5-18" dbh on approximately 1,050 acres to reduce fuel hazard and improve understory biodiversity (Alternative 3 and 4)	Decrease at ground disturbed portion from harvest (skid trail/landings—approximately 160-260 acres), overall, improves through slash on up to 790 to 890 acres.	No direct effect.	Improves through opening the canopy, allowing for understory veg to compete.	Soil condition impaired on skid trails/landings (160-260 acres), but overall improves soil condition through slash on 790 to 890 acres, no effect to PFC.	No direct effect due to BMP's.
Thin fuelbreaks along main roads on approximately 1,250 acres (alter natives 3 and 4)	All proposed by hand, no direct effect from ground disturbance.	No direct effect.	Improves through opening the canopy, allowing for understory veg to compete.	All proposed by hand, no direct effect from ground disturbance	No direct effect due to BMP's.
Remove tanks and rehabilitate site @ Dick Hart (Alternative 2-4)	Short term decrease through ground disturbance on 3 acres, long term improvement.	Decrease in wetted perimeter at site during construction, but downstream will increase wetted perimeter through change in how water moves through the system. Natural channel design will slow water movement, allowing more to stay on-site.	Short term decrease due to ground disturbance on 3 acres(1-2 years), but will improve over time. Also, less attraction for ungulates, so will receive less use.	Improvement of soil condition over time through less activity by ungulates at the tank, will improve PFC on-site long-term through.	No direct effect due to BMP's.
Natural channel design, layback banks/hydromulch Barbershop Canyon, Houston Draw, Lockwood Draw, East Bear Canyon, Buck Springs, Dick Hart Draw, Kinder Draw, and Bill McClintock Draw	Short term decrease in effective ground cover due to soil disturbance on approximately 75-100 acres, but long term positive effect as headcut does not proceed, stability to the stream is reached and vegetation can come into the meadow systems. BMP application will	Will stabilize stream systems, making more vertically stable, thus improving the streams ability to store water (will not further lower the water table).	Short term decrease in plant species composition due to ground disturbance on 75 to 100 acres. Long term improvement as streams becomes vertically and horizontally stable and water stays on-site. Change to riparian species is expected, especially with BMP	Improvement in PFC – see the other measures discussion.	Some increase in sediments during construction and immediately after construction. BMP application will decrease amount of sediments and duration of potential sediment delivery.

[5] This is the maximum acreage that is expected to be disturbed if this treatment has a commercial sale is used and products are removed from the site. If there is no commercial tree operation, and the trees are cut with a shear, then acreage disturbed will be approximately 200 to 500 acres. If the trees are felled by hand and left on-ste, ther ewill be little to no ground disturbance.

ACTIVITY	CHANGE IN EFFECTIVE GROUND COVER	CHANGE IN WETTED PERIMENTER	CHANGE IN VEGETATIVE SPECIES COMPOSITION	IMPROVEMENT PFC/SOIL CONDITION	WATER QUALITY
meadows (Alternative 2-4)	minimize duration of negative effect.		application.		
Thin trees generally up to 16 inches DBH on a total of approximately 83 acres in upland areas above Merritt, McFarland, Limestone Tank and Upper Buck Springs to increase flow duration of springs (Alternative 2-4)	Decrease at ground disturbed portion from harvest and fuel treatments on approximately 12 to 16 acres, overall, improves through slash.	Potentially will increase water on-site, will improve wetted area at springs.	Improves through opening the canopy, allowing for understory veg to compete.	Soil condition impaired on skid trails (12-16 acres), but overall improves soil condition through slash. Increase water on site will allow for increased vegetative growth with improvement to PFC.	No direct effect due to BMP's.
Raise culverts to create ponded wetlands 321C (Alternative 2-4)	Improve vegetative condition with desirable riparian species over time. Will take approximately 2 years for riparian species to begin to occupy the site.	Will create ponded wetland where one currently does not exist. Will improve capillary action to hold water on-site.	Will create ponded wetland; expect riparian veg within 1-2 years after construction.	Improvement in PFC – see the other measures discussion.	No direct effect due to BMP's.
Rehabilitate or remove any stream channel wood structures located in Buck Springs and Houston Draw that are not functioning properly (Alternative 2-4)	Short term decrease in effective ground cover due to soil disturbance on less than 1 acre, but long term positive effect as headcut does not proceed, stability to the stream is reached and vegetation can come into the meadow systems.	Will stabilize stream systems, making more vertically and horizontally stable, thus improving the streams ability to store water (will not further lower the water table).	Will stabilize stream systems, making more vertically and horizontally stable, thus improving the streams ability to store water, expect riparian vegetation to stay the same or increase.	Improvement in PFC – see the other measures discussion.	No direct effect due to BMP's.
Stabilize stream crossings (Alternative 2-4)	Positive effect, stability to stream is reached and vegetation can come into the meadow systems. Some short-term negative effect at sites that have ground disturbance (about 1 to 2 acres). This effect is minimized through BMP application.	Indirect positive effect by changing water regime and slowing water movement throughout the system. Less downcutting, improved potential to increase wetted perimeter in riparian areas.	Indirect positive effect by changing water regime and slowing water movement throughout the system. Less downcutting, improved potential to increase wetted perimeter in riparian areas, thus increasing potential for riparian vegetation.	Indirect improvement in PFC – see the other measures discussion.	No direct effect due to BMP's.
Install pole fence along 321C at meadow sections (Alternative 2-4)	Positive effect to meadows as less impact (trampling/compaction) is decreased, improving vegetative conditions and ground cover. Some short-term negative effect at sites that have ground disturbance (about 1 to 2 acres). This effect is minimized through BMP application.	Positive effect to Bill McClintock Draw with elk exclosure improving vegetative conditions and allowing for increase in riparian plant species which will hold water on-site, increasing wetted perimeter.	Species comp should change over time as less impacts occur, improved veg ground cover. Direct positive effect in Bill McClintock Draw with elk exclosure within 1-2 years. Increase in riparian plants, decrease in Poa as site increases wet character.	Improvement in PFC – see the other measures discussion.	No direct effect due to BMP's.
Relocate 643A road w/ semi-permeable fill road (Alternative 2-4)	Positive effect to meadow as less impact (trampling/compaction) is decreased, improving vegetative conditions and ground cover. Some short-term negative effect at sites that have ground disturbance (about 1 to 2 acres). This effect is minimized through BMP application.	Positive effect to riparian portion of Holder Cabin Draw through improved water flow through system, increased surface roughness, less compaction.	Positive effect to riparian portion of Holder Cabin Draw through improved water flow through system, increased surface roughness, less compaction.	Indirect improvement in PFC – see the other measures discussion.	No direct effect due to BMP's.
Pave locations on 95/96 roads (Alternative 2-4)	Indirect positive effect due to a change in the timing and delivery of water will improve stream stability, increasing veg. Some short-term negative effect at sites that have ground disturbance (about 1 acre). This effect is minimized through BMP application.	Indirect positive effect due to a change in the timing and delivery of water.	No direct effect, indirect positive through change in water delivery .	Indirect improvement in PFC – see the other measures discussion.	No direct effect due to BMP's.
Remove encroaching conifers in meadow systems up to 9 inches in Bear Canyon, Houston Draw, Barbershop Canyon, Buck Springs, Bill McClintock Draw, Kinder Draw, East Bear Canyon, General	Will improve through microclimate creation and site protection under slash. Indirect positive effect due to change in amount of water available to plants. Some short-term negative effect at sites that have ground disturbance (about 0-15 acres). This effect is minimized through	Indirect positive effect due to a change in the timing and delivery of water.	Positive change with microclimate creation under the slash and protection from grazing ungulates under the slash	Indirect improvement due to improved vegetative conditions, Some short-term negative effect at sites that have ground disturbance (about 0-15 acre). This effect is minimized through BMP application.	No direct effect due to BMP's.

ACTIVITY	CHANGE IN EFFECTIVE GROUND COVER	CHANGE IN WETTED PERIMENTER	CHANGE IN VEGETATIVE SPECIES COMPOSITION	IMPROVEMENT PFC/SOIL CONDITION	WATER QUALITY
Springs, Holder Cabin, Merritt Draw, Middle Leonard Canyon, West Leonard Canyon, and McClintock Springs meadows. Slash would be lopped and scattered to a 2-foot height across meadows (Alternative 2-4)	BMP application.				
Create area closures at Dane Springs and Dines Tank for protection of spinedace habitat (Alternative 2-4)	Positive effect as less impact (trampling/compaction) is decreased, improving vegetative conditions and ground cover. Some short-term negative effect at sites that have ground disturbance (about 1-5 acres). This effect is minimized through BMP application.	Indirect positive effect due to a change in the timing and delivery of water.	No direct effect, indirect positive through change in water delivery .	Improvement in PFC – see the other measures discussion.	No direct effect due to BMP's.
Designate open road system (Alternative 2)	Will have no change on approximately 347 miles of road. Should improve effective ground cover on roads slated to be closed/decommissioned over time.	Will have no change on approximately 347 miles of road. Open roads will located away from meadows—should improve wetted area perimeter.	Will have no change on approximately 347 miles of road. Open roads will located away from meadows—should improve vegetative conditions on roads slated to be closed/decommissioned over time.	Will have no change on approximately 347 miles of road. Open roads will located away from meadows and streams—should improve PFC and should improve soil conditions on roads slated to be closed/decommissioned over time.	No direct effect due to BMP's.
Reopen 3.1 miles of currently closed road to create a recreation loop (Alternative 2 and 3)	Will remove ground cover from this road, on approximately 5.6 acres.	No effect is in upland position.	Will remove vegetation from this road, on approximately 5.to 6 acres.	No effect is in upland position.	No direct effect due to BMP's.
Close 18.5 miles of currently open roads (Alternative 2)	No change over current, because open roads are to mineral soil at present. Will improve as site regenerates.	No direct effect –roads slated for closure not in meadows.	Will improve as site regenerates. There will be 15 to 20 acres of ground disturbance that may be susceptible to noxious weeds. BMP's will minimize impacts of possible noxious weeds.	Will improve soil condition over time as site recovers from closure.	No direct effect due to BMP's.
Decommission and obliterate 17.9 miles of currently open roads (Alternative 2)	Short term decrease in effective ground cover due to soil disturbance on 35-45 acres, but long term positive effect as water moves through the system more naturally and open roads become vegetated. Stability to the stream is reached and vegetation can come into the meadow systems.	Will stabilize stream systems, making more vertically stable, thus improving the streams ability to store water (will not further lower the water table).	Short term decrease in plant species composition due to ground disturbance. Long term improvement as streams becomes vertical and horizontally stable and water stays on-site. There will be 35 to 45 acres of ground disturbance that may be susceptible to noxious weeds. BMP's will minimize impacts of possible noxious weeds.	Removal of road stressor and potential improvement in PFC on the following reaches with the road treatments on FR 298 (stream reach 1502000808B003-currently proper functioning condition (PFC)), FR 732 (stream reach 1502000808G004-currently functional at-risk), FR 298A (stream reach 1502000808B005-currently proper functioning condition), FR 9030D (stream reach 1502000808F015-currently functional at-risk). FR 9707L (stream reach 1502000808D020-currently PFC), FR 9713G (stream reach 1502000808B005-currently proper functioning condition), FR 9714F (stream reach 1502000808C004-currently functional at-risk), FR 9722W (stream reach 1502000808E008-currently PFC), FR 9737R (stream reach 1502000808D010-currently functional at-risk and 1502000808D013, currently proper functioning condition),, FR 9737Y(stream reach 1502000808E011-PFC and 1502000808E012, currently functional at-risk). Some short-term sediment production on 35 to 45 acres, but will be minimized with BMP's. .	Some short-term sediment increases, but minimized due to BMP's.
Decommission and obliterate 14.7 miles of currently closed roads (Alternative 2-4)	Short term decrease in effective ground cover due to soil disturbance on 25-30 acres, but long term positive effect as water moves through the system more naturally. Stability to the stream is reached and vegetation can come into the	Will stabilize stream systems, making more vertically stable, thus improving the streams ability to store water (will not further lower the water table).	Short term decrease in plant species composition due to ground disturbance on 25-30 acres, but effect is minimized (duration) by BMP's. Long term improvement as streams becomes vertically and horizontally stable and	Removal of road stressor and potential Improvement in PFC on the following reaches with the road treatments on FR 643A (stream reach 1502000808C004-currently functional at-risk), FR 9713K(stream reach 1502000808B005-currently proper functioning condition (PFC)), FR 9714X	Some short-term sediment increases, but minimized due to BMP's.

ACTIVITY	CHANGE IN EFFECTIVE GROUND COVER	CHANGE IN WETTED PERIMENTER	CHANGE IN VEGETATIVE SPECIES COMPOSITION	IMPROVEMENT PFC/SOIL CONDITION	WATER QUALITY
	meadow systems.		water stays on-site. There will be 25 to 30 acres of ground disturbance that may be susceptible to noxious weeds. BMP's will minimize impacts of possible noxious weeds.	(stream reach 1502000808B008-currently nonfunctional). FR 9735P (stream reach 1502000808D003-currently PFC and 1502000808D004 currently functional at-risk), FR 9714F (stream reach 1502000808C003- currently PFC and 1502000808C004-currently functional at-risk. .	
Relocate .8 miles of currently open road (Alternative 2 and 3)	Will increase vegetative cover on road to be re-located, will decrease vegetative ground cover on new road location.	Removes old road from meadow, but meadow is not wet meadow—no effect.	Will increase vegetative species on road to be re-located, will decrease vegetative species cover on new road location.	Will improve soil condition on road to be re-located, will move soil condition to unsat on new road location. No effect to PFC.	Some short-term sediment increases, but minimized due to BMP's.
Designate open road system of 322 miles (Alternative 3)	Will have no change on approximately 322 miles of road. Should improve effective ground cover on roads slated to be closed/decommissioned over time.	Will have no change on approximately 322 miles of road. Open roads will located away from meadows—should improve wetted area perimeter.	Will have no change on approximately 322 miles of road. Open roads will located away from meadows—should improve vegetative conditions on roads slated to be closed/decommissioned over time.	Will have no change on approximately 322 miles of road. Open roads will located away from meadows and streams—should improve PFC and should improve soil conditions on roads slated to be closed/decommissioned over time.	No direct effect due to BMP's.
Close 36.7 miles of currently open roads (Alternative 3)	No change over current, because open roads are to mineral soil at present. Will improve as site regenerates.	No direct effect –roads slated for closure not in wet meadows.	Will improve as site regenerates. There will be 35 to 45 acres of ground disturbance that may be susceptible to noxious weeds. BMP's will minimize impacts of possible noxious weeds.	Will improve soil condition over time as site recovers from closure activities, Removal of road stressor on non-riparian stream crossings on the following roads: 719, 00137C, 00141A, 00141B, 00321C, 00600A, 00726D, 06033C, 09030N, 09616A, 09616B, 09711L, 09712T, 09712Y, 09714E, 09714G, and 09729K. This connectivity to streams will be minimized on approximately 46 stream crossing by the closing of these roads..	Some short-term sediment increases, but minimized due to BMP's.
Decommission and obliterate 30.9 miles of currently open roads (Alternative 3)	Short term decrease in effective ground cover due to soil disturbance on 45-60 acres, but long term positive effect as water moves through the system more naturally and open roads become vegetated. Stability to the stream is reached and vegetation can come into the meadow systems.	Will stabilize stream systems, making more vertically stable, thus improving the streams ability to store water (will not further lower the water table).	Short term decrease in plant species composition due to ground disturbance. Long term improvement as streams becomes vertical and horizontally stable and water stays on-site. There will be 45 to 60 acres of ground disturbance that may be susceptible to noxious weeds. BMP's will minimize impacts of possible noxious weeds.	Removal of road stressors and potential improvement in PFC on the following reaches with the road treatments on FR 298 (stream reach 1502000808B003-currently proper functioning condition (PFC)), FR 298A (stream reach 1502000808B005-currently proper functioning condition), FR 321C (stream reach 1502000808D010-currently functional at-risk), FR 9030D (stream reach 1502000808F015-currently functional at-risk). FR 9616B (stream reach 1502000808D010-currently functional at-risk), FR 9707L (stream reach 1502000808D020-currently PFC), FR 9713G (stream reach 1502000808B005-currently proper functioning condition), FR 9714F (stream reach 1502000808C004-currently functional at-risk), FR 9714G (stream reach 1502000808C004-currently functional at-risk), FR 9722W (stream reach 1502000808E008-currently PFC), FR 9737R (stream reach 1502000808D010-currently functional at-risk and 1502000808D013, currently proper functioning condition),, FR 9737Y(stream reach 1502000808E011-PFC and 1502000808E012, currently functional at-risk).	Some short-term sediment increases, but minimized due to BMP's.
Designate open road system of 225 miles (Alternative 4)	Will have no change on approximately 225 miles of road. Should improve effective ground cover on roads slated to be closed/decommissioned over time.	Will have no change on approximately 225 miles of road. Open roads will located away from meadows—should improve wetted area perimeter.	Will have no change on approximately 225 miles of road. Open roads will located away from meadows—should improve vegetative conditions on roads slated to be closed/decommissioned over time.	Will have no change on approximately 225 miles of road. Open roads will located away from meadows and streams—should improve PFC and should improve soil conditions on roads slated to be closed/decommissioned over time.	No direct effect due to BMP's.
Close 125.4 miles of currently open roads (Alternative 4)	No change over current, will improve as site regenerates.	No direct effect –roads slated for closure not in meadows.	Will improve as site regenerates. There will be 120 to 160 acres of ground disturbance that may be susceptible to noxious weeds. BMP's will minimize	Will improve soil condition over time as site recovers from closure. Removal of road stressors and potential improvement in PFC on the following reaches with the road treatments. This activity will	Some short-term sediment increases, but minimized due to BMP's.

ACTIVITY	CHANGE IN EFFECTIVE GROUND COVER	CHANGE IN WETTED PERIMENTER	CHANGE IN VEGETATIVE SPECIES COMPOSITION	IMPROVEMENT PFC/SOIL CONDITION	WATER QUALITY
			impacts of possible noxious weeds.	improve meadow and riparian conditions in the approximately 1.5 miles of road that have interactions with riparian streamcourses on FR 732 (stream reach 1502000808G004-currently functional at-risk), FR 137D (stream reach 1502000808B007-currently nonfunctional), FR 9713G (stream reach 1502000808B005-currently proper functioning condition), FR 9737R(stream reach 1502000808D010-currently functional at-risk and 1502000808D013, currently proper functioning condition), FR 9738N (stream reach 1502000808E016-currently functional at-risk) through removal of a stressor on the system, namely vehicular traffic.	
Decommission and obliterate 36.7 miles of currently open roads (Alternative 4)	Short term decrease in effective ground cover due to soil disturbance on 70-100 acres, but long term positive effect as water moves through the system more naturally and open roads become vegetated. Stability to the stream is reached and vegetation can come into the meadow systems.	Will stabilize stream systems, making more vertically stable, thus improving the streams ability to store water (will not further lower the water table).	Short term decrease in plant species composition due to ground disturbance. Long term improvement as streams becomes vertical and horizontally stable and water stays on-site. There will be 70 to 100 acres of ground disturbance that may be susceptible to noxious weeds. BMP's will minimize impacts of possible noxious weeds.	Improvement in PFC on the following reaches with the road treatments on FR 298 (stream reach 1502000808B003-currently proper functioning condition (PFC)), FR 600 (stream reach 1502000808B004- currently PFC), FR 732 (stream reach 1502000808G004-currently functional at-risk), FR 298A (stream reach 1502000808B005-currently proper functioning condition), FR 321C (stream reach 1502000808D010-currently functional at-risk), FR 9030D (stream reach 1502000808F015-currently functional at-risk). FR 9031J (stream reach 1502000808F014-currently functional at-risk), FR 9707L (stream reach 1502000808D020-currently PFC), FR 9713G (stream reach 1502000808B005-currently proper functioning condition), FR 9714F (stream reach 1502000808C004-currently functional at-risk), FR 9714G (stream reach 1502000808C004-currently functional at-risk), FR 9722W (stream reach 1502000808E008-currently PFC), FR 9735P (stream reach 1502000808D003-currently PFC and 1502000808D004-currently functional at-risk), FR 9737R (stream reach 1502000808D010-currently functional at-risk and 1502000808D013, currently proper functioning condition),, FR 9737Y(stream reach 1502000808E011-PFC and 1502000808E012, currently functional at-risk). Some short-term sediment production on 70 to 100 acres, but will be minimized with BMP's..	Some short-term sediment increases, but minimized due to BMP's.

Table 15: Summary of watershed health effects by measures to soil and water attributes.

disturbance on approximately 11,300 acres. With this alternative, an additional 1,275-2,300 acres of ground disturbance will take place, for a total of approximately 12,575 to 13,600 acres of ground disturbance cumulatively for the watershed over the last 10-years from tree harvest projects. The Blue Ridge Urban Interface project and Maple Draw Project were done by hand and minimal ground disturbance took place during the tree removal portions of these projects.

Each of the timber sales listed above had fuel treatments for activity fuels. As with the assumption above, timber sales were machine piled and burned. This activity has resulted in high intensity burns at pile sites over approximately 1% of the sale areas, or approximately 200 acres of high intensity burns. The Blue Ridge Urban Interface project has approximately 5,400 acres of burning treatments within the watershed. High intensity burns are expected to occur on 1-5% of the project area or 50 to 250 acres of high intensity burns. Alternative 2 will generate approximately 200-1,100 acres of high intensity burns, for a maximum total of 450 to 1,550 acres of high intensity burns within the Upper Clear Creek Watershed.

The future and foreseeable projects are the Buck Springs precommercial thinning project that will have lop and scatter fuel treatments proposed . This is expected to be completed by hand, and no acres of ground disturbance are expected from this project. The Christmas Tree project is also not a ground disturbing project, therefore, there will not be any measurable ground disturbance from future and foreseeable projects. The Victorine Wildland Urban Interface Project is expected to have approximately 145 to 245 acres of ground disturbance and 20 to 155 acres of high intensity burn acres. Table 16 displays a summary of the acres of the ground disturbance and high intensity burns within the Upper Clear Creek watershed.

Table 16: Summary of ground disturbing acres in Upper Clear Creek Watershed, with alternative 2, past and present.

Acres of ground disturbance in Alternative 2	Past acres of ground disturbance	Future acres of ground disturbance	Total acres of ground disturbance	% of watershed
1,275-2,300	11,300	145-245	12,720-13,845	6-7%
Acres of high intensity fire disturbance in Alternative 2	**Past acres of high intensity fire disturbance**	**Future acres of high intensity fire disturbance**	**Total acres of high intensity fire disturbance**	**% of watershed**
200-1,100	250	20-155	470-1,505	0-1%

Table 16: This table summarizes the acres of ground disturbance from precommercial thinning activities and prescribed burning activities in Alterantive 2, plus past acres of ground disturbance from past activities, and expected acres of ground disturbance from future and foreseeable projects.

Overall, alternative 2 disturbs approximately 1% of ground the Upper Clear Creek watershed. Cumulatively, the project plus past ground disturbing activities disturb about 12,720 to 13,845 acres, or approximately 6-7% of the total watershed acres. Alternative 2 adds as many as 200 to 1,100 acres of high intensity fire within the Upper Clear Creek watershed. Cumulatively, the project plus past burning activities will have about 470 to 1,505 acres of high intensity burn, or 0-1% of high intensity fire within the Upper Clear Creek watershed. Many of high intensity burn acres also occur on previously disturbed sites from harvest activities. Most all of the treatment

acres within the watershed are also on upland positions, so there is and has been very little sediment movement to streamcourses. The past use of Best Management Practices has mitigated the impacts of bare soil from ground disturbance and it is believed that the effects from Alternative 2 will be minimal to soil and water resources within the watershed.

Effects of Alternative 3

There are some difference in effects between Alternative 2 and Alternative 3 are the acres affected by thins from below and uneven-aged treatments (1,052 total harvest acres), the approximately 1,250 acres of fuelbreaks and an additional 400 acres of prescribed burning acres. The proposed road system, and miles of closure and decommissioning also change in this Alternative. The rest of the effects are the same as for Alternative 2. Table 15 displays a summary of effects to soil and water measures by treatment type.

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project to soils will include timber sales and thinning that can effect the distribution of course woody debris, primarily through fuel treatments. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code). The timeframe for past actions is 10 years. The ten year time frame is used because vegetation has been re-established for many years on these sites, and course woody debris has naturally accumulated on-site from breakage and mortality within this time frame.

Upper Clear Creek

Tables 10-14 listed above displays the past, present and future and ongoing timber sale and precommercial thinning projects that occur within the Upper Clear Creek watershed. Within the past timber sale projects (approximately 22,000 acres), a majority of the projects were machine piled (Pack Rat Salvage did not have machine piling, but will still be included in this portion of ground disturbance for the watershed), therefore, we will assume 50% of the timber sale project area received ground disturbance. The skidding and hauling of timber disturbed approximately 15-20% of the sale area, however, the machine piling areas are the same acres. Therefore, the analysis will look at the machine pile disturbance only. Past actions have ground disturbance on approximately 11,300 acres. With this alternative, an additional 1,465-2,580 acres of ground disturbance will take place, for a total of approximately 12,765 to 13,880 acres of ground disturbance cumulatively for the watershed over the last 10-years from tree harvest projects. The Blue Ridge Urban Interface project and Maple Draw Project were done by hand and minimal ground disturbance took place during the tree removal portions of these projects.

Each of the timber sales listed above had fuel treatments for activity fuels. As with the assumption above, timber sales were machine piled and burned. This activity has resulted in high intensity burns at pile sites over approximately 1% of the sale areas, or approximately 200 acres of high intensity burns. The Blue Ridge Urban Interface project has approximately 5,400 acres of burning treatments within the watershed. High intensity burns are expected to occur on 1-5% of the project area, or 50 to 250 acres of high intensity burns. Alternative 3 will generate approximately 200-1,100 acres of high intensity burns, for a maximum total of 450 to 1,550 acres of high intensity burns within the Upper Clear Creek Watershed.

The future and foreseeable projects are the Buck Springs precommercial thinning project that will have lop and scatter fuel treatments proposed . This is expected to be completed by hand, and no acres of ground disturbance are expected from this project. The Christmas Tree project is also not a ground disturbing project, therefore, there will not be any measurable ground disturbance from future and foreseeable projects. The Victorine Wildland Urban Interface Project is expected to have approximately 145 to 245 acres of ground disturbance and 20 to 155 acres of high intensity burn acres. Table 17 displays a summary of the acres of the ground disturbance and high intensity burns within the Upper Clear Creek watershed.

Table 17: Summary of ground disturbing acres in Upper Clear Creek Watershed, with Alternative 3, past and present.

Acres of ground disturbance in Alternative 3	Past acres of ground disturbance	Future acres of ground disturbance	Total acres of ground disturbance	% of watershed
1,465-2,680	11,300	145-245	12,880-14,125	6-7%
Acres of high intensity fire disturbance in Alternative 3	**Past acres of high intensity fire disturbance**	**Future acres of high intensity fire disturbance**	**Total acres of high intensity fire disturbance**	**% of watershed**
200-1,100	250	20-155	470-1,505	0-1%

Table 17: This table summarizes the acres of ground disturbance from precommercial thinning activities and prescribed burning activities in Alterantive 3, plus past acres of ground disturbance from past activities, and expected acres of ground disturbance from future and foreseeable projects.

Overall, alternative 3 disturbs approximately 1% of ground the Upper Clear Creek watershed. Cumulatively, the project plus past ground disturbing activities disturb about 12,880 to 14,125 acres, or approximately 6-7% of the total watershed acres. Alternative 3 adds 200 to 1,100 acres of high intensity fire within the Upper Clear Creek watershed. Cumulatively, the project plus past burning activities will have about 470 to 1,505 acres of high intensity burn, or 0-1% of high intensity fire within the Upper Clear Creek watershed. Many of the high intensity burn acres also occur on previously disturbed sites from harvest activities. Most all of the treatment acres within the watershed are also on upland positions, so there is and has been very little sediment movement to streamcourses. The past use of Best Management Practices has mitigated the impacts of bare soil from ground disturbance and it is believed that the effects from Alternative 3 will be minimal to soil resources within the watershed.

Effects of Alternative 4

The only difference between Alternative 4 and Alternative 3 is the proposed road system, and the corresponding miles of closure and decommissioning also change in this Alternative. The rest of the effects are the same as for Alternative 3. Table 15 displays a summary of effects to soil and water measures by treatment type.

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project to soils will include timber sales and thinning that can effect the distribution of course woody

debris, primarily through fuel treatments. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code). The timeframe for past actions is 10 years. The ten year time frame is used because vegetation has been re-established for many years on these sites, and course woody debris has naturally accumulated on-site from breakage and mortality within this time frame.

Upper Clear Creek

Tables 10-14 listed above displays the past, present and future and ongoing timber sale and precommercial thinning projects that occur within the Upper Clear Creek watershed. Within the past timber sale projects (approximately 22,000 acres), a majority of the projects were machine piled (Pack Rat Salvage did not have machine piling, but will still be included in this portion of ground disturbance for the watershed), therefore, we will assume 50% of the timber sale project area received ground disturbance. The skidding and hauling of timber disturbed approximately 15-20% of the sale area, however, the machine piling areas are the same acres. Therefore, the analysis will look at the machine pile disturbance only. Past actions have ground disturbance on approximately 11,300 acres. With this alternative, an additional 1,570-2,720 acres of ground disturbance will take place, for a total of approximately 13,870 to 14,020 acres of ground disturbance cumulatively for the watershed over the last 10-years from tree harvest projects. The Blue Ridge Urban Interface project and Maple Draw Project were done by hand and minimal ground disturbance took place during the tree removal portions of these projects.

Each of the timber sales listed above had fuel treatments for activity fuels. As with the assumption above, timber sales were machine piled and burned. This activity has resulted in high intensity burns at pile sites over approximately 1% of the sale areas, or approximately 200 acres of high intensity burns. The Blue Ridge Urban Interface project has approximately 5,400 acres of burning treatments within the watershed. High intensity burns are expected to occur on 1-5% of the project area, or 50 to 250 acres of high intensity burns. Alternative 4 will generate approximately 200-1,100 acres of high intensity burns, for a maximum total of 450 to 1,550 acres of high intensity burns within the Upper Clear Creek Watershed.

The future and foreseeable projects are the Buck Springs precommercial thinning project that will have lop and scatter fuel treatments proposed . This is expected to be completed by hand, and no acres of ground disturbance are expected from this project. The Christmas Tree project is also not a ground disturbing project, therefore, there will not be any measurable ground disturbance from future and foreseeable projects. The Victorine Wildland Urban Interface Project is expected to have approximately 145 to 245 acres of ground disturbance and 20 to 155 acres of high intensity burn acres. Table 18 displays a summary of the acres of the ground disturbance and high intensity burns within the Upper Clear Creek watershed.

Overall, Alternative 4 disturbs approximately 1% of ground the Upper Clear Creek watershed. Cumulatively, the project plus past ground disturbing activities disturb about 13,015 to 14,265 acres, or approximately 6-7% of the total watershed acres. Alternative 4 adds 200 to 1,100 acres of high intensity fire within the Upper Clear Creek watershed. Cumulatively, the project plus

Table 18: Summary of ground disturbing acres in Upper Clear Creek Watershed, with alternative 4, past and present.

Acres of ground disturbance in Alternative 4	Past acres of ground disturbance	Future acres of ground disturbance	Total acres of ground disturbance	% of watershed
1,570-2,720	11,300	145-245	13,015-14,265	6-7%
Acres of high intensity fire disturbance in Alternative 4	**Past acres of high intensity fire disturbance**	**Future acres of high intensity fire disturbance**	**Total acres of high intensity fire disturbance**	**% of watershed**
200-1,100	250	20-155	470-1,505	0-1%

Table 18: This table summarizes the acres of ground disturbance from precommercial thinning activities and prescribed burning activities in Alterantive 4, plus past acres of ground disturbance from past activities, and expected acres of ground disturbance from future and foreseeable projects.

past burning activities will have about 470 to 1,505 acres of high intensity burn, or 0-1% of high intensity fire within the Upper Clear Creek watershed. Many of the high intensity burn acres also occur on previously disturbed sites from harvest activities. Most all of the treatment acres within the watershed are also on upland positions, so there is and has been very little sediment movement to streamcourses. The past use of Best Management Practices has mitigated the impacts of bare soil from ground disturbance and it is believed that the effects from Alternative 4 will be minimal to soil resources within the watershed.

Water Environmental Consequences

Alternative 1

Direct and Indirect Effects

There are no direct effects to water quality within this alternative. There are potential, unquantifiable indirect effects from not treating ladder fuels that could lead to an increased risk of stand replacing, high intensity wildfires.

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project will include timber sales and thinning that may involve mechanized equipment that can create ground disturbance. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code) and the East Verde 5th code watershed. The timeframe for past actions is 10 years.

Upper Clear Creek

Alternative 1 will not add any additional ground disturbing activities within the Upper Clear Creek watershed; therefore, there will be no direct cumulative effect from this alternative.

Alternative 2

Direct and Indirect Effects

As stated in the section on soils above, the total acres disturbed in this Alternative would be about 1,275 to 2,300 total acres. The site disturbance from the list of proposed activities that have been outlined in the soils section above do have the potential to detach sediments and moved these sediments off-site and into streamcourses. However, the application of Best Management Practices (BMP's) 3, 4, 5, 6, 7, 8. 9, 11, 12, 13, 15, 16, 18, 19, 20, 25, 26, 27, 28, 29, 30, 32, and 33 are designed specifically to minimize ground disturbance and minimize sediment production to maintain water quality. For a listing of specific BMP's by proposed treatments, please see the soils section above.

An indirect effect of harvest activities is the use of heavy equipment and logging contractors camping on-site during harvest can also negatively affect water quality. The effects are hazardous materials spills and controlling sanitation facilities. This is mitigated through BMP 21 and 23.

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project will include timber sales and thinning that may involve mechanized equipment that can create ground disturbance. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code). The timeframe for past actions is 10 years.

Tables 10-14 above, summarizes past, present, and future or foreseeable projects that occur in the Upper Clear Creek watershed. The analysis in the soil section is germane to the water section also. Table 16 above summarizes the total acres of expected cumulative ground disturbance with the acres disturbed from Alternative 2. The total acres of ground disturbance from the proposed projects in alternative 2, as well as past and future projects are less than 6-7% of the entire watershed acres. All of these practices are designed with sediment reduction BMP's in place. The past use of BMP's has maintained water quality to standards within the watershed. It is expected that the use of BMP's in the current proposed projects will also protect and maintain water quality to standards. Therefore, the East Clear Creek Watershed Health Improvement Project is not expected to detrimentally affect water quality in the Upper Clear Creek drainage system.

Alternative 3

Direct and Indirect Effects

As stated in the section on soils above, the total acres disturbed in this Alternative would be about 1,465 to 2,580 total acres. The site disturbance from the list of proposed activities that have been outlined in the soils section above do have the potential to detach sediments and moved these sediments off-site and into streamcourses. However, the application of Best Management Practices (BMP's) 3, 4, 5, 6, 7, 8. 9, 11, 12, 13, 15, 16, 18, 19, 20, 25, 26, 27, 28, 29, 30, 32, and 33 are designed specifically to minimize ground disturbance and minimize

sediment production to maintain water quality. For a listing of specific BMP's by proposed treatments, please see the soils section above.

An indirect effect of harvest activities is the use of heavy equipment and logging contractors camping on-site during harvest can also negatively affect water quality. The effects are hazardous materials spills and controlling sanitation facilities. This is mitigated through BMP 21 and 23.

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project will include timber sales and thinning that may involve mechanized equipment that can create ground disturbance. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code). The timeframe for past actions is 10 years.

Tables 10-14 above, summarizes past, present, and future or foreseeable projects that occur in the Upper Clear Creek watershed. The analysis in the soil section is germane to the water section also. Table 17 above summarizes the total acres of expected cumulative ground disturbance with the acres disturbed from Alternative 3. The total acres of ground disturbance from the proposed projects in alternative 3, as well as past and future projects are less than 6-7% of the entire watershed acres. All of these practices are designed with sediment reduction BMP's in place. The past use of BMP's has maintained water quality to standards within the watershed. It is expected that the use of BMP's in the current proposed projects will also protect and maintain water quality to standards. Therefore, Alternative 3 of the East Clear Creek Watershed Health Improvement Project is not expected to detrimentally affect water quality in the Upper Clear Creek drainage system.

Alternative 4

Direct and Indirect Effects

As stated in the section on soils above, the total acres disturbed in this Alternative would be about 1,570 to 2,720 total acres. The site disturbance from the list of proposed activities that have been outlined in the soils section above do have the potential to detach sediments and moved these sediments off-site and into streamcourses. However, the application of Best Management Practices (BMP's) 3, 4, 5, 6, 7, 8. 9, 11, 12, 13, 15, 16, 18, 19, 20, 25, 26, 27, 28, 29, 30, 32, and 33 are designed specifically to minimize ground disturbance and minimize sediment production to maintain water quality. For a listing of specific BMP's by proposed treatments, please see the soils section above.

An indirect effect of harvest activities is the use of heavy equipment and logging contractors camping on-site during harvest can also negatively affect water quality. The effects are hazardous materials spills and controlling sanitation facilities. This is mitigated through BMP 21 and 23.

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project will include timber sales and thinning that may involve mechanized equipment that can create ground disturbance. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code). The timeframe for past actions is 10 years.

Tables 10-14 above, summarizes past, present, and future or foreseeable projects that occur in the Upper Clear Creek watershed. The analysis in the soil section is germane to the water section also. Table 18 above summarizes the total acres of expected cumulative ground disturbance with the acres disturbed from Alternative 4. The total acres of ground disturbance from the proposed projects in Alternative 4, as well as past and future projects are less than 6-7% of the entire watershed acres. All of these practices are designed with sediment reduction BMP's in place. The past use of BMP's has maintained water quality to standards within the watershed. It is expected that the use of BMP's in the current proposed projects will also protect and maintain water quality to standards. Therefore, Alternative 4 of the East Clear Creek Watershed Health Improvement Project is not expected to detrimentally affect water quality in the Upper Clear Creek drainage system.

Effects to Wildlife

Wildlife Affected Environment

Wildlife species are integral components of the ecosystem that make up the ECC Watershed Health analysis area. The area has seen changes in the populations since pre-European settlement, with some species extirpated from the area (Merriam's elk, grizzly bear, and Mexican wolf) while some are recent additions to the biota (Rocky Mountain elk, feral pigs, starlings, rainbow trout, green sunfish, crayfish). The following tables list the species of wildlife (including threatened, endangered species) within the analysis area that were analyzed. More in-depth habitat descriptions are contained within the wildlife specialist and addendums to the wildlife specialist reports [99, 131, 107, 76 and 105]. In-depth discussion of management indicator species habitats and their populations are contained in the addendum to the wildlife specialist report that is contained in the project record [131].

Two of the Threatened and Endangered wildlife, fish and plant species have critical habitat designations. First, the Mexican spotted owl has approximately 58,500 acres of the Project area lies within Critical Habitat Unit GM10, within the Gila Mountains Recovery Unit. Only areas classified as restricted or protected habitat within the CHU make up the actual acres of critical habitat (USDI 2000). The protected and restricted habitat acres within the area total approximately 24,200 acres, which is considered the true critical habitat acres of the analysis area.

In addition, Twenty-one PACs lie wholly or partially within the Project Area. Mexican spotted owl PACs makeup about 10,400 acres of the project area, with an additional 9,000 acres of steep slopes providing protected habitat (Table 20).

Table 19. Summary of Threatened and Endangered Wildlife, Fish, and Plant Species in the Project Area.

SPECIES NAME	SCIENTIFIC NAME	LISTING STATUS[6]	STATUS IN AREA
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	END, S1B, S1N, SEN	Potential Habitat
Bald Eagle	*Haliaeetus leucocephalus*	THR, S1B, S3N, SEN	Present
Mexican Spotted Owl	*Strix occidentalis lucida*	THR, S3S4, SEN	Present
Little Colorado Spinedace	*Lepidomeda vittata*	THR, S1, SEN	Persent
Chiricahua Leopard Frog	*Rana chiricahuensis*	THR, S3, SEN	Potential Habitat

Table 20: Breakdown of Mexican spotted owl habitat classifications on the Project Area.

MSO HABITAT	ACRES
Protected Habitat	
PACs	10,400 acres
Steep slopes in Mixed Conifer	9,000 acres
Restricted Habitat	
Target Threshold Habitat	3,500 acres
Mixed Conifer, Restricted	8,000 acres
Pine-Oak, Restricted	0 acres
Unrestricted Habitat	
Ponderosa Pine Habitat	40,000 acres

The Little Colorado spinedace is the second species with critical habitat designation within the analysis area. Critical habitat was designated at the time of the listing of spinedace as a threatened species, and includes 31 miles of East Clear Creek within the Coconino National Forest. This critical habitat extends from the East Clear Creek/ Leonard Canyon confluence, upstream to Blue Ridge Reservoir; and from the upper end of the reservoir to Potato Lake. As stated, the description of designated critical habitat within East Clear Creek excludes that reach occupied by the Blue Ridge Reservoir. Those portions of ECC immediately associated with the

[6] Listing status refers to a species Federal, State, or Forest Service designation. Federal status refers to the species having status under the authority of the Endangered Species Act. A designation of endangered (END), threatened (THR), or proposed (P) is given. State status refers to species of concern identified within the state of Arizona. State status may indicate the status of a species on a Global (G), National (N), or Statewide (S) basis, with a ranking of (1) critically imperiled due to extreme rarity (<5 locations) or biologically vulnerable, (2) Imperiled due to rarity (6-20 locations) or other factors of vulnerability, or (3) either very rare throughout its range or locally restricted (21-100 locations) or other factors of vulnerability throughout its range. Forest Service status refers to those species identified in the Regional Forester's Sensitive Species List (Region 3, July 21, 1999). These are designated as sensitive (SEN).

project area include about six miles below Blue Ridge Reservoir, and about eight miles above the reservoir.

Table 21. Summary of Sensitive Wildlife, Plants, and Fish in the Project Area.

SPECIES NAME	SCIENTIFIC NAME	LISTING STATUS[7]	STATUS IN PROJECT AREA
Birds			
American peregrine falcon	*Falco peregrinus anatum*	S2B, S2N, SEN	Present
Common Black Hawk	*Buteogallus anthracinus*	S2B, S3N, SEN	Present
Northern goshawk	*Accipiter gentilis*	S2B, S2N, SEN	Present
Amphibeans and Reptiles			
Northern Leopard Frog	*Rana pipiens*	SEN	Historic in aquatic
Southwestern (Arizona) Toad	*Bufo microscaphus*	S2. SEN	Historic in Drainages
Narrow-headed gartersnake	*Thamnophis rufipunctatus*	SEN	Potential in Drainages
Fish			
Little Colorado Sucker	*Catostomus* spp. 3	S2, SEN	Present in ECC
Roundtail Chub	*Gila robusta*	S2, SEN	Present in ECC
Insects			
Mountain Silverspot Butterfly	*Speyeria nokomis nitocris*	SEN	Potential in Riparian
Blue-black Silverspot Butterfly	*Speyeria nokomis nokomis*	SEN	Potential in Riparian
Spotted Skipperling	*Piruna polingii*	SEN	Potential in Riparian
Maricopa Tiger Beetle	*Cicindela oregona Maricopa*	S3, SEN	Potential in Drainages
Hairy-necked Tiger Beetle	*Cicindela hirticollis corpuscula*	S2, SEN	Potential in drainages Drainages
Plants			
Arizona Bugbane	*Cimicifuga arizonica*	S2S3, SEN	Potential in Steep Canyons
Mogollon Thistle	*Cirsium parryi ssp. mogollonicum*	S1, SEN	Present in Riparian
Eastwood Alum Root	*Heuchera eastwoodiae*	S3, SEN	Potential in Drainages

[7] Listing status refers to a species Federal, State, or Forest Servie designation. Federal status refers to status under the authority of the Endangered Species Act as endangered (END), threatened (THR), or Proposed (P). State status refers to species of concerns for the state of Arizona (S), with a ranking of (1) critically imperiled due to extreme rarity or biologically vulnerable, (2) imperiled due to rarity or other factors of vulnerability, or (3) either very rare throughout its range or locally restricted or other factors of vulnerability throughout its range. Forest Service states (SEN) refers to species identified in the Regional Forester's Sensitive Species Lits (Region 3, July 21, 1999).

SPECIES NAME	SCIENTIFIC NAME	LISTING STATUS[7]	STATUS IN PROJECT AREA
Cliff Fleabane	*Erigeron saxatilis*	S2, SEN	Present on Cliff Faces
Rusby's Milkvetch	*Astragalus rusbyi*	SEN	Potential In Uplands
Flagstaff Pennyroyal	*Hedeoma diffusum*	S3, SEN	Potential In Uplands
Arizona Sneezeweed	*Helenium arizonicum*	S3, SEN	Potential in Drainages
Flagstaff Beardtongue	*Penstemon nudiflorus*	SEN	Potential In Uplands
Early Elfin	*Incisalia fotis*	SEN	Potential in Uplands
Clams			
California Floater	*Anodonta californiensis*	SEN	Present in Aquatic

Table 22: Management Indicator Species by Management Area within the Analysis Area

Management Indicator Species	*MA3*	*MA4*	*MA5*	*MA6*	*MA7*	*MA9*	*MA12*	*MA19*
Turkey	X	X						
Northern Goshawk	X	X						
Pygmy Nuthatch	X	X						
Elk	X	X		X	X	X		
Abert's Squirrel	X	X		X				
Red Squirrel	X	X						
Hairy Woodpecker	X	X		X				
Mexican Spotted Owl	X	X						
Red-Naped Sapsucker			X					
Mule Deer			X	X	X			
Cinnamon Teal							X	
Macroinvertebrates							X	
Lincoln's Sparrow							X	
Yellow breasted Chat							X	
Lucy's Warbler							X	
Pronghorn						X		
Plain Titmouse					X		X	
No Mgt Ind Species								X

Table 22: The table lists the management indicator species (MIS) as indicated within the Coconino National Forest Plan for the respective management areas that occur within the East Clear Creek Watershed Health Analysis Area. The list of management areas follows directly below. * Note that MA7, MA9, MA10 represent less than 0.1% of the project area and do not provide adequate habitat for two MIS, pronghorn and plain titmouse. In addition, the yellow-breasted chat and Lucy's warbler are MIS species for MA12, but are lower elevation riparian species, and are not found within the elevational range of the analysis area. Lincoln's sparrow is a very high elevation riparian species, and is not found within the lavational range of the analysis area. Cinnamon teal is associated with wetlands in MA12, of which there are less than 5 acres in the analysis area. These six species are not considered MIS for this project.

Table 23: Forestwide habitat and population trends for MIS in the project area.

SPECIES	HABITAT	FORESTWIDE HABITAT TRENDS	FORESTWIDE POPULATION TRENDS
Wild Turkey	Late seral ponderosa pine	declining	stable
Northern Goshawk	Late seral ponderosa pine	declining	inconclusive
Mexican spotted owl	Late seral mixed conifer	declining	inconclusive
American Elk	Early seral ponderosa pine, and mixed conifer	increasing,	declining
Hairy woodpecker	Snag component	pine snags declining; fir snags increasing	stable-to-slightly increasing
Pygmy Nuthatch	Late seral ponderosa pine	declining	stable
Abert Squirrel	Early seral ponderosa pine	stable	inconclusive
Red Squirrel	Late seral mixed conifer	decline	unknown
Red-naped sapsucker	Aspen Snags	stable	stable
Mule deer	Early seral aspen	declining	declining
Cinnamon Teal	Open water Seasonal wetlands	stable stable, below potential	inconclusive
Lincoln's sparrow	Late seral high riparian	stable, below potential	inconclusive
Macroinvertebrates	High elevation riparian	stable	stable

Wildlife Environmental Consequences

Effects of Alternative 1 on Wildlife

This effects discussion will be a summary of two specialists reports, the general wildlife specialists report [99,107] and the fisheries specialists report [76, 105]. The complete discussion of effects to species can be found in those documents. A summary of effects can be found in the following tables on the first row of each table: Table 24 summarizes the affects to aquatic species, Table 25 summarizes the effects to management indicator species (MIS), Table 26 summarizes the effects to sensitive species, and Table 27 summarizes the effects to Federally listed Endangered, Threatened, and Proposed for Listed. All effects include the implementation of applicable BMP's that are outlined in the mitigation section in Chapter 2 (Table 8).

Effects of Alternatives 2 On Wildlife

This effects discussion will be a summary of two specialists reports, the general wildlife specialists report [99,107, 130] and the fisheries specialists report [76, 105]. The complete discussion of effects to species can be found in those documents. Table 24 summarizes the affects to aquatic species, Table 25 summarizes the effects to management indicator species (MIS), Table 26 summarizes the effects to sensitive species, and Table 27 summarizes the effects to Federally listed Endangered, Threatened, and Proposed for Listed species by project for Alternative 2. All effects include the implementation of applicable BMP's that are outlined in the mitigation section in Chapter 2 (Table 8).

Table 24 : Summary of Watershed Health Effects On Little Colorado spinedace and aquatic dependent species and their Habitat

Activity	Spinedace Habitat	General Fish/Aquatic Habitat
No Watershed Health Actions (Alternative 1)	Negative – Indirect Effect short-term. With the elimination of all protective ground cover following a catastrophic fire, the immediate effects are an increase in total water yield and storm-flow discharge. Surface erosion is greatly increased by the increase in water runoff over the exposed ground surface. This surface runoff and associated surface erosion generally transports large volumes of water, sediment, organic debris, and dissolved nutrients from the slopes to the drainage channels could damage or eliminate stocked spinedace and/or stocking sites. Possible positive indirect effect long-term: Benefits to fish habitat conditions can sometimes be realized following a catastrophic fire. The addition of large woody debris tends to improve habitat diversity by providing cover and creating new spawning, incubation, and rearing areas. Addition of nutrients to a stream may benefit relatively sterile streams. Nutrients would help to support additional plant and animal life that provides a food source for fish	Same as effect to spinedace habitat.
Prescribed burning to reduce fuel hazard on 22,600 acres (Alternative 2)	Negative – Indirect Effect (short-term) Potential for transport and/or loading of silt and ash within potential stock sites: Dane, Yeager, General Springs, & Houston Draw. BMP's minimize the potential effect. Positive - Indirect Effect (long-term) Reduced risk of catastrophic fire effects and some nutrient flush to streams.	Negative – Indirect Effect (short-term) Potential for transport and/or loading of silt and ash within associated stream channels. BMP's minimize the potential effect. Positive - Indirect Effect (long-term) Reduced risk of high amounts of silt and ash loading to stream channel rendering water quality and embedded substrates uninhabitable.

Activity	Spinedace Habitat	General Fish/Aquatic Habitat
Prescribed burning to reduce fuel hazard on 23,000 acres (Alternative 3 and 4)	Negative – Indirect Effect (short-term) Potential for transport and/or loading of silt and ash within potential stock sites: Dane, Yeager, General Springs, & Houston Draw. BMP's minimize the potential effect. Positive - Indirect Effect (long-term) Reduced risk of catastrophic fire effects and some nutrient flush to streams.	Negative – Indirect Effect (short-term) Potential for transport and/or loading of silt and ash within associated stream channels. BMP's minimize the potential effect. Positive - Indirect Effect (long-term) Reduced risk of high amounts of silt and ash loading to stream channel from stand-replacing wildfire rendering water quality and embedded substrates uninhabitable.
Thinning to reduce fuel hazard generally up to 12" and improve understory biodiversity on 9,600 acres (Alternative 2-4)	Little to no accountable effect. Very slight possibility for supplemental ground water storage and release into Miller Cyn and General Springs Canyon from reduced canopy treatment in largest thinning block on Battleground Ridge. Drainages may experience increased flows during snowmelt.	Little to no accountable effect. Very slight possibility for supplemental ground water storage and release into Miller Cyn and General Springs Canyon from reduced canopy treatment in largest thinning block on Battleground Ridge. Drainages may experience increased flows during snowmelt
Commercial thinning trees generally 5-20" dbh to reduce fuel hazard and improve understory biodiversity on 670 acres (Alternative 2-4)	Little to no accountable effect. Very slight possibility for supplemental ground water storage and release into Dane Canyon. Drainages may experience increased flows during snowmelt.	Little to no accountable effect. Very slight possibility for supplemental ground water storage and release into Dane canyon. Drainages may experience increased flows during snowmelt
Commercial thinning trees generally 5-18" dbh to reduce fuel hazard and improve understory biodiversity on 1,050 acres (Alternative 2-4)	Little to no accountable effect. Very slight possibility for supplemental ground water storage and release into East Clear Creek. Drainages may experience increased flows during snowmelt.	Little to no accountable effect. Very slight possibility for supplemental ground water storage and release into East Clear Creek. Drainages may experience increased flows during snowmelt
Thin fuelbreaks along main roads on approximately 1,250 acres (Alternatives 3 and 4)	Little to no accountable effect. Very slight possibility for supplemental ground water storage and release into East Clear Creek. Drainages may experience increased flows during snowmelt. Indirect positive effect to possibly minimize large wildfire potential along main travel routes.	Little to no accountable effect. Very slight possibility for supplemental ground water storage and release into East Clear Creek. Drainages may experience increased flows during snowmelt. Indirect positive effect to possibly minimize large wildfire potential along main travel routes.
Remove tanks and rehabilitate site @ Dick Hart (Alternative 2-4)	No direct effect, due to implementation of project specific BMP's. Some potential for short-term sediment increase from project to ECC below the reservoir. Long-term reduction of sediments from this site.	Short-term negative effect from pulse of project induced sediment transported through respective drainages and habitat disturbance on-site for frog species (if present). Long-term positive effect from reduction in contributed sediment loading and transport through respective drainages, as well as return to a more natural hydrograph.
Natural channel design, layback banks/hydromulch Barbershop Canyon, Houston Draw, Lockwood Draw, East Bear Canyon, Buck Springs, Dick Hart Draw, Kinder Draw, and Bill McClintock Draw meadows (Alternative 2-4)	Depending on timing of installation, may have short-term negative effect on previously stocked spinedace in Houston Draw and in Bear Canyon below the confluence with East Bear Canyon. This effect is mitigated through BMP's. Long-term positive effect from reduced contribution of sediment from treated banks and improved storage capacity will increase duration of flow.	Short-term negative effect from pulse of project induced sediment transported through respective drainages. This effect is mitigated through BMP's. Long-term positive effect from reduction in contributed sediment loading and transport through respective drainages. Improved storage capacity will increase duration of flow.

Activity	Spinedace Habitat	General Fish/Aquatic Habitat
Thin trees generally up to 16 inches DBH on a total of approximately 83 acres in upland areas above Merritt, McFarland, Limestone Tank and Upper Buck Springs to increase flow duration of springs (Alternative 2-4)	No direct effect to spinedace. Short-term positive effect from increased flows.	No direct effect to aquatic species. Short-term positive effect from increased flows.
Raise culverts to create ponded wetlands Dick Hart and 321C (Alternative 2-4)	No effect unless spinedace are stocked into Dane Canyon.	Short-term negative effect from pulse or project induced sediment. Possible increase in pool habitat down drainage should substantial ponding occur above treated site.
Rehabilitate or remove any stream channel wood structures located in Buck Springs and Houston Draw that are not functioning properly (Alternative 2-4)	Depending on timing of rehab work, may have short-term negative effect from project generated sediment potential stocking sites in Buck Springs & on a stocking site in Houston Draw. Sediment production from this work is minimized by BMP's. Long-term positive effect from reduced contribution of sediment from treated channel cutting.	Short-term negative effect from pulse of project induced sediment transported through respective drainages. Long-term positive effect from reduction in contributed sediment loading and transport through respective drainages.
Stabilize stream crossings (Alternative 2-4)	No direct effect to occupied spinedace habitat. Short-term negative effect watershed-wide from pulse of project induced sediment transported through respective drainages. Long-term positive effects watershed-wide from reduction in contributed sediment loading and transport through respective drainages from existing source areas.	Short-term negative effect from pulse of project induced sediment transported through respective drainages. Long-term positive effects from reduction in contributed sediment loading and transport through respective drainages from existing source areas.
Install pole fence along 321C at meadow sections (Alternative 2-4)	Possibility of short-term negative effect from project generated sediment transport through system is very slight. Possibility for long-term positive effects in reduced sediment transport and slight increase in downstream water yield to future stocking site in Dane Canyon.	Short-term negative effect from pulse of project induced sediment transported through respective drainages. Long-term positive effects from reduction in contributed sediment loading and transport through respective drainages from existing source areas. Possible increase in pool habitat from ponded wetlands.
Relocate 643A road w/ semi-permeable fill road (Alternative 2-4)	Possibility of short-term negative effect from project generated sediment transport through system in Yeager Canyon. Possibility for long-term positive effects in reduced sediment transport and slight increase in downstream water yield to future stocking site in Yeager Canyon through improved storage in Yeager Canyon headwaters.	Short-term negative effect from pulse of project induced sediment transported through respective drainages. Long-term positive effects from reduction in contributed sediment loading and transport through respective drainages from existing source areas.
Pave locations on 95/96 roads (Alternative 2-4)	Short-term negative effect from project generated sediment transport through drainages. Long-term positive effects in reduced sediment transport and loading within the stream channels of the future stocking sites in Yeager Cyn and Houston Draw. Reduced sediments from 95/96 road at ECC.	Short-term negative effect from pulse of project induced sediment transported through respective drainages. Long-term positive effect from reduction in contributed sediment loading and transport through respective drainages from existing source areas.

Activity	Spinedace Habitat	General Fish/Aquatic Habitat
Remove encroaching conifers in meadow systems up to 9 inches in Bear Canyon, Houston Draw, Barbershop Canyon, Buck Springs, Bill McClintock Draw, Kinder Draw, East Bear Canyon, General Springs, Holder Cabin, Merritt Draw, Middle Leonard Canyon, West Leonard Canyon, and McClintock Springs meadows. Slash would be lopped and scattered to a 2-foot height across meadows (Alternative 2-4)	Improved soil condition in meadows will improve storage potential and duration of water flow. Drainages may experience increased flows during snowmelt. Improvement in meadow habitat may help to improve PFC in Buck Springs, Holder, General Springs, Houston and Merritt Draws.	Improved soil condition in meadows will improve storage potential and duration of water flow. Drainages may experience increased flows during snowmelt. Improvement in meadow habitat may improve PFC.
Create area closures at Dane Springs and Dines Tank for protection of LC spinedace habitat (Alternatives 2-4) (Alternative 2-4)	Short-term negative effect from project generated sediment transport through Dane Canyon and Dines Tank. Long-term positive effects in reduced sediment transport and loading within the stream channels of the future stocking sites in Dane Canyon. Long-term protection of known spinedace location at Dines Tank.	Short-term negative effect from pulse of project induced sediment transported through respective drainages. Long-term positive effects from reduction in contributed sediment loading and transport through respective drainages from existing source areas.
Designate open road system of 347 miles (Alternative 2)	Open road system is designed to minimize impacts from roads to drainages, but is administrative in nature and no ground disturbance is expected to occur. Some road disturbance still associated with Bill McClintock Draw on open road FR 321C (Dane Canyon). Other actions to minimize road disturbance (meadow fencing, ponded wetlands along 321C) will minimize current effects to spinedace in Dane Canyon. Overall, decrease of open roads over current will improve water flow watershed-wide and decrease peak flows.	Open road system is designed to minimize impacts from roads to drainages, but is administrative in nature and no ground disturbance is expected to occur. Overall, decrease of open roads over current will improve water flow watershed-wide and decrease peak flows.
Reopen 3.1 miles of currently closed road to create a recreation loop (Alternative 2)	No direct effect, is bench road above Yeager Canyon. Adequate buffer occurs to dissipate any sediments.	No direct effect, is bench road above Yeager Canyon. Adequate buffer occurs to dissipate any sediments.
Close 18.5 miles of currently open roads (Alternative 2)	Possibility of short-term negative effect from project generated sediment transport through system on the total of 18.5 miles of closure (not all closures have stream connections, so upland road closures will have minimal impact). No closures are directly tied to spinedace habitat. Long-term improvement in water quality through decreased sediment production. Overall long-term improved baseline in habitat conditions. The Dane Canyon (808D) and Limestone Canyon (808E) 6th code watersheds are the sub-watersheds where the most miles of road closure will occur (approximately 4 miles in each sub-watershed).	Possibility of short-term negative effect from project generated sediment transport through system on the total of 18.5 miles of closure. Long-term improvement in water quality through decreased sediment production specifically on 3.4 miles of road in riparian areas/meadows (FR's 9707J,9712U, 9714L, 9733N, 9734T, and 9738N).

Activity	Spinedace Habitat	General Fish/Aquatic Habitat
Decommission and obliterate 17.9 miles of currently open roads (Alternative 2)	Possibility of short-term negative effect from project generated sediment transport through system on the total of 17.9 miles of decommissioning. 2.7 miles of decommissioning are directly tied to spinedace habitat (FR 298, 298A, 9722W and 9737R) have highest potential to disturb spinedace habitat. BMP's will minimize potential sediment impacts. Long-term improvement in water quality through decreased sediment production. Overall long-term improved baseline in habitat conditions	Possibility of short-term negative effect from project generated sediment transport through system on the total of 17.9 miles of decommissioning. Long-term improvement in water quality through decreased sediment production. This includes portions of 19 roads that have connections to riparian and non-riparian streamcourses for decommissioning (8.8 miles).
Decommission and obliterate 14.7 miles of currently closed roads (Alternative 2-4)	Possibility of short-term negative effect from project generated sediment transport through system on the total of 14.7 miles of decommissioning. 4.8 miles of decommissioning are directly tied to spinedace habitat (FR 9714X and 9735P).	Possibility of short-term negative effect from project generated sediment transport through system on the total of 14.7 miles of decommissioning. Seven roads for 13.9 miles are directly related to riparian/stream impacts (643A, 9707W, 9714Q, 9714X, 9733Y, 9735P, and 9737Q).
Relocate .8 miles of currently open road (Alternative 2 and 3)	Road relocation is out of meadow, will improve soil condition on rehabilitated old road bed for 1.4 acres in the Dane Canyon drainage area. Slight possibility of sediment displacement during project implementation. No direct effect to spinedace. Overall long-term improved baseline in habitat conditions	Road relocation is out of meadow, will improve soil condition on rehabilitated old road bed for 1.4 acres in the Dane Canyon drainage area. Slight possibility of sediment displacement during project implementation.
Designate open road system of 322 miles (Alternative 3)	Open road system is designed to minimize impacts from roads to drainages, but is administrative in nature and no ground disturbance is expected to occur. Some road disturbance still associated with Bill McClintock Draw on open road FR 321C (Dane Canyon). Other actions to minimize road disturbance (meadow fencing, ponded wetlands along 321C) will minimize current effects to spinedace in Dane Canyon. Overall, decrease of open roads over current will improve water flow watershed-wide and decrease peak flows.	Open road system is designed to minimize impacts from roads to drainages, but is administrative in nature and no ground disturbance is expected to occur. Overall, decrease of open roads over current will improve water flow watershed-wide and decrease peak flows.

Activity	Spinedace Habitat	General Fish/Aquatic Habitat
Close 36.7 miles of currently open roads (Alternative 3)	Disturbance areas where roads will be obliterated are above non-riparian, ephemeral drainages, with the exception of eleven road segments that have connections to non-riparian streamcourses on the following roads: 719, 00137C, 00141A, 00141B, 00321C, 00600A, 00726D, 06033C, 09030N, 09616A, 09616B, 09711L, 09712T, 09712Y, 09714E, 09714G, and 09729K. Short-term pulses of soil movement into these drainages are not expected to adversely impact downstream fish habitat for the LC spinedace. The Dane Canyon (808D) and Houston Draw (808E) 6th code watersheds are the sub-watersheds where the most miles of road closure will occur (approximately 4 miles in each sub-watershed). Overall long-term improved baseline in habitat conditions	Same as spinedace—no expected negative effect to fishery/amphibian habitat, but possible long-term improvement through reduction of sediment sources watershed-wide.
Decommission and obliterate 30.9 miles of currently open roads (Alternative 3)	The following roads are scheduled for decommissioning and have connections to riparian streamcourses: 298, 09031G, 09713G,723, 09031J, 09714F, 00298A, 09616B, 09722W, 00321C, 09707A, 09737R, 06033C, 09707L, 09737Y, 09030D, and 09711P. There is a direct connection to occupied spinedace habitat with FR 298, 298A, 9722W, and 9737W. The remaining roads have connections to potential spinedace habitat. There may be some short-term sediment from construction activities that will be minimized by BMP's, with an overall long-term improvement in riparian conditions through removed roads and reduction of sediments. Overall long-term improved baseline in habitat conditions	Overall, all roads listed in spinedace section have potential negative short-term affect from construction related activities. Long-term benefits will occur through decreased sediment production.
Designate open road system of 225 miles (Alternative 4)	Open road system is designed to minimize impacts from roads to drainages, but is administrative in nature and no ground disturbance will occur. The effect to fish habitat will be a longer duration of water within the watershed as a whole due to decreased road density, thus there will be more potential for fish habitat within the watershed, and especially pools that retain Little Colorado spinedace.	Open road system is designed to minimize impacts from roads to drainages, but is administrative in nature and no ground disturbance will occur. The effect to fish habitat will be a longer duration of water within the watershed as a whole due to decreased road density, thus there will be more potential for fish habitat within the watershed.

Activity	Spinedace Habitat	General Fish/Aquatic Habitat
Close 125.4 miles of currently open roads (Alternative 4)	Improvement toward a more natural water flow off these areas, and dampening of peak flow, could favor enhanced groundwater storage and subsequent baseflows downstream. The Leonard Canyon (808b) and Houston Draw (808E) 6th code watersheds are the sub-watersheds where the most miles of road closure will occur (approximately 33 miles of road closure in each sub-watershed). The Dane Canyon 6th code watershed (808D) will also have approximately 20 miles of road closure in this alternative. The Yeager Canyon 6th code watershed (808c) will have the open road density decreased by nearly 8 miles. Overall long-term improved baseline in habitat conditions	Improvement toward a more natural water flow off these areas, and dampening of peak flow, could favor enhanced groundwater storage and subsequent baseflows downstream. The Leonard Canyon (808b) and Houston Draw (808E) 6th code watersheds are the sub-watersheds where the most miles of road closure will occur (approximately 33 miles of road closure in each sub-watershed). The Dane Canyon 6th code watershed (808D) will also have approximately 20 miles of road closure in this alternative. The Yeager Canyon 6th code watershed (808c) will have the open road density decreased by nearly 8 miles.
Decommission and obliterate 36.7 miles of currently open roads (Alternative 4)	The following roads are scheduled for decommissioning and have connections to riparian streamcourses: 298, 06033C, 09713G, 600, 09030D, 09713L, 723, 09031J, 09714F, 732, 09707A, 09714G, 00298A, 09707L, 09722W, 00321C, 09708T, 09735P, 00600A, 09711L, 09737R, 09737Y. There is a direct connection to occupied spinedace habitat with FR 298, 298A, 9722W, and 9737W. The remaining roads have connections to potential spinedace habitat. There may be some short-term sediment from construction activities that will be minimized by BMP's, with an overall long-term improvement in riparian conditions through removed roads and reduction of sediments. Overall long-term improved baseline in habitat conditions	Overall, all roads listed in spinedace section have potential negative short-term affect from construction related activities. Long-term benefits will occur through decreased sediment production.

Table 24: Table of effects of Little Colorado spinedace and associated aquatic species and their habitat [76,99,105,107, 126]. The table displays descriptions of expected effects from proposed projects to potential spinedace stocking sites as well as general fish/aquatic habitat. Other aquatic species include the following species (Little Colorado spinedace, bluehead sucker, roundtail chub, Little Colorado sucker, narrow-headed garter snake, arizona southwestern toad, northern leopard frog, macroinvertebrates and the Chiricahua leopard frog).

Table 25: Summary of Effects to Management Indicator Species

Species / Activity	Turkey	Northern Goshawk	Pygmy Nuthatch	Elk	Abert's Squirrel	Red squirrel	Hairy woodpecker	Red-naped sapsucker	Mule Deer
No Watershed Health Actions (Alternative 1)	No disturbance from implementation, decline in understory seed production as canopies close. Increased threat of stand-replacing fire.	No disturbance from implementation, prey base of squirrels may show potential increase with thick canopies. Increased threat of stand-replacing fire.	No disturbance from implementation, potential increase in snags due to drought. No recruitment for yellow pines due to suppressed slow growth/increased mortality from competition affects yellow pine habitat component. Increased threat of stand-replacing fire.	Stable population, increasing hiding cover through regeneration, disturbance from roads same, but may increase with human population increase will have increased use. Increased threat of stand-replacing fire.	Increase in small tree component and no disturbance from implementation activities. Increased threat of stand-replacing fire.	Increased threat of stand-replacing fire. No disturbance from implementation.	Increased threat of stand-replacing fire. No disturbance from implementation	Increased threat of stand-replacing fire. No disturbance from implementation	Increasing hiding cover through regeneration, disturbance from roads same, but may increase with human population Increased threat of stand-replacing fire. Decrease of understory biodiversity and less browse species.
Prescribed burning to reduce fuel hazard on 22,600 acres (Alternative 2)	Increase in understory vegetative production from nutrient flush. Prescribed burning would likely convert 35 acres of combo cover to thermal cover. Spring burning may cause young to abandon nests. Overall, foraging would improve for turkeys, while nesting cover may decline slightly. There may be loss of a few older trees during burning that may affect roost, but this is expected to be extremely low in incidence. There would be a decreased threat of wildfire.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Possible improved conditions for prey due to improved understory conditions, so improvement in prey availability. About 1,000 acres of burned proposed in PFA's could disturb reproductive activities if during vreeding season. BMP to mitigate this will burn outside of breeding season on these acres. Burning would have little direct effect to late seral stage habitat.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. BMP's to protect snags will minimize snag loss, but still expect approximately a 10% loss of snags from burns—some snag creation through fire. Burning during the nesting season may reduce bird populations by negatively affecting young.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Improved understory nutrients from burn. Some loss of hiding/thermal cover on ridge tops, remaining cover exists in draws and canyons and is abundant. Hiding cover will decrease by about 90 acres. Prescribed burning would likely convert combo cover to thermal cover.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some loss of tree component may negatively effect ability of squirrels to move from predators. Possible short-term reduction in fungi production, especially in moderate to high intensity burn sites.	Similar effects as Abert's squirrel, however are less throughout the analysis due to the small acreage of treatments in the mixed conifer.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. BMP's to protect snags will minimize snag loss—some snag creation through fire. Burning during the nesting season may reduce bird populations by negatively affecting young.	Decrease of threat of stand replacing fire which could negatively effect aspen production in the long term, some short-term disturbance during implementation. Burns may stimulate aspen regeneration, but without protection from grazing ungulates will not improve aspen conditions in the long run. Burning during the nesting season may reduce bird populations by negatively affecting young.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Burning will open canopy and allow for increased understory vegetative response. Prescribed burning, will increase seed germination of prime browse specie (*Ceanothus fendlerii).*
Prescribed burning to reduce fuel hazard on 23,000 acres (Alternative 3 and 4)	Increase in understory vegetative production from nutrient flush. Spring burning may cause young to abandon nests. Overall, burning is expected to improve understory conditions by removing dense pine reproduction which is overtaking small openings, thereby improving breeding, brooding, and loafing habitat. There would be a decreased threat of wildfire.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Possible improved conditions for prey due to improved understory conditions, so improvement in prey availability. About 1,000 acres of burned proposed in PFA's could disturb reproductive activities if during vreeding season. BMP to mitigate this will burn outside of breeding season on these acres. Burning would have little direct effect to late seral stage habitat.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. BMP's to protect snags will minimize snag loss, but still expect approximately a 10% loss of snags from burns—some snag creation through fire. Burning during the nesting season may reduce bird populations by negatively affecting young.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Improved understory nutrients from burn. Some loss of hiding/thermal cover on ridge tops, remaining cover exists in draws and canyons and is abundant. Burning will occur on approximately 960 acres of combination, 70 acres of hiding, and 1,300 acres of thermal cover will probably have small wholes opened up within groups. Prescribed burning would likely convert combo cover to thermal	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some loss of tree component may negatively effect ability of squirrels to move from predators. Possible short-term reduction in fungi production, especially in moderate to high intensity burn sites.	Similar effects as Abert's squirrel, however are less throughout the analysis due to the small acreage of treatments in the mixed conifer.			

Species / Activity	Turkey	Northern Goshawk	Pygmy Nuthatch	Elk	Abert's Squirrel	Red squirrel	Hairy woodpecker	Red-naped sapsucker	Mule Deer
				cover.					
Thinning to reduce fuel hazard and improve understory biodiversity on 9,600 acres on trees generally up to 12" dbh (Alternative 2-4)	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Increase in understory vegetation through opening of canopies, and slash after thin (subsequent prescribed burn on activity fuels may decrease the acres of cover. Overall, foraging would improve for turkeys, while nesting cover may decline slightly. Late seral stage habitat would likely increase over the long-term, as trees grow faster.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Existing nesting areas are not proposed for treatment, so would not directly impact goshawks, increase in down woody material short-term could increase prey species availability. Removing small diameter trees will create three aged-stands (uneven-aged) over a majority of the sites, thus moving towards goshawk guidelines.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. No snags or large trees cut, so no direct effect, could have long-term benefit in stand structure through increased growth rates.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some loss of hiding/thermal cover on ridge tops, remaining cover exists in draws and canyons and is abundant. Increase light to forest floor will stimulate increased production of grass, forb, browse species should increase forage.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Loss of tree component may negatively effect ability of squirrels to move from predators, however, overstory will remain intact, therefore effect is small. Increase in fungi production will improve food source.	Similar effects as Abert's squirrel, however are less throughout the analysis due to the small acreage of treatments in the mixed conifer.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. No snags or large trees cut, so no direct effect, could have long-term benefit in stand structure through increased growth rates.	Decrease of threat of stand replacing fire which could negatively effect aspen production in the long term, some short-term disturbance during implementation.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Thinning will open canopy and allow for increased understory vegetative response. In combination with prescribed burning, will increase seed germination of prime browse specie (*Ceanothus fendlerii).* Some loss of cover (conversion of 35 acres of combo cover to thermal cover, reduction of hiding cover by 55 acres.)
Commercial thinning trees generally 5-20" dbh to reduce fuel hazard and improve understory biodiversity on 670 acres (Alternative 2-4)	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Increase in understory vegetation through opening of canopies, some hiding cover creation short-term through slash. Overall, foraging would improve for turkeys, while nesting cover may decline slightly. Late seral stage habitat would likely increase over the long-term, as trees grow faster.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Existing nesting areas are not proposed for treatment, so would not directly impact goshawks, increase in down woody material short-term could increase prey species availability.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Thin from below on 670 acres should not affect large-tree component, Long-term benefit in stand structure through increased growth rates in trees to get to a large tree component quicker.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some loss of hiding/thermal cover on ridge tops, remaining cover exists in draws and canyons and is abundant. Increase light to forest floor will stimulate increased production of grass, forb, browse species should increase forage.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Loss of tree component may negatively effect ability of squirrels to move from predators.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Loss of tree component may negatively effect ability of squirrels to move from predators.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Thin from below on 670 acres should not affect large-tree component, Long-term benefit in stand structure through increased growth rates in trees to get to a large tree component quicker.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. No direct effect from treatment because not treating aspen sites. Opening of canopy in mixed conifer may produce aspen regeneration that could be beneficial long-term, but without protection from grazing ungulates will not improve aspen conditions in the long run.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Thinning will open canopy and allow for increased understory vegetative response. In combination with prescribed burning, will increase seed germination of prime browse specie (*Ceanothus fendlerii).*
Commercial thin trees generally 5-18 in dbh on 1,052 acres to reduce fuel hazard and improve understory biodiversity (Alternative 3 and 4 only)	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Increase in understory vegetation through opening of canopies, some hiding cover creation for small mammals short-term through slash. Overall, foraging would improve for turkeys, while nesting cover may decline slightly. Late seral stage habitat would likely increase over the long-term, as trees grow faster.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Existing nesting areas are not proposed for treatment, so would not directly impact goshawks, increase in down woody material short-term could increase prey species availability. Unveven-aged prescriptions will move toward goshawk guidelines.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some removal of large tree component possible on uneven-aged prescriptions (none over 24" DBH), could have effect on 400 acres, Long-term benefit in stand structure through increased growth rates in trees to get to a large tree component quicker.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some loss of hiding/thermal cover on ridge tops, remaining cover exists in draws and canyons and is abundant. Increase light to forest floor will stimulate increased production of grass, forb, browse species should increase forage.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Loss of tree component may negatively effect ability of squirrels to move from predators.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Loss of tree component may negatively effect ability of squirrels to move from predators.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some removal of large tree component possible on uneven-aged prescriptions (none over 24" DBH), could have effect on 400 acres, Long-term benefit in stand structure through increased growth rates in trees to get to a large tree component quicker.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. No direct effect from treatment because not treating aspen sites.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Thinning will open canopy and allow for increased understory vegetative response. In combination with prescribed burning, will increase seed germination of prime browse specie (*Ceanothus fendlerii).*

Species / Activity	Turkey	Northern Goshawk	Pygmy Nuthatch	Elk	Abert's Squirrel	Red squirrel	Hairy woodpecker	Red-naped sapsucker	Mule Deer
Thin fuelbreaks along main roads on approximately 1,250 acres (Alternatives 3 and 4).	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Increase in understory vegetation through opening of canopies, some hiding cover creation for small mammals short-term through slash. Overall, foraging would improve for turkeys, while nesting cover may decline slightly. Late seral stage habitat would likely increase over the long-term, as trees grow faster.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Existing nesting areas are not proposed for treatment, so would not directly impact goshawks, increase in down woody material short-term could increase prey species availability.							
Remove tanks and rehabilitate site @ Dick Hart (Alternative 2-4)	Possible disturbance during implementation, BMP to fence from ungulates after treatment will improve grass-forb production and provide excellent seed production.	No direct effect, some possible disturbance during implementation. Elk proof fence to protect site has potential for avian mortality.	No direct effect, no habitat component tied to meadow area.	Disturbance during implementation. BMP to protect the site will remove approximately 5 acres from elk foraging.	No direct effect, no habitat component tied to meadow area.	Out of mixed conifer, no effect.	No direct effect, no habitat component tied to meadow area.	Out of aspen componet, no direct effect.	Disturbance during implementation. BMP to protect the site will remove approximately 5 acres from deer foraging
Natural channel design, layback banks/hydromulch Barbershop Canyon, Houston Draw, Lockwood Draw, East Bear Canyon, Buck Springs, Dick Hart Draw, Kinder Draw, and Bill McClintock Draw meadows (Alternative 2-4)	Possible disturbance during implementation, BMP to fence from ungulates after treatment will improve grass-forb production and provide excellent seed production.	No direct effect, some possible disturbance during implementation. Elk proof fence to protect site has potential for avian mortality.	No direct effect, no habitat component tied to meadow area.	Disturbance during implementation. BMP to protect the site will remove approximately 123 acres from elk foraging.	No direct effect, no habitat component tied to meadow area.	Out of mixed conifer, no effect.	No direct effect, no habitat component tied to meadow area.	Out of aspen componet, no direct effect.	Disturbance during implementation. BMP to protect the site will remove approximately 123 acres from deer foraging
Thin trees generally up to 16 inches DBH on a total of approximately 83 acres in upland areas above Merritt, McFarland, Limestone Tank and Upper Buck Springs to increase flow duration of springs (Alternative 2-4)	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Increase in understory vegetation through opening of canopies, some hiding cover creation short-term. Possible increase in spring flows would aid turkeys.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Existing nesting areas are not proposed for treatment, so would not directly impact goshawks, increase in down woody material short-term could increase prey species availability.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some removal of large tree component possible (none over 16" DBH), could have effect on 83 acres, Long-term benefit in stand structure through increased growth rates in trees to get to a large tree component quicker.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some loss of hiding/thermal cover on ridge tops, remaining cover exists in draws and canyons and is abundant. Increase light to forest floor will stimulate increased production of grass, forb, browse species should increase forage.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Loss of tree component may negatively effect ability of squirrels to move from predators.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Loss of tree component may negatively effect ability of squirrels to move from predators.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Some removal of large tree component possible (none over 16" DBH), could have effect on 83 acres, Long-term benefit in stand structure through increased growth rates in trees to get to a large tree component quicker.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. No direct effect from treatment because not treating aspen sites. Opening of canopy in mixed conifer may produce aspen regeneration that could be beneficial long-term, but without protection from grazing ungulates will not improve aspen conditions in the long run.	Decrease of threat of stand replacing fire—short-term disturbance during implementation. Thinning will open canopy and allow for increased understory vegetative response. In combination with prescribed burning, will increase seed germination of prime browse specie (*Ceanothus fendlerii).*

Species / Activity	Turkey	Northern Goshawk	Pygmy Nuthatch	Elk	Abert's Squirrel	Red squirrel	Hairy woodpecker	Red-naped sapsucker	Mule Deer
Raise culverts to create ponded wetlands Dick Hart and 321C (Alternative 2-4)	Possible disturbance during implementation, Wet site will produce robust vegetation.	No direct effect, some possible disturbance during implementation.	No direct effect, no habitat component tied to meadow area.	Disturbance during implementation. Improved forage opportunity and watering opportunity for elk.	No direct effect, no habitat component tied to meadow area.	Out of mixed conifer, no effect.	No direct effect, no habitat component tied to meadow area.	Out of aspen componet, no direct effect.	Disturbance during implementation. Improved forage opportunity and watering opportunity for elk.
Rehabilitate or remove any stream channel wood structures located in Buck Springs and Houston Draw that are not functioning properly (Alternative 2-4)	Possible disturbance during implementation, BMP to fence from ungulates after treatment will improve grass-forb production and provide excellent seed production.	No direct effect, some possible disturbance during implementation. Elk proof fence to protect site has potential for avian mortality.	No direct effect, no habitat component tied to meadow area.	Disturbance during implementation. BMP to protect the site will remove approximately 60 acres from elk foraging.	No direct effect, no habitat component tied to meadow area.	Out of mixed conifer, no effect.	No direct effect, no habitat component tied to meadow area.	Out of aspen componet, no direct effect.	Disturbance during implementation. BMP to protect the site will remove approximately 60 acres from deer foraging
Stabilize stream crossings (Alternative 2-4)	Possible disturbance during implementation, is associated with roads so no direct tie to habitat components. Indirect tie to moderated runoff from roads could improve downstream channel conditions and improve possible seed production.	Possible disturbance during implementation, is associated with roads so no direct tie to habitat components.	No direct effect, no habitat component tied to road area.	Possible disturbance during implementation, is associated with roads so no direct tie to habitat components. Indirect tie to moderated runoff from roads could improve downstream channel conditions and improve possible forage production.	No direct effect, no habitat component tied to road area.	No direct effect, no habitat component tied to road area.	No direct effect, no habitat component tied to road area.	No direct effect, no habitat component tied to road area.	Possible disturbance during implementation, is associated with roads so no direct tie to habitat components. Indirect tie to moderated runoff from roads could improve downstream channel conditions and improve possible forage production.
Install pole fence along 321C at meadow sections (Alternative 2-4)	Possible disturbance during implementation. Positive effect as less impact (trampling/compaction) is decreased, improving vegetative conditions and ground cover.	Possible disturbance during implementation. No direct tie to prey/habitat.	No direct effect, no habitat component tied to meadow area.	Possible disturbance during implementation. Positive effect as less impact (trampling/compaction) is decreased, improving vegetative conditions and ground cover.	No direct effect, no habitat component tied to meadow area.	No direct effect, no habitat component tied to meadow area.	No direct effect, no habitat component tied to meadow area.	No direct effect, no habitat component tied to meadow area.	Possible disturbance during implementation. Positive effect as less impact (trampling/compaction) is decreased, improving vegetative conditions and ground cover.
Relocate 643A road w/ semi-permeable fill road (Alternative 2-4)	Possible disturbance during implementation. Positive effect as less impact (trampling/compaction) is decreased, improving vegetative conditions and ground cover.	Possible disturbance during implementation. No direct tie to prey/habitat.	No direct effect, no habitat component tied to meadow area.	Possible disturbance during implementation. Positive effect as less impact (trampling/compaction) is decreased, improving vegetative conditions and ground cover.	No direct effect, no habitat component tied to meadow area.	No direct effect, no habitat component tied to meadow area.	No direct effect, no habitat component tied to meadow area.	No direct effect, no habitat component tied to meadow area.	Possible disturbance during implementation. Positive effect as less impact (trampling/compaction) is decreased, improving vegetative conditions and ground cover.
Pave locations on 95/96 roads (Alternative 2-4)	Possible disturbance during implementation, is associated with roads so no direct tie to habitat components. Indirect tie to moderated runoff from roads could improve downstream channel conditions and improve possible seed production.	Possible disturbance during implementation, is associated with roads so no direct tie to habitat components.	No direct effect, no habitat component tied to road area.	Possible disturbance during implementation, is associated with roads so no direct tie to habitat components. Indirect tie to moderated runoff from roads could improve downstream channel conditions and improve possible forage production.	No direct effect, no habitat component tied to road area.	No direct effect, no habitat component tied to road area.	No direct effect, no habitat component tied to road area.	No direct effect, no habitat component tied to road area.	Possible disturbance during implementation, is associated with roads so no direct tie to habitat components. Indirect tie to moderated runoff from roads could improve downstream channel conditions and improve possible forage production.
Remove encroaching conifers in meadow systems up to 9 inches in Bear	Possible disturbance during implementation. Will improve through microclimate creation	Possible disturbance during implementation. Will improve through microclimate creation	No direct effect, no habitat component tied to meadow area.	Indirect improvement due to improved vegetative conditions	No direct effect, no habitat component tied to meadow area.	No direct effect, no habitat component tied to meadow area.	No direct effect, no habitat component tied to meadow area.	No direct effect, no habitat component tied to meadow area.	Possible disturbance during implementation. Will improve through microclimate creation

Species / Activity	Turkey	Northern Goshawk	Pygmy Nuthatch	Elk	Abert's Squirrel	Red squirrel	Hairy woodpecker	Red-naped sapsucker	Mule Deer
Canyon, Houston Draw, Barbershop Canyon, Buck Springs, Bill McClintock Draw, Kinder Draw, East Bear Canyon, General Springs, Holder Cabin, Merritt Draw, Middle Leonard Canyon, West Leonard Canyon, and McClintock Springs meadows. Slash would be lopped and scattered to a 2-foot height across meadows (Alternative 2-4)	and site protection under slash. Indirect positive effect due to change in amount of water available to plants, improving habitat conditions on 330 acres.	and site protection under slash. Indirect positive effect due to change in amount of water available to plants, improving habitat conditions on 330 acres.							and site protection under slash. Indirect positive effect due to change in amount of water available to plants, improving habitat conditions on 330 acres.
Create area closures at Dane Springs and Dines Tank for protection of spinedace habitat (Alternative 2-4)	Decrease of vehicular traffic on 45 acres.	Decrease of vehicular traffic on 45 acres.	Decrease of vehicular traffic on 45 acres.	Decrease of vehicular traffic on 45 acres.	Decrease of vehicular traffic on 45 acres.	Decrease of vehicular traffic on 45 acres.	Decrease of vehicular traffic on 45 acres.	Decrease of vehicular traffic on 45 acres.	Decrease of vehicular traffic on 45 acres.
Designate open road system 0f 347 miles (Alternative 2)	Decreases current open road density by approximately 40 miles, less vehicular disturbance, less poaching potential.	Decreases current open road density by approximately 40 miles, less vehicular disturbance. Decreases effects to pfa's (see below)	Decreases current open road density by approximately 40 miles, less vehicular disturbance.	Decreases current open road density by approximately 40 miles, less vehicular disturbance.	Decreases current open road density by approximately 40 miles, less vehicular disturbance.	Decreases current open road density by approximately 40 miles, less vehicular disturbance.	Decreases current open road density by approximately 40 miles, less vehicular disturbance.	Decreases current open road density by approximately 40 miles, less vehicular disturbance.	Decreases current open road density by approximately 40 miles, less vehicular disturbance.
Reopen 3.1 miles of currently closed road to create a recreation loop (Alternative 2)	Will increase disturbance to this site for 3.1 miles.	Will increase disturbance to this site for 3.1 miles. No tie to habitat/prey component, no direct effect. Not in pfa.	Will increase disturbance to this site for 3.1 miles.	Will increase disturbance to this site for 3.1 miles.	Will increase disturbance to this site for 3.1 miles. No tie to tree component, no direct effect.	Will increase disturbance to this site for 3.1 miles. No tie to tree component, no direct effect.	Will increase disturbance to this site for 3.1 miles. No tie to large tree component, no direct effect.	Will increase disturbance to this site for 3.1 miles. No tie to aspen, no direct effect.	Will increase disturbance to this site for 3.1 miles.
Close18.5 miles of currently open roads (Alternative 2)	Will decrease vehicular disturbance on 18.5 miles of road. Removal of roads in meadows will improve habitat conditions for turkey.	Will decrease vehicular disturbance on 3.8 miles of road in pfa's on 4 road segments (9711V, 9733M, 9734B, and 9739W).	Will decrease vehicular disturbance on 18.5 miles of road.	Will decrease vehicular disturbance on 18.5 miles of road.	Will decrease vehicular disturbance on 18.5 miles of road.	Will decrease vehicular disturbance on 18.5 miles of road.	Will decrease vehicular disturbance on 18.5 miles of road.	Will decrease vehicular disturbance on 18.5 miles of road.	Will decrease vehicular disturbance on 18.5 miles of road.
Decommission and obliterate 17.9 miles of currently open roads (Alternative 2)	Will decrease vehicular disturbance on 17.9 miles of road. Removal of roads in meadows will improve habitat conditions for turkey.	Will decrease vehicular disturbance on 1.8 miles of road in pfa's on five road segments (139B, 321A, 9707Y, 9722Y and 9616Y).	Will decrease vehicular disturbance on 17.9 miles of road.	Will decrease vehicular disturbance on 17.9 miles of road.	Will decrease vehicular disturbance on 17.9 miles of road.	Will decrease vehicular disturbance on 17.9 miles of road.	Will decrease vehicular disturbance on 17.9 miles of road.	Will decrease vehicular disturbance on 17.9 miles of road.	Will decrease vehicular disturbance on 17.9 miles of road.
Decommission and obliterate 14.7 miles of currently closed roads (Alternative 2-4)	Some disturbance during implementation. Removal of roads in meadows will improve habitat conditions for turkey.	Some disturbance during implementation, no direct disturbance in goshawk pfa.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.

Species / Activity	Turkey	Northern Goshawk	Pygmy Nuthatch	Elk	Abert's Squirrel	Red squirrel	Hairy woodpecker	Red-naped sapsucker	Mule Deer
Relocate .8 miles of currently open road (Alternative 2 and 3)	Some disturbance during implementation.	Some disturbance during implementation. No direct disturbance in goshawk pfa.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.	Some disturbance during implementation.
Designate open road system of 322 miles (Alternative 3)	Decreases current open road density by approximately 60 miles, less vehicular disturbance, less poaching potential.	Decreases current open road density by approximately 60 miles, less vehicular disturbance. Decreases effects to pfa's (see below)	Decreases current open road density by approximately 60 miles, less vehicular disturbance.	Decreases current open road density by approximately 60 miles, less vehicular disturbance, less poaching potential.	Decreases current open road density by approximately 60 miles, less vehicular disturbance, less poaching potential.	Decreases current open road density by approximately 60 miles, less vehicular disturbance, less poaching potential.	Decreases current open road density by approximately 60 miles, less vehicular disturbance.	Decreases current open road density by approximately 60 miles, less vehicular disturbance.	Decreases current open road density by approximately 60 miles, less vehicular disturbance, less poaching potential.
Close 36.7 miles of currently open roads (Alternative 3)	Will decrease vehicular disturbance on 36.7 miles of road. Removal of roads in meadows will improve habitat conditions for turkey.	Will decrease vehicular disturbance on 5.2 miles of road in pfa's on 10 road segments (00095D, 00096C, 00300H, 09615P, 09711V, 09733M, 09734B, 09734C, 09734F, and 09739W).	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.
Decommission and obliterate 30.9 miles of currently open roads (Alternative 3)	Will decrease vehicular disturbance on 30.9 miles of road. Removal of roads in meadows will improve habitat conditions for turkey.	Will decrease vehicular disturbance on 2.1 miles of road in pfa's on five road segments (139B, 321A, 9616V, 9707Y, 9722Y, 9712W, and 9616Y).	Will decrease vehicular disturbance on 30.9 miles of road.	Will decrease vehicular disturbance on 30.9 miles of road.	Will decrease vehicular disturbance on 30.9 miles of road.	Will decrease vehicular disturbance on 30.9 miles of road.	Will decrease vehicular disturbance on 30.9 miles of road.	Will decrease vehicular disturbance on 30.9 miles of road.	Will decrease vehicular disturbance on 30.9 miles of road.
Designate open road system of 225 miles (Alternative 4)	Decreases current open road density by approximately 160 miles, less vehicular disturbance, less poaching potential.	Decreases current open road density by approximately 160 miles, less vehicular disturbance. Decreases effects to pfa's (see below).	Decreases current open road density by approximately 160 miles, less vehicular disturbance.	Decreases current open road density by approximately 160 miles, less vehicular disturbance, less poaching potential	Decreases current open road density by approximately 160 miles, less vehicular disturbance, less poaching potential.	Decreases current open road density by approximately 160 miles, less vehicular disturbance, less poaching potential.	Decreases current open road density by approximately 160 miles, less vehicular disturbance.	Decreases current open road density by approximately 160 miles, less vehicular disturbance.	Decreases current open road density by approximately 160 miles, less vehicular disturbance, less poaching potential
Close 125.4 miles of currently open roads (Alternative 4)	Will decrease vehicular disturbance on 125.4 miles of road. Removal of roads in meadows will improve habitat conditions for turkey.	Will decrease vehicular disturbance on 5.2 miles of road in pfa's on 15 road segments (00139B, 09708D, 09711V, 09712T, 09712W, 09714C, 09714R, 09733M, 09733T, 09734B, 09734C, 09734F, 09738T, 09738W, and 09739W).	Will decrease vehicular disturbance on 125.4 miles of road.	Will decrease vehicular disturbance on 125.4 miles of road. Less habitat fragmentation.	Will decrease vehicular disturbance on 125.4 miles of road.	Will decrease vehicular disturbance on 125.4 miles of road.	Will decrease vehicular disturbance on 125.4 miles of road.	Will decrease vehicular disturbance on 125.4 miles of road.	Will decrease vehicular disturbance on 125.4 miles of road. Less habitat fragmentation.
Decommission and obliterate 36.7 miles of currently open roads (Alternative 4)	Will decrease vehicular disturbance on 36.7 miles of road. Removal of roads in meadows will improve habitat conditions for turkey.	Will decrease vehicular disturbance on 2.1 miles of road in pfa's on five road segments (139B, 321A, 9616V, 9707Y, 9722Y, 9712W, and 9616Y).	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.	Will decrease vehicular disturbance on 36.7 miles of road.

Table 25: Table 25 lists a summary of effects to management indicator species (MIS). The table does not include the effects to Mexican spotted owl (they are covered in Table 27). The effects to macroinvertebrates are disclosed in Table 24 above and not included in this table. Note that MA7 and MA9 represent less than 0.1% of the project area and do not provide adequate habitat for two MIS, pronghorn and plain titmouse. In addition, the yellow-breasted chat and Lucy's warbler are MIS species for

MA12, but are lower elevation riparian species, and are not found within the elevational range of the analysis area. Lincoln's sparrow is a very high elevation riparian species, and is not found within the elevation range of the analysis area. Cinnamon teal is associated with wetlands in MA12, of which there are less than 5 acres in the analysis area. These six species are not considered MIS for this project. All affects assume implementation of all prescribed BMP's in Table 8 of this document.

Table 26: Summary of Effects to Sensitive Species

Species / Activity	Peregrine falcon	Common black hawk	Arizona bugbane, Mogollon thistle, Eastwood Alum root, and Arizona Sneezeweed	Cliff fleabane	Mountain silverspot butterfly, Blue-black silverspot butterfly, Maricopa Tiger beetle, and Spotted skipperling	Rusby's Milvetch, Flagstaff Pennyroyal, and Flagstaff Beardstounge	Early Elfin
No Watershed Health Actions (Alternative 1)	No disturbance from implementation, decline in understory seed production as canopies close. Increased threat of stand-replacing fire could affect eyries.	Increased threat of stand-replacing fire. No disturbance from implementation activities. Woody riparian species in ECC stay stable unless large fire occurs.	Increased threat of stand-replacing fire. No disturbance from implementation activities.	No direct effect to habitat.	Increased threat of stand-replacing fire. No disturbance from implementation, Meadow systems stay stable or degrade through time, decreasing potential habitat over long-term. Recreation impacts at Dane Springs would continue, degrading habitat. Sediment to streams would continue or increase over time on roads that have stream crossings or are located in meadows.	No effect to the species.	Increase threat of stand replacing fire, no disturbance from implementation.
Prescribed burn of 22,600 acres to reduce fuel hazard (Alternative 2)	Decrease of threat of stand replacing fire—short-term disturbance on-site and not at eyrie during implementation. May improve prey base over time. No direct effect to known eyries.	Decrease of threat of stand replacing fire—no direct effect to stream habitats so no direct effect.	No direct effect to habitat.	No direct effect to habitat.	Decrease of threat of stand replacing fire— no direct effect to stream/meadow habitats so no direct effect.	Prescribed fire is expected to have little effect to the plants or there habitat.	Decrease of threat of stand replacing fire— no direct effect because no treatments in Early Elfin habitat.
Prescribed burn 23,000 acres to reduce fuel hazrd. (Alternatives 3 and 4).	Decrease of threat of stand replacing fire—short-term disturbance on-site and not at eyrie during implementation. May improve prey base over time. No direct effect to known eyries.	Decrease of threat of stand replacing fire—no direct effect to stream habitats so no direct effect.	No direct effect to habitat.	No direct effect to habitat.	Decrease of threat of stand replacing fire— no direct effect to stream/meadow habitats so no direct effect.	Prescribed fire is expected to have little effect to the plants or there habitat.	Decrease of threat of stand replacing fire— no direct effect because no treatments in Early Elfin habitat.
Thinning to reduce fuel hazard generally up to 12 " dbh and improve understory biodiversity on 9,600 acres (Alternative 2-4)	Decrease of threat of stand replacing fire—short-term disturbance on-site and not at eyrie during implementation. Increase in understory vegetation through opening of canopies, some hiding cover creation short-term for prey base. No direct effects to eyries.	Decrease of threat of stand replacing fire—no direct effect to stream habitats so no direct effect.	No direct effect to habitat.	No direct effect to habitat.	Decrease of threat of stand replacing fire— no direct effect to stream/meadow habitats so no direct effect.	Thinning activities may trample potential populations.	Decrease of threat of stand replacing fire— no direct effect because no treatments in Early Elfin habitat.
Commercial thin trees 5-20" dbh on 670 acres to reduce fuel hazard and improve understory biodiversity (Alternative 2-4)	Decrease of threat of stand replacing fire—short-term disturbance on-site and not at eyrie during implementation. Increase in understory vegetation through opening of canopies, some hiding cover creation short-term for prey base near Mogollon Rim. No direct effect at eyries.	Decrease of threat of stand replacing fire—no direct effect to stream habitats so no direct effect.	No direct effect to habitat.	No direct effect to habitat.	Decrease of threat of stand replacing fire— no direct effect to stream/meadow habitats so no direct effect.	Thinning activities may trample potential populations.	Decrease of threat of stand replacing fire— no direct effect because no treatments in Early Elfin habitat.
Commercial thin trees generally 5-18 in dbh on 1,052 acres to reduce fuel hazard and improve understory biodiversity (Alternative 3 and 4)	Decrease of threat of stand replacing fire—short-term disturbance on-site and not at eyrie during implementation. Increase in understory vegetation through opening of	Decrease of threat of stand replacing fire—no direct effect to stream habitats so no direct effect.	No direct effect to habitat.	No direct effect to habitat.	Decrease of threat of stand replacing fire— no direct effect to stream/meadow habitats so no direct effect.	Thinning activities may trample potential populations.	Decrease of threat of stand replacing fire— no direct effect because no treatments in Early Elfin habitat.

Species / Activity	Peregrine falcon	Common black hawk	Arizona bugbane, Mogollon thistle, Eastwood Alum root, and Arizona Sneezeweed	Cliff fleabane	Mountain silverspot butterfly, Blue-black silverspot butterfly, Maricopa Tiger beetle, and Spotted skipperling	Rusby's Milvetch, Flagstaff Pennyroyal, and Flagstaff Beardstounge	Early Elfin
	canopies. No direct effect at eyries.						
Thin fuelbreaks along main roads on approximately 1,250 acres (Alternatives 3 and 4)	Decrease of threat of stand replacing fire—no direct effect to stream habitats so no direct effect.	Decrease of threat of stand replacing fire—no direct effect to stream habitats so no direct effect.	No direct effect to habitat.	No direct effect to habitat.	Decrease of threat of stand replacing fire— no direct effect to stream/meadow habitats so no direct effect.	Thinning activities may trample potential populations.	Decrease of threat of stand replacing fire— no direct effect because no treatments in Early Elfin habitat.
Remove tanks and rehabilitate site @ Dick Hart (Alternative 2-4)	No direct effect to eyries, some improved habitat for prey base. Some possible avian mortality with elk-proof fence for site protection.	No direct effect because habitat does not exist currently. May improve downstream conditions where habitat exists in the long-term.	No species currently present, will improve potential habitat conditions over time.	No direct effect to habitat.	No direct effect because habitat does not exist currently. Improved meadow conditions could create suitable habitat over time.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Natural channel design, layback banks/hydromulch Barbershop Canyon, Houston Draw, Lockwood Draw, East Bear Canyon, Buck Springs, Dick Hart Draw, Kinder Draw, and Bill McClintock Draw meadows (Alternative 2-4)	No direct effect—not in habitat or in eyrie location. Improvement in meadow conditions will improve habitats for prey base, increase in potential avian mortality from elk proof fences.	Channel restoration will occur in sites that do not have, or will not support large woody riparian vegetation that Common black hawk utilizes, so no direct effect. May improve downstream conditions where habitat exists in the long-term.	No species currently present, will improve potential habitat conditions over time.	No direct effect to habitat.	Disturbance during implementation. Improved meadow conditions will improve habitat potential.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Thin trees generally up to 16 inches DBH on a total of approximately 83 acres in upland areas above Merritt, McFarland, Limestone Tank and Upper Buck Springs to increase flow duration of springs (Alternative 2-4)	No effect—not in habitat or in eyrie location.	No direct effect because habitat does not exist currently.	Disturbance during implementation. Improved water flow conditions will improve habitat potential.	No direct effect to habitat.	Disturbance during implementation. Improved water flow conditions will improve habitat potential.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Raise culverts to create ponded wetlands Dick Hart and 321C (Alternative 2-4)	No effect—not in habitat or in eyrie location.	Raised culverts will occur in sites that do not have, or will not support large woody riparian vegetation that Common black hawk utilizes, so no direct effect. May improve downstream conditions where habitat exists in the long-term.	No species currently present, will improve potential habitat conditions over time.	No direct effect to habitat.	No effect currently because no habitat currently exists. Increased water site increases potential habitat.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Rehabilitate or remove any stream channel wood structures located in Buck Springs and Houston Draw that are not functioning properly (Alternative 2-4)	No effect—not in habitat or in eyrie location.	Meadowl restoration will occur in sites that do not have, or will not support large woody riparian vegetation that Common black hawk utilizes, so no direct effect. May improve downstream conditions where habitat exists in the long-term.	No species currently present, will improve potential habitat conditions over time.	No direct effect to habitat.	Disturbance during implementation. Improved meadow conditions will improve habitat potential.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Stabilize stream crossings (Alternative 2-4)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.

Species / Activity	Peregrine falcon	Common black hawk	Arizona bugbane, Mogollon thistle, Eastwood Alum root, and Arizona Sneezeweed	Cliff fleabane	Mountain silverspot butterfly, Blue-black silverspot butterfly, Maricopa Tiger beetle, and Spotted skipperling	Rusby's Milvetch, Flagstaff Pennyroyal, and Flagstaff Beardstounge	Early Elfin
Install pole fence along 321C at meadow sections (Alternative 2-4)	No effect—not in habitat or in eyrie location.	Pole fence will occur in sites that do not have, or will not support large woody riparian vegetation that Common black hawk utilizes, so no direct effect. May improve downstream conditions where habitat exists in the long-term.	No species currently present, will improve potential habitat conditions over time.	No direct effect to habitat.	Disturbance during implementation. Improved meadow conditions will improve habitat potential.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Relocate 643A road w/ semi-permeable fill road (Alternative 2-4)	No effect—not in habitat or in eyrie location.	Road relocation will occur in sites that do not have, or will not support large woody riparian vegetation that Common black hawk utilizes, so no direct effect. May improve downstream conditions where habitat exists in the long-term.	No species currently present, will improve potential habitat conditions over time.	No direct effect to habitat.	No effect currently because no habitat currently exists. Increased water site increases potential habitat.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Pave locations on 95/96 roads (Alternative 2-4)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Remove encroaching conifers in meadow systems up to 9 inches in Bear Canyon, Houston Draw, Barbershop Canyon, Buck Springs, Bill McClintock Draw, Kinder Draw, East Bear Canyon, General Springs, Holder Cabin, Merritt Draw, Middle Leonard Canyon, West Leonard Canyon, and McClintock Springs meadows. Slash would be lopped and scattered to a 2-foot height across meadows (Alternative 2-4)	No direct effect—not in habitat or in eyrie location. Improvement in meadow conditions will improve habitats for prey base, increase in potential avian mortality from elk proof fences.	Meadow thinning will occur in sites that do not have, or will not support large woody riparian vegetation that Common black hawk utilizes, so no direct effect. May improve downstream conditions where habitat exists in the long-term.	No species currently present, will improve potential habitat conditions over time.	No direct effect to habitat.	Disturbance during implementation. Improved meadow conditions will improve habitat potential.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Create area closures at Dane Springs and Dines Tank for protection of spinedace habitat (Alternative 2-4)	No effect—not in habitat or in eyrie location.	No direct effect, possible indirect effect of improved downstream conditions.	No species currently present, will improve potential habitat conditions over time.	No direct effect to habitat.	No direct effect, possible indirect effect of improved downstream conditions.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Designate open road system of 347 miles (Alternative 2)	Decreases current open road density by approximately 40 miles, less vehicular disturbance. No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Open road system is designed to minimize impacts from roads to drainages, but is administrative in nature and no ground disturbance is expected to occur. Overall, decrease of open roads over current will improve water flow watershed-wide and decrease peak flows.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.

Species / Activity	Peregrine falcon	Common black hawk	Arizona bugbane, Mogollon thistle, Eastwood Alum root, and Arizona Sneezeweed	Cliff fleabane	Mountain silverspot butterfly, Blue-black silverspot butterfly, Maricopa Tiger beetle, and Spotted skipperling	Rusby's Milvetch, Flagstaff Pennyroyal, and Flagstaff Beardstounge	Early Elfin
Reopen 3.1 miles of currently closed road to create a recreation loop (Alternative 2)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	No direct effect, is bench road above Yeager Canyon. Adequate buffer occurs to dissipate any sediments.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Close18.5 miles of currently open roads (Alternative 2)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Possibility of short-term negative effect from project generated sediment transport through system on the total of 18.5 miles of closure. Long-term improvement in water quality through decreased sediment production specifically on 3.4 miles of road in riparian areas/meadows (FR's 9707J,9712U, 9714L, 9733N, 9734T, and 9738N).	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Decommission and obliterate 17.9 miles of currently open roads (Alternative 2)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Possibility of short-term negative effect from project generated sediment transport through system on the total of 17.9 miles of decommissioning. Long-term improvement in water quality through decreased sediment production. This includes portions of 19 roads that have connections to riparian and non-riparian streamcourses for decommissioning (8.8 miles).	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Decommission and obliterate 14.7 miles of currently closed roads (Alternative 2-4)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Possibility of short-term negative effect from project generated sediment transport through system on the total of 14.7 miles of decommissioning. Seven roads for 13.9 miles are directly related to riparian/stream impacts (643A, 9707W, 9714Q, 9714X, 9733Y, 9735P, and 9737Q).	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Relocate .8 miles of currently open road (Alternative 2 and 3)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Road relocation is out of meadow, will improve soil condition on rehabilitated old road bed for 1.4 acres in the Dane Canyon drainage area. Slight possibility of sediment displacement during project implementation.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Designate open road system of 322 miles (Alternative 3)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive	No direct effect to habitat.	Open road system is designed to minimize impacts from roads to drainages, but is administrative in nature and no ground disturbance is	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.

Species / Activity	Peregrine falcon	Common black hawk	Arizona bugbane, Mogollon thistle, Eastwood Alum root, and Arizona Sneezeweed	Cliff fleabane	Mountain silverspot butterfly, Blue-black silverspot butterfly, Maricopa Tiger beetle, and Spotted skipperling	Rusby's Milvetch, Flagstaff Pennyroyal, and Flagstaff Beardstounge	Early Elfin
		effect to habitat.	effect to habitat.		expected to occur. Overall, decrease of open roads over current will improve water flow watershed-wide and decrease peak flows.		
Close 36.7 miles of currently open roads (Alternative 3)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Same as spinedace—no expected negative effect to fishery/amphibian habitat, but possible long-term improvement through reduction of sediment sources watershed-wide.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Decommission and obliterate 30.9 miles of currently open roads (Alternative 3)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Overall, all roads listed in spinedace section have potential negative short-term affect from construction related activities. Long-term benefits will occur through decreased sediment production.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Designate open road system of 225 miles (Alternative 4)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Open road system is designed to minimize impacts from roads to drainages, but is administrative in nature and no ground disturbance will occur. The effect to fish habitat will be a longer duration of water within the watershed as a whole due to decreased road density, thus there will be more potential for fish habitat within the watershed.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.
Close 125.4 miles of currently open roads (Alternative 4)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Improvement toward a more natural water flow off these areas, and dampening of peak flow, could favor enhanced groundwater storage and subsequent baseflows downstream. The Leonard Canyon (808b) and Houston Draw (808E) 6th code watersheds are the sub-watersheds where the most miles of road closure will occur (approximately 33 miles of road closure in each sub-watershed). The Dane Canyon 6th code watershed (808D) will also have approximately 20 miles of road closure in this alternative. The Yeager Canyon 6th code watershed (808c) will have the open road density decreased by nearly 8 miles.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.

Species / Activity	Peregrine falcon	Common black hawk	Arizona bugbane, Mogollon thistle, Eastwood Alum root, and Arizona Sneezeweed	Cliff fleabane	Mountain silverspot butterfly, Blue-black silverspot butterfly, Maricopa Tiger beetle, and Spotted skipperling	Rusby's Milvetch, Flagstaff Pennyroyal, and Flagstaff Beardstounge	Early Elfin
Decommission and obliterate 36.7 miles of currently open roads (Alternative 4)	No effect—not in habitat or in eyrie location.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to habitat.	Overall, all roads listed in spinedace section have potential negative short-term affect from construction related activities. Long-term benefits will occur through decreased sediment production.	No effect—no habitat present.	No direct effect because no treatments in Early Elfin habitat.

Table 26: Table 26 lists a summary of effects to Sensitive Species. The table does not include the effects Eared trogon (it is a transient to the analysis area and does not breed within the analysis area). The effects of the analysis area to the roundtail chub, Little Colorado sucker, narrow headed gartersnake, Arizona southwestern toad, and the Northern leopard frog are included in Table 24 above. The effects to the northern goshawk are contained in Table 27 above. All affects assume implementation of all prescribed BMP's inTable 8 of this document.

Table 27: Summary of Effects to Federally Threatened, Endangered, and Proposed for Listed Species

Species / Activity	Bald eagle	Southwestern willow flycatcher	Mexican spotted owl
No Watershed Health Actions (Alternative 1)	No disturbance from any project implementation. Increased threat of stand-replacing fire could affect roost sites.	Increased threat of stand-replacing fire. No disturbance from implementation activities, meadow/stream systems stay stable or degrade through time, decreasing potential habitat over long-term. High potential of scour of woody vegetation if stand replacing fire occurs.	No direct effect to nests, PAC's, critical habitat, or restricted habitat. Increased threat of stand-replacing fire could negatively effect habitat components for MSO. Increasing canopies is decreasing understory vegetation.
Prescribed burning to reduce fuel hazard on 22,600 acres (Alternative 2)	Decrease of threat of stand replacing fire—short-term disturbance on-site if burned in winter during project implementation. Possible loss of roost site if snags burnt. BMP to protect snags will diminish this effect.	This action would not occur in potential southwestern willow flycatcher habitat, and therefore would have only minor effects to the habitat, through slight increases in sediment and ash input. Controlled burning would reduce the risk of wildfire, by reducing accumulations of fuels and the laddering effects of doghair thickets.	No direct effect to PAC or nest sites (0 acres burned), approximately 1,665 acres burned in other protected habitat, approximately 1,550 acres burned in target threshold, approximately 3,210 acres burned in other restricted habitat. Burning would reduce snags and dead logs, with an overall short-term loss of cover for prey species. Protection from wildfire provided by fuels reduction next to PAC's and not by directly treating the PAC. Over time, fuels will build up again without maintenance. Improvement in understory vegetation through open canopies can improve prey base.
Prescribed burning to reduce fuel hazard on 23,000 acres (Alternative 3 and 4)	Decrease of threat of stand replacing fire—short-term disturbance on-site if burned in winter during project implementation. Possible loss of roost site if snags burnt. BMP to protect snags will diminish this effect.	This action would not occur in potential southwestern willow flycatcher habitat, and therefore would have only minor effects to the habitat, through slight increases in sediment and ash input. Controlled burning would reduce the risk of wildfire, by reducing accumulations of fuels and the laddering effects of doghair thickets.	No direct effect to PAC or nest sites (0 acres burned), approximately 1,670 acres burned in other protected habitat, approximately 1,550 acres burned in target threshold, approximately 3,215 acres burned in other restricted habitat. Burning would reduce snags and dead logs, with an overall short-term loss of cover for prey species. Protection from wildfire provided by fuels reduction next to PAC's and not by directly treating the PAC. Over time, fuels will build up again without maintenance. Improvement in understory vegetation through open canopies can improve prey base.

Species / Activity	Bald eagle	Southwestern willow flycatcher	Mexican spotted owl
Thinning on trees generally up to 12" dbh to reduce fuel hazard and improve understory biodiversity on 9,600 acres (Alternative 2-4)	Decrease of threat of stand replacing fire—short-term disturbance on-site during implementation if done in the fall or winter. Tree size to be thinned is small and on ridge tops, thus, not likely to be a roost site. No direct effects.	Decrease of threat of stand replacing fire—no direct effect to stream/meadow habitats so no direct effect.	No direct effect to PAC or nest sites (0 acres thinned in PAC), approximately 15 acres thinned in protected habitat in Alternative 2-4. Approximately 770 acres are proposed for thinning in target threshold in Alternatives 2-4, approximately 780 acres thinned in restricted habitat in Alternatives 2-4. Protection from wildfire provided by fuels reduction next to PAC's and not by directly treating the PAC. Over time, fuels will build up again without maintenance. Improvement in understory vegetation through open canopies can improve prey base, as well as slash left on-site. Timing restriction BMP decreases effects of disturbance during breeding season.
Commercial thin trees generally 5-20" dbh on 670 acres to reduce fuel hazard and improve understory biodiversity (Alternative 2-4)	Decrease of threat of stand replacing fire—short-term disturbance on-site during implementation if done in the fall or winter. Could fell trees that may be roost tree, but not likely—restriction to tree size removed is 24" DBH maximum. Thin from below prescription likely to not include many large trees.	Decrease of threat of stand replacing fire—no direct effect to stream/meadow habitats so no direct effect.	No direct effect to PAC or nest sites (0 acres harvested in PAC). 0 acres are proposed to be harvested in protected habitat, target threshold or restricted habitat Protection from wildfire provided by fuels reduction next to PAC's and not by directly treating the PAC. Over time, fuels will build up again without maintenance. Improvement in understory vegetation through open canopies can improve prey base, as well as slash left on-site. Timing restriction BMP decreases effects of disturbance during breeding season.
Commercial thin generally 5-20" dbh on 1,052 acres to reduce fuel hazard and improve understory biodiversity (Alternative 3 and 4)	Decrease of threat of stand replacing fire—short-term disturbance on-site during implementation if done in the fall or winter. Could fell trees that may be roost tree, but not likely—restriction to tree size removed is 24" DBH maximum. Thin from below prescription likely to not include many large trees.	Decrease of threat of stand replacing fire—no direct effect to stream/meadow habitats so no direct effect.	No direct effect to PAC or nest sites (0 acres thinned in PAC), approximately 175 acres thinned in protected habitat in Alternative 3-4. Approximately 50acres are proposed for thinning in target threshold in Alternatives 3-4, approximately 130 acres thinned in restricted habitat in Alternatives 2-4. Protection from wildfire provided by fuels reduction next to PAC's and not by directly treating the PAC. Over time, fuels will build up again without maintenance. Improvement in understory vegetation through open canopies can improve prey base, as well as slash left on-site. Timing restriction BMP decreases effects of disturbance during breeding season.
Thin fuelbreaks along main roads on approximately 1,250 acres (Alternatives 3	Decrease of threat of stand replacing fire—short-term disturbance on-site	Decrease of threat of stand replacing fire—no direct effect to stream/meadow	No direct effect to PAC or nest sites, or protected, target threshold, or restricted habitat.

Species / Activity	Bald eagle	Southwestern willow flycatcher	Mexican spotted owl
and 4)	during implementation if done in the fall or winter. Tree size to be thinned is small and on ridge tops, thus, not likely to be a roost site. No direct effects.	habitats so no direct effect.	
Remove tanks and rehabilitate site @ Dick Hart (Alternative 2-4)	No direct effect to roost or habitat components. Improved habitat for prey base. Some possible avian mortality with elk-proof fence for site protection.	No effect does not have habitat component for woody riparian vegetation on-site. Indirect effect of improved meadow condition could improve downstream flows as Dick Hart Draw enters ECC just below the reservoir.	No direct effect to PAC. Current habitat components in location in meadow are currently Kentucky bluegrass that provides limited habitat for prey base. Improved habitat for prey base as site recovers. BMP to protect site from all grazers will improve vole population. Avian mortality with elk-proof fence for site protection is a limited possibility.
Natural channel design, layback banks/hydromulch Barbershop Canyon, Houston Draw, Lockwood Draw, East Bear Canyon, Buck Springs, Dick Hart Draw, Kinder Draw, and Bill McClintock Draw meadows (Alternative 2-4)	No direct effect—no habitat present. Improvement in meadow conditions will improve habitats for prey base, potential avian mortality from elk proof fences. Improved stream flow from improved meadow conditions may increase duration of water on-site.	Sites are all in areas that currently do not have habitat for southwestern willow flycatcher. Improved meadow conditions will improve habitat potential if willows are planted as part of revegetation plan (historic photos have willows in headwater meadow communities in ECC). Potential for avian mortality exists with elk-proof fence.	No direct effect to PAC or nest. Current habitat components in locations are dominated by Kentucky bluegrass that provides limited habitat for prey base. Improved habitat for prey base as site recovers. BMP to protect site from all grazers will improve vole population. Avian mortality with elk-proof fence for site protection is a limited possibility.
Thin trees generally up to 16 inches DBH on a total of approximately 83 acres in upland areas above Merritt, McFarland, Limestone Tank and Upper Buck Springs to increase flow duration of springs (Alternative 2-4)	No direct effect, sites are in meadow, shallow drainage sites where limited roost sites occur.	Not in stream channel habitat-no direct effects on-site. Indirect effect off-site is potential improved water flow from springs.	No direct effect to PAC or nest. Could have off-site beneficial effect from increased streamflow and improved riparian conditions in Merritt Draw, Houston Draw, Limestone Draw and Upper Buck Springs. All acres in restricted habitat (83 acres).
Raise culverts to create ponded wetlands Dick Hart and 321C (Alternative 2-4)	No effect—no habitat present.	No effect currently because no habitat currently exists. Increased water site increases potential habitat, but size is small and has limited site potential to produce woody riparian vegetation (will produce emergent vegetation).	No direct effect to PAC or nests. Could have off-site potential improvement in riparian conditions that could increase prey base.
Rehabilitate or remove any stream channel wood structures located	No effect—no habitat present.	Sites are all in areas that currently do not have habitat for	No direct effect to PAC or nest. Current habitat components in locations are dominated by Kentucky

Species / Activity	Bald eagle	Southwestern willow flycatcher	Mexican spotted owl
in Buck Springs and Houston Draw that are not functioning properly (Alternative 2-4)		southwestern willow flycatcher. Improved meadow conditions will improve habitat potential if willows are planted as part of revegetation plan (historic photos have willows in headwater meadow communities in ECC).	bluegrass that provides limited habitat for prey base. Improved habitat for prey base as site recovers.
Stabilize stream crossings (Alternative 2-4)	No effect—no habitat present.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to PAC or nest. Potential improved riparian conditions could improve prey base attributes.
Install pole fence along 321C at meadow sections (Alternative 2-4)	No effect—no habitat present.	No direct effect in headwater meadow system. No potential to produce woody riparian vegetation unless entire site protected from elk (no cattle grazing occurs in this pasture).	No direct effect to PAC or nest. Potential improved riparian conditions could improve prey base attributes, but potential is limited due to other disturbances (recreation/elk).
Relocate 643A road w/ semi-permeable fill road (Alternative 2-4)	No effect—no habitat present.	No effect currently because no habitat currently exists. Increased water on site from ponded wetland increases potential habitat downstream in Yeager Canyon.	No direct effect to PAC or nest. Potential improved riparian conditions could improve prey base attributes.
Pave locations on 95/96 roads (Alternative 2-4)	No effect—no habitat present.	No direct effect from the project on-site, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	No direct effect to PAC or nest.
Remove encroaching conifers in meadow systems up to 9 inches in Bear Canyon, Houston Draw, Barbershop Canyon, Buck Springs, Bill McClintock Draw, Kinder Draw, East Bear Canyon, General Springs, Holder Cabin, Merritt Draw, Middle Leonard Canyon, West Leonard Canyon, and McClintock Springs meadows. Slash would be lopped and scattered to a 2-foot height across	No direct effect—no habitat present.	No direct effect, all projects do not have habitat components. Improved soil condition in these headwater meadows should improve stream conditions downstream that could have indirect positive effect to habitat.	No direct effect to PAC or nest. Potential improved soil conditions in these headwater meadows could improve prey base attributes.

Species / Activity	Bald eagle	Southwestern willow flycatcher	Mexican spotted owl
meadows (Alternative 2-4)			
Create area closures at Dane Springs and Dines Tank for protection of spinedace habitat (Alternative 2-4)	No effect—no habitat present.	No direct effect, possible indirect effect of improved downstream conditions.	No direct effect to PAC or nest. Possible indirect effect of improved downstream conditions.
Designate open road system of 347 miles (Alternative 2)	Decreases current open road density by approximately 40 miles, less vehicular disturbance. No effect—no habitat present.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat. Decrease of 40 miles of open road could decrease peak flows and lower scouring potential.	No direct effect to PAC or nest. Potential improved riparian condition downstream could improve prey base attributes.
Reopen 3.1 miles of currently closed road to create a recreation loop (Alternative 2 and 3)	No effect—no habitat present.	No direct effect, no habitat component tied to road area.	No direct effect to PAC or nest. Some potential increase in disturbance in foraging area.
Close 18.5 miles of currently open roads (Alternative 2)	No effect—no habitat present.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	Closure of 7.5 miles in PACS (31 road segments-728, 733, 6144, 00095E, 00095K, 00095R, 00141B, 00141C, 00141F, 00501C, 00726B, 00727A, 00727C, 09030F, 09031H, 09031M, 09707T, 09707X, 09709K, 09709Y, 09711M, 09713H, 09713V, 09713Y, 09723X, 09723Y, 09724X, 09725Y, 09733K, and 09745A) is direct positive effect to minimize disturbance in these sites. Timing restriction BMP will eliminate disturbance during implementation.
Decommission and obliterate 17.9 miles of currently open roads (Alternative 2)	No effect—no habitat present.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	Decommission of 3.3 miles in PACS (16 road segments-732, 00095J, 00141U, 00726C, 06033C, 06033G, 09707P, 09707U, 09707W, 09708U, 09709W, 09711L, 09711R, 09713G, 09722Y and 09723U) is direct positive effect to minimize disturbance in these sites. Timing restriction BMP will eliminate disturbance during implementation.
Decommission and obliterate 14.7 miles of currently closed roads (Alternative 2-4)	No effect—no habitat present.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	Decommission of .1 miles in PAC's(1 road segment-9707W) is direct positive effect to minimize disturbance in these sites. Timing restriction BMP will eliminate disturbance during implementation.
Relocate .8 miles of currently open road (Alternative 2 and 3)	No effect—no habitat present	No direct effect, no habitat component tied to road area. Relocated road is moved out of meadow.	No direct effect to PAC or nest.

Species / Activity	Bald eagle	Southwestern willow flycatcher	Mexican spotted owl
Designate open road system of 322 miles (Alternative 3)	Decreases current open road density by approximately 60 miles, less vehicular disturbance. No effect—no habitat present.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat. Decrease of 60 miles of open road could decrease peak flows and lower scouring potential.	No direct effect to PAC or nest. Potential improved riparian condition downstream could improve prey base attributes.
Close 36.7 miles of currently open roads (Alternative 3)	No effect—no habitat present.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	Closure of 7.5 miles in PACS (27 road segments 728, 733, 6144, 00095E, 00095K, 00095R, 00096C, 00123A, 00141B, 00141C, 00141F, 00501C, 00726B, 00727A, 00727C, 00727D, 09030F, 09031H, 09031M, 09615P, 09709Y, 09711M, 09713H, 09713Y, 09723X, 09724X, and 09745A) is direct positive effect to minimize disturbance in these sites. Timing restriction BMP will eliminate disturbance during implementation.
Decommission and obliterate 30.9 miles of currently open roads (Alternative 3)	No effect—no habitat present	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	Decommission of 3.2 miles in PACS (15 road segments-732, 00095H, 00095J, 00141U, 00726C, 06033C, 06033G, 09707P, 09707U, 09709W, 09711L, 09711R, 09713G, 09722Y, and 09723U) is direct positive effect to minimize disturbance in these sites. Timing restriction BMP will eliminate disturbance during implementation.
Designate open road system of 225 miles (Alternative 4)	Decreases current open road density by approximately 160 miles, less vehicular disturbance. No effect—no habitat present.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat. Decrease of 160 miles of open road should decrease peak flows and lower scouring potential.	No direct effect to PAC or nest. Potential improved riparian condition downstream could improve prey base attributes. Less disturbance watershed-wide.
Close 125.4 miles of currently open roads (Alternative 4)	No effect—no habitat present.	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	Closure of 8.5 miles in PACS (40 road segments- 666, 726, 728, 730, 733, 6144, 00095E, 00095H, 00095K, 00095R, 00141B, 00141C, 00141F, 00501C, 00719G, 00726B, 00727A, 00727C, 06033F, 09030F, 09031H, 09031M, 09707T, 09707X, 09709K, 09709Y, 09711L, 09711M, 09711Q, 09713G, 09713H, 09713V, 09713Y, 09715P, 09722U, 09723X, 09723Y, 09724X, 09725Y, 09733K, and 09745A) is direct positive effect to minimize disturbance in these sites.

Species / Activity	Bald eagle	Southwestern willow flycatcher	Mexican spotted owl
			Timing restriction BMP will eliminate disturbance during implementation.
Decommission and obliterate 36.7 miles of currently open roads (Alternative 4)	No effect—no habitat present	No direct effect, no habitat component tied to road area. Potential improvement in stream conditions downstream could have indirect positive effect to habitat.	Decommission of 3.2 miles in PACS (17 road segments-732, 00095J, 00141U, 00726C, 06033C, 06033G, 09615P, 09707P, 09707U, 09707W, 09708U, 9709W, 09711L, 09711R, 09713G, 09722Y, and 09723U) is direct positive effect to minimize disturbance in these sites. Timing restriction BMP will eliminate disturbance during implementation.

Table28: Table 27 lists a summary of effects to Federally Threatened, Endangered, or Proposed for Listing Species. The table does not include the effects the Threatened Little Colorado spinedace or the Chiricahua Leopard Frog, whose effects are summarized in Table 24 of this document. All affects assume implementation of all prescribed BMP's inTable 8 of this document.

Cumulative Effects of Alternatives 2 on Wildlife

The cumulative effect boundary for wildlife species is very difficult to quantify due to the variety of species within the analysis area. For the purpose of this analysis, the cumulative effects boundary will be the East Clear Creek watershed boundary, with duration of the effects for 10 years.

There are several cumulative and on-going activities that are occurring that affect wildlife species within the analysis area. Past grazing by domestic and wild ungulates has affected habitat components greatly. Heavy livestock grazing (sheep and cattle) at the turn of the century has created many of the conditions that occur within the analysis area. Large numbers of grazing animals denuded meadow areas of vegetation that stabilized the meadow systems (willows, sedge, rush, spikerush). This led to channel cutting events that lowered water tables within the meadow systems and increased the efficiency of water moving through the system. Past fire management practices have also affected the conditions within the analysis area. Fire suppression has increased fuel loadings throughout the area. Some of this has been negated by past timber sale activities and the corresponding post-sales fuels reduction (pile and burning of activities fuels). Timber sales also roaded the analysis area, which are having affects to the watershed and correspondingly the wildlife. Recreation use will continue to increase, thus the cumulative impacts from recreation will increase. On-going domestic livestock use and wild ungulate grazing is also a cumulative impact to wildlife. The control of permitted cattle grazing impacts will also be key to attaining the displayed effects to wildlife species. A parallel analysis of the permitted cattle grazing within the analysis area is occurring with the analysis area Environmental Impact Statement.

Grazing by wild ungulates, and in particular, by elk, will have the greatest impact to the success of the proposed actions in meadow systems. Cattle grazing has been eliminated in a majority of the headwater meadow systems with the implementation of the recent Buck Springs EIS and Record of Decision. In particular, large amounts of grazing by elk in meadow systems may negate revegetation efforts of disturbed sites. Best Management Practices # 6 and # 7 discuss protection measures for revegetation efforts and will be key for successful site restoration. Efforts by the Arizona Game and Fish Department to reduce herd size in the East Clear Creek watershed will

also be key to successful site restoration. As with the soils cumulative effects discussion, roads, recreation, and past fire exclusion are also cumulative impacts to wildlife.

Actions within the watershed that also affect wildlife species include the Victorine Wildland Urban Interface Project and the Blue Ridge Wildland Urban Interface Project through thinning and burning on a total of approximately 8,200 and 5,400 acres respectively. Past Timber Sales within the watershed have treated nearly 28,000 acres, but we are assuming burning occurred through pile burns that totaled only 1 to 5% of the sites. These actions have similar effects to all of the species discussed above and will improve habitat conditions over time. Alternative 2 will add approximately 22,600 acres of burning, for a total of nearly 36,000 to 37,000 acres of prescribed burning watershed-wide. This is approximately 18% of the entire watershed being treated to minimize fuel loadings through prescribed burning.

This, in combination with approximately 49,000 acres of thinning (approximately 10,000 acres from this analysis in combination with the 39,000 acres from other projects--24% of the watershed total acres) will cumulatively decrease the chance of stand replacing fire directly on 49,000 acres. The cumulative effect to wildlife habitat components will not occur on all of the acres at one time and will vary by year, depending on how many acres are implemented annually. Even though there are large acreages proposed for treatment, cover for animals will still be abundant through topographic features (drainages and canyons) and there are no detrimental effects to cover attributes.

For Mexican spotted owl habitat components, a maximum of 10% loss in snags and 25% loss of logs are predicted on 1,664 acres of protected and 1,552 acres target-threshold habitat that are being treated within this analysis. Up to 5% of pine trees greater than 18 inches and 10% of oaks greater than 10 inches drc is possible. These losses could result in slight reductions in canopy closure and basal area (5%). These losses are expected to have some impacts to the constituent elements of MSO habitat, but are not expected to result in adverse impacts to the owls or their habitats. Burning would occur outside of MSO PAC's.

Plant species richness is moderate across critical habitat. Thinning and burning treatments would increase the amount of sunlight reaching the ground, and would stimulate increased production of ground vegetation (grasses, forbs, and shrubs). This would increase plant species richness within critical habitat.

The East Clear Creek Ecosystem Assessment (ECCEA, USDA 1996) determined that multi-storied stands made up 66% of the watershed. Though the assessment area was larger than the current project area, a similar percentage of the project area is in multi-storied stands. Critical habitat lies within canyons and on slopes that were not logged with even-aged prescriptions in the 1970's and 80's, and likely have a higher percentage in a multi-storied condition. Understory thinning and burning would thin tree densities in the younger tree classes, but would not eliminate those classes, and would therefore maintain the multi-storied condition. Increases in tree growth would promote larger trees and improved habitat conditions for owls in the long-term.

The ECCEA found that about 41% of the stands were in an open canopy (0-40%), about 44 % were in a moderate canopy (40-60%), and about 15% were in a closed canopy (60%+). With the reduction of past logging in protected habitat (steep slopes), it is assumed that a higher percentage

of closed canopies are found in critical habitat. It is predicted that there could be a possible 5% reduction in canopy closures and basal area in protected and target-threshold habitat, and a 10% reduction in restricted habitat. These reductions would have the potential for a slight reduction in these constituent elements, and would promote increases in plant species richness and residual plant cover to provide for the needs of prey species. There are no expected impacts to canyon constituent elements from this project.

Roads impact wildlife in a variety of ways, from disturbance to acting as sediment delivery systems. The proposed road work within this project reduces the open road density by approximately 40 miles within the analysis area, and as such will decrease some impacts from vehicular disturbance to wildlife. In particular, the road closure/decommissioning proposed within Goshawk PFA's will decrease disturbance during the breeding season by a total of 5.6 miles. Road closure/decommissioning proposed within Mexican spotted owl PAC's will decrease disturbance during the breeding season by a total of about 11 miles.

Road closure/decommissioning proposed within riparian stream corridors will decrease sediment production to streams for aquatic species by a total of 10 miles Mitigation measures proposed under this analysis will further reduce impacts from roads in relation to sediment delivery to streams In addition, Alternative 2 will reduce the amount of sediment production and minimize the impacts to peak flows from roads within the analysis area only. On a watershed scale, these treatments are not complete, but will reduce sediment impacts and will improve habitat conditions for aquatic dependent species in the long-run by minimizing road related impacts to streams by approximately 15%.

Recreation impacts to meadows are reduced in each of the Alternatives, but will not be completely solved. The Arizona OHV Forest Plan Amendment - For Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests progress may limit off-road use, which may minimize recreation impacts to meadows. Alternative 2 provides a larger improvement in meadow conditions through the thinning of encroaching trees within 330 acres of meadows. This is 80% of the total meadow acres in this watershed, which will aid in moving these to a satisfactory soil condition. The slash left on-site will also protect the site from elk grazing, therefore, this treatment has a great potential to minimize the cumulative impact of elk grazing at the sites where slash is left on-site in the meadows.

Management indicator species that are tied to late seral stage conditions include Turkey, the Northern goshawk, Mexican spotted owl, pygmy nuthatch, hairy woodpecker, and the red squirrel. For turkeys, implementation of this Alternative would result in no change in habitat capability for this species within the analysis area specific to late seral ponderosa pine indicator habitat, and thus would meet Forest Plan Standards and Guidelines. Forest-wide habitat trends would continue in a very slow downward trend while population trends would remain stable for turkeys. For Northern goshawks, there would be no changes in late-seral habitat for northern goshawks under this alternative. There would be no cumulative effects. Forest-wide habitat trends would continue in a very slow downward trend while population trends would remain inconclusive for goshawks.

For the Mexican spotted owl, there would be no changes to Forest-wide habitat trends for late-seral mixed conifer, which is declining, or to Forest-wide population trends which are inconclusive. For the Pygmy nuthatch and hairy woodpecker, this project would slightly reduce the availability of snags for feeding and nesting structures in the project area. Late-seral ponderosa pine would not be

affected. This project would not affect Forest-wide habitat trends, which show declines in late-seral stage ponderosa pine, mixed conifer and spruce-fir, and stable conditions in snags. Forest-wide population trends would continue to be stable for pygmy nuthatch and slightly increasing for hairy woodpeckers, and for the Red squirrel, some of the areas within the analysis area are experiencing understory recruitment of white fir and Douglas fir trees, but they do not provide suitable habitat for red squirrels. There would be no changes from this project to Forest-wide habitat trends for late-seral mixed conifer, which is declining, or to Forest-wide population trends which are inclonclusive.

Management indicator species that are tied to early seral-stages include the abert squirrel and elk. For the Abert squirrel, this project would have short-term negative effects to Aberts squirrel and would likely have long-term benefits to squirrel habitat and squirrels. Forest-wide habitat trends for early-seral ponderosa pine would remain stable, while Forest-wide population trend would remain inconclusive. For elk, this project would not affect Forest-wide habitat trends, which show slight increases in early seral stage mixed conifer and spruce-fir, due to wildfires. Population trends would continue to be governed by goals to reduce or maintain populations through hunting pressure.

The red-naped sapsucker is tied to aspen communities. Past projects in the watershed have fenced about 60 acres of aspen, allowing for regeneration that may replace some aspen snags in the very far distant future. Other burning and thinning projects without fencing would increase sprouting, but without fencing would do nothing to improve survival of the sprouts. Overall, this project would not change Forest-wide habitat or population trends. Aspen is declining throughout the Forest, though snags are currently stable. It is likely in the near future, that snags will decline rapidly as snags fall and there are few replacements. Red-naped sapsucker populations are currently stable on the Forest, and this project would not change those trends.

Mule deer are also tied to aspen, as well as brush species that are produced under ponderosa pine canopies (fendler ceanothus). It is felt that overall, this project would not change Forest-wide habitat or population trends. Aspen is declining throughout the Forest, while mule deer populations also show declines on the Forest, and this project is would not change those trends. For Lincoln's sparrow, Forest-wide habitat trend would remain stable, but well below potential, while Forest-wide habitat trend would remain inconclusive in meadows. Macroinvertebrate populations may have a short-term negative effect from stream channel work, but the long-term effects of these projects would be a reduction of sedimentation and an improvement of water quality. Forest-wide habitat and population trends would remain stable.

Overall, the actions proposed in Alternative 2 of this project are designed to improve watershed conditions, reduce fuels and stagnant doghair thickets, re-introduce a natural fire regime, and improve riparian function. Cumulatively, the Buck Springs Range Allotment EIS, the Victorine Wildlife Urban Interface Project and the Blue Ridge Wildlife Urban Interface Project will work in concert to promote these improved conditions throughout the East Clear Creek Watershed. Grazing pressures would be reduced through implementation of the Buck Springs Range Allotment Environmental Impact Statement and through ongoing efforts of the Arizona Game and Fish Department to reduce elk populations. Recreation and road impacts would be reduced through this project. Short-term impacts due to construction activities would include potential increases in sedimentation to drainages, and losses of small pieces of potential habitat for a few sensitive aquatic dependent species. These same species, along with several threatened and

endangered species would benefit over the long-term by improvements in watershed conditions, reduced threats of catastrophic fires, increases in suitable habitat and improvements in riparian function.

Effects of Alternatives 3 on Wildlife

This effects discussion will be a summary of two specialists reports, the general wildlife specialists report [99,107] and the fisheries specialists report [76, 105]. The complete discussion of effects to species can be found in those documents. Table 24 summarizes the affects to aquatic species, Table 25 summarizes the effects to management indicator species (MIS), Table 26 summarizes the effects to sensitive species, and Table 27 summarizes the effects to Federally listed Endangered, Threatened, and Proposed for Listed species by project for Alternative 2. All effects include the implementation of applicable BMP's that are outlined in the mitigation section in Chapter 2 (Table 8).

Cumulative Effects of Alternatives 3 on Wildlife

The cumulative effect boundary for wildlife species is very difficult to quantify due to the variety of species within the analysis area. For the purpose of this analysis, the cumulative effects boundary will be the East Clear Creek watershed boundary, with a duration of the effects for 10 years.

The only cumulative effect that is different for this Alternative from Alternative 2 is the change in harvest acres, prescribed burn acres, and roads management. Alternative 3 will add approximately 23,000 acres of burning to the cumulative total acres of burning within the watershed for the 10-year time period, for a total of nearly 36,400 to 37,400 acres of prescribed burning watershed-wide. This is approximately 24% of the entire watershed being treated to minimize fuel loadings through prescribed burning. This, in combination with approximately 50,000 acres of thinning cumulatively (the nearly 11,000 acres from this project in combination with the nearly 39,000 acres from previous projects-or 25% of the watershed total acres) will cumulatively decrease the chance of stand replacing fire directly 50,000 acres. The cumulative effect to wildlife habitat components will not occur on all of the acres at one time and will vary by year, depending on how many acres are implemented annually. Even though there are large acreages proposed for treatment, cover for animals will still be abundant through topographic features (drainages and canyons) and there are no detrimental effects to cover attributes. The effects to critical habitat are the same as for Alternative 2.

Roads impact wildlife in a variety of ways, from disturbance to acting as sediment delivery systems. The proposed road work within this project reduces the open road density by approximately 60 miles within the analysis area, and as such will decrease some impacts from vehicular disturbance to wildlife. In particular, the road closure/decommissioning proposed within Goshawk PFA's will decrease disturbance during the breeding season by a total of 7.3 miles. Road closure/decommissioning proposed within Mexican spotted owl PAC's will decrease disturbance during the breeding season by a total of about 11 miles.

Road closure/decommissioning proposed within riparian stream corridors will decrease sediment production to streams for aquatic species by a total of about 20.5 miles Mitigation measures proposed under this analysis will further reduce impacts from roads in relation to sediment delivery to streams In addition, Alternative 2 will reduce the amount of sediment production and

minimize the impacts to peak flows from roads within the analysis area only. On a watershed scale, these treatments are not complete, but will reduce sediment impacts and will improve habitat conditions for aquatic dependent species in the long-run by minimizing road related impacts to streams by approximately 15%.

Much like the soil resources, Alternative 3 will provide benefit to wildlife resources in the long-term, but will also provide the greatest potential short-term direct impacts from construction and fire activities. The effects and trends of management indicator species are the same as Alternative 2.

Overall, the actions proposed in Alternative 3 of this project are designed to improve watershed conditions, reduce fuels and stagnant doghair thickets, re-introduce a natural fire regime, and improve riparian function. Cumulatively, the Buck Springs Range Allotment EIS, the Victorine Wildlife Urban Interface Project and the Blue Ridge Wildlife Urban Interface Project will work in concert to promote these improved conditions throughout the East Clear Creek Watershed. Grazing pressures would be reduced through implementation of the Buck Springs Range Allotment Environmental Impact Statement and through ongoing efforts of the Arizona Game and Fish Department to reduce elk populations. Recreation and road impacts would be reduced through this project. Short-term impacts due to construction activities would include potential increases in sedimentation to drainages, and losses of small pieces of potential habitat for a few sensitive aquatic dependent species. These same species, along with several threatened and endangered species would benefit over the long-term by improvements in watershed conditions, reduced threats of catastrophic fires, increases in suitable habitat and improvements in riparian function.

Effects of Alternatives 4 on Wildlife

This effects discussion will be a summary of two specialists reports, the general wildlife specialists report [99,107] and the fisheries specialists report [76, 105]. The complete discussion of effects to species can be found in those documents. Table 24 summarizes the affects to aquatic species, Table 25 summarizes the effects to management indicator species (MIS), Table 26 summarizes the effects to sensitive species, and Table 27 summarizes the effects to Federally listed Endangered, Threatened, and Proposed for Listed species by project for Alternative 4. All effects include the implementation of applicable BMP's that are outlined in the mitigation section in Chapter 2 (Table 8).

Cumulative Effects of Alternatives 4 on Wildlife

The cumulative effect boundary for wildlife species is very difficult to quantify due to the variety of species within the analysis area. For the purpose of this analysis, the cumulative effects boundary will be the East Clear Creek watershed boundary, with a duration of the effects for 10 years.

The only cumulative effect that is different for this Alternative from Alternative 3 are the miles of road closure. The cumulative effects from riparian restoration work is the same as Alternative 2. The cumulative effects from thinning and burning are the same as Alternative 2.

Roads impact wildlife in a variety of ways, from disturbance to acting as sediment delivery systems. The proposed road work within this project reduces the open road density by

approximately 160 miles within the analysis area, and as such will decrease some impacts from vehicular disturbance to wildlife. In particular, the road closure/decommissioning proposed within Goshawk PFA's will decrease disturbance during the breeding season by a total of 7.3 miles. Road closure/decommissioning proposed within Mexican spotted owl PAC's will decrease disturbance during the breeding season by a total of about 12 miles.

Road closure/decommissioning proposed within riparian stream corridors will decrease sediment production to streams for aquatic species by a total of 22.5 miles Mitigation measures proposed under this analysis will further reduce impacts from roads in relation to sediment delivery to streams In addition, Alternative 2 will reduce the amount of sediment production and minimize the impacts to peak flows from roads within the analysis area only. On a watershed scale, these treatments are not complete, but will reduce sediment impacts and will improve habitat conditions for aquatic dependent species in the long run by minimizing road related impacts to streams by approximately 15%.

Much like the soil resources, Alternative 4 will provide benefit to wildlife resources in the long-term, but will also provide the greatest potential short-term direct impacts from construction and fire activities. The effects and trends of management indicator species are the same as Alternative 2.

Overall, the actions proposed in Alternative 4 of this project are designed to improve watershed conditions, reduce fuels and stagnant doghair thickets, re-introduce a natural fire regime, and improve riparian function. Cumulatively, the Buck Springs Range Allotment EIS, the Victorine Wildlife Urban Interface Project and the Blue Ridge Wildlife Urban Interface Project will work in concert to promote these improved conditions throughout the East Clear Creek Watershed. Grazing pressures would be reduced through implementation of the Buck Springs Range Allotment Environmental Impact Statement and through ongoing efforts of the Arizona Game and Fish Department to reduce elk populations. Recreation and road impacts would be reduced through this project. Short-term impacts due to construction activities would include potential increases in sedimentation to drainages, and losses of small pieces of potential habitat for a few sensitive aquatic dependent species. These same species, along with several threatened and endangered species would benefit over the long-term by improvements in watershed conditions, reduced threats of catastrophic fires, increases in suitable habitat and improvements in riparian function.

Recreation and Visual Quality

Recreation and Visual Quality Affected Environment

Recreation Sites/Uses There are two developed campgrounds within the analysis area. The Rock Crossing Campground sits above and to the north of Blue Ridge Reservoir and within a short drive of the boat ramp and access. Trails lead to popular fishing spots. The Knoll Lake Campground is located on the southeastern boundary of the analysis area, on Knoll Lake. Boating and fishing are popular activities on the lake.

Dispersed recreational use can be characterized by the common themes of summer activities, winter activities, consumptive use of forest resources, and educational/person development type activities. An estimated 70% of the visits to the area occur during the summer season (Memorial Day to Labor Day). It is estimated that a full 90% of the users are Arizona residents, with many users returning to their favorite sites or settings on an annual basis.

Trail systems run through the entire analysis area, including the Arizona Trail, U-Bar, Barbershop, Fred Haught, Houston Brothers, Babe Haught, Rock Crossing, and General Crook National Historic Trail. Recreational activities include: hiking; viewing wildlife; dispersed car-camping; backpack camping; water-based activities such as boating, canoeing, and water play; orienteering; horseback riding, caving, rock climbing, photography, picnicking; taking scenic drives; bicycling; off highway vehicle travel; shooting; and gathering in family or social groups. Off Highway Vehicle (OHV) use has increased dramatically in the last several years. Some areas within the analysis area are showing signs of use from OHV's, while more fragile areas appear abused from OHV use.

The local hunting seasons last from about mid-August through December and accounts for many of the fall visitors to the area. The winter snow pack generally limits access from most recreational users from mid-December to mid-March.

The gathering of forest resources often ties the need for subsistence with the pursuit of recreational experiences. Consumptive use within the analysis area includes: firewood cutting; post and pole cutting; Christmas tree cutting; collecting boughs and cones; collection and transplanting of wildlings; collection of native mineral resources (i.e.: sandstone, chert); fishing; hunting; gathering antlers; collecting food and medicinal resources such as berries, nuts, mushrooms, and bracken fern; and collecting biological specimens for research.

Lands and Recreation Special Uses Arizona Public Service is under permit for overhead power transmission lines that cross the analysis area. Knoll Lake and Blue Ridge Reservoir are under special use authorizations to the Arizona Game and Fish Department and Department of Energy respectively. There are several temporary special use permits and currently include guided hunting and ATV services.

Wild and Scenic Rivers East Clear Creek, Leonard Canyon and Barbershop Canyon were evaluated for potential Wild and Scenic River designation in 1993. In a preliminary assessment, East Clear Creek and Barbershop Canyon had two outstandingly remarkable values (ORV's) identified, fisheries habitat and scenic value. The Barbershop Canyon section was determined to be potentially eligible for a Wild classification. The East Clear Creek segment was determined to be potentially eligible with a Scenic classification**.** Leonard Canyon had only one single outstandingly remarkable value recognized, that being fisheries habitat. This segment was determined in the 1993 study to be eligible as Recreational classification.

Inventoried Roadless Areas Inventoried Roadless Areas (IRA) have been delineated for the Coconino National Forest. These areas were first delineated under the RARE II roadless area review process in the early 1980's. The original designation as roadless areas has been included in the proposed Roadless Area policy that was formulated under the Clinton administration. This proposed policy is currently under review by the Bush administration.

The analysis area contains one complete IRA and a portion of another IRA within the boundaries of the analysis area. The 1,310 Barbershop IRA lies completely within the boundaries of the analysis area. A total of 309 acres of the 2,035 acre East Clear Creek IRA lies within the boundary of the analysis area. These two IRA's were considered for inclusion into the Wilderness System under the Arizona Wilderness Bill in August of 1984, but were not included because they were considered too small.

Recreation Opportunity Spectrum and Visual Quality The Forest Plan lists the Recreation Opportunity Spectrum classes within the analysis area as Roaded Natural Appearing (RNA) on 64,891 acres, Semi-Primitive Motorized (SPM) on 4,322 acres, and Semi-Primitive Non-Motorized (SPNM) for 1,312 acres in the two designated roadless areas in the analysis area (Barbershop Canyon and East Clear Creek). Visual Quality Objective (VQO) designations include 17 acres of maximum modification along Mogollon Rim Ranger Station, 42,408 acres of modification which occurs on the ridge tops, 19,373 acres of partial retention designation which occurs in canyons, and 7,908 acres of retention that occurs along State Highway 87, the Mogollon Rim and around Blue Ridge Reservoir.

Recreation and Visual Quality Environmental Consequences

Effects of Alternative 1

Recreation activities/Uses

No change to the *developed site* component of the analysis area. Knoll Lake and Blue Ridge Reservoir as well as Rock Crossing Campground are very crowded on the summer and fall weekends, and not well used mid-weeks, or during the off season. That is not expected to change.
Trail use is expected to remain at the low use level. Conflicts between motorized and non-motorized uses are expected to continue or accelerate
Boating sites will remain unchanged except for the gradual increases resulting from population growth in general.
Dispersed activities will continue as before, the increased pressure and degradation of riparian areas near popular dispersed camp sites may make them less desirable over time as use continues to increase. Conflicts between recreationists will continue, as off road vehicle use and extended occupancy of popular sites increases. This alternative would have the greatest negative effect on the major meadows since vehicle access would continue.

Recreation and Lands Special Uses

No change to the current situation.

Wild and Scenic Rivers

No change is expected to the ORV's in any of the three potential rivers from this alternative.

Inventoried Roadless Areas

No change is expected to these designated areas.

ROS
No Change to existing conditions.

Cumulative Effects
The cumulative effects area for recreation activities is the East Clear Creek Watershed. The duration of the effects will be 10 years. Because the project does not propose any activities in Alternative 1, there are no cumulative effects from this Alternative.

Effects of Alternative 2

Recreation Activities/Uses
No change in the *Developed site* use or activities is expected. The currently developed and historic *trails* should not experience any changes in management, but visitors may see changes alongside the Arizona Trail, or along Barbershop or some of the Cabin loop trails as developments (tanks and culverts) are modified. The trailside appearance may change due to thinning and burning proposals. These changes would be gradual, and occur over time, the trails would not need to be used as fireline, and activities would be monitored to ensure that the integrity of these historic trails would be maintained. During thinning and burning activities, notices would inform visitors of the activities, for safety purposes. Trail and reservoir users may experience over the long term, an increase in water flow, which would provide an aesthetic positive change, and also possibly provide water for pack stock, and a source for humans to obtain water for treatment prior to use. The projects are meant to increase water flow over time, and should increase recreation enjoyment of the area.

The following activities will have the most direct impact to dispersed recreationists and their many and varied uses of the analysis area. As obliterated roads are returned to their natural contours, they will not be useable to OHV riders as they are currently. The road closure into Dane Springs will oust some campers and many (no hard numbers) OHV riders who enjoy the area from their camp up near the 321A road. Long-term maintenance and effectiveness monitoring would ensure the integrity of the fences/gates/conversion to trail. Installing pole fences and concentrating the dispersed campsites along the 321C road into more regulated areas along the meadows would tend to cause the visitors who use these areas to move on to other areas. The current traditional users may no longer fit into the smaller sites as delineated along the 321C road and other places where they formerly camped. Most visitors use the dispersed camping areas because they have fewer regulations, and they can be further from the sights and sounds of visitors outside of their group. In a dispersed site, visitors can park where they wish and set up temporary camping areas that expand and contract as the group size changes.

The major change caused by the planned activities, especially the ones intended to change the behavior of dispersed recreation users, may be ill-received at first, and a good solid PR campaign would help visitors understand the changes. Users will express their reaction to the changes across the watershed by one or more ways: complaining, violating the closures, vandalizing the site, or moving to another area. The OHV users who reach a blocked off road or former “trail” may do some of the same things.

Effectiveness monitoring, through in-the-field education and Law Enforcement activities and ongoing maintenance to structures such as fences would become part of the cost of installation. Most likely, the participants in dispersed recreation activities would move around or be displaced from their current place as the developments take place across the watershed.
Thinning and larger scale activities, that tend to take place over time, will mostly go unnoticed by the recreating public. Relocating the road into Holder cabin meadow may not affect the users, but the need for creating special orders and backing them up will become apparent. As with the meadow closures installed at other locations around the district, these would need monitoring and repair to maintain their integrity. The people participating in these activities may either move elsewhere, and the improvements would need to be patrolled often to ensure the compliance with closures.

Recreation and Special Lands Uses

The small mammal group (NAU under research permit) that has pin flags in Dick Hart Draw may be unable to conduct research during construction activities to rehabilitate the streambanks. Changes to meadow camping areas in the 321C vicinity would curtail some of the organized large group camping as previously permitted, since the area would not be large enough for some of the groups requesting permits for group activities. No other changes are expected from the planned activities.

Wild and Scenic Rivers/Inventoried Roadless areas

No changes to these areas based on current description of the planned activities. The Outstandingly remarkable values in the remote, inaccessible canyons and the “roadlessness” of these areas would not be compromised by the activities. The benefits to the fisheries in these canyons would be best described in the fisheries section.

ROS classification

The 9,600 acres of prescribed burning, as well as thinning in the understory would reduce doghair thickets of small suppressed trees, and provide a more park-like appearance to the forest. Most forest visitors tend to prefer the park-like appearance. In the short-term, accumulations of slash, and some of the intensive rehab efforts in the meadows and drainages would detract from the forest view. None of the alternatives does much to strategically promote changes to off-road motorized access to the extent that opportunities for solitude or natural quiet would increase significantly. Alternative 2 would result in a change to any ROS class designation.

Cumulative Effects

The area of interest for cumulative effects is the East Clear Creek watershed. The duration of effects is 10 years based on the life of the decision.

In Alternative 2, the projects proposed within the analysis area for road related issues are the only proposed road related activities within the watershed, thus there are no cumulative road effects to add to. The cumulative effect of increasing population will create more potential for recreation effects to the analysis area. The on-going Arizona Off Highway Vehicle Forest Plan Amendment - For Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests analysis once completed and implemented will minimize the effects from Off Highway Vehicles (OHV’s) by limiting areas of use. This will aid in minimizing the potential impacts from OHV’s on forest

resources. The designation of the open road system within this analysis will begin the implementation of this project. However, without enforcement and education of the public, there is a potential for increased damage from recreation use in the future.

Tables 10-14 above list the past, present, and future projects that may effect visual quality in this analysis area. We will assume for this analysis that all of the past and present timber sales and thinnings will have 100% of the acres prescribed burned. We will also assume that only the Victorine project will have prescribed burning, so there will be an additional 8,000 acres of prescribed burning within the next 5-10 years.

Alternative 2 will add approximately 22,600 acres of burning, for a total of nearly 36,000 to 37,000 acres of prescribed burning watershed-wide within the last 10 years. This is approximately 18% of the entire watershed being treated to minimize fuel loadings through prescribed burning over the past 10 years, as well as the next 5-10 years. The effect of burning on visual quality is short-term—usually brown needles for 1-2 years, so the 36,000 to 37,000 acre total is misleading. Actual implementation of burning is expected to be 2,000 to 8,000 acres per year, therefore the effect of visuals with brown needles is 4,000 to 16,000 acres in any 2 year period. There is a short-term potential for disturbance to recreation users during the actual ignition through smoke. IThe duration of this is usually 1 to 3 days after ignition, therefore there could be displacement of users from prescribed burning.

Cumulatively, the effect of this is rather small watershed wide (2-8% of the area). Alternative 2 will also add a approximately 10,000 acres of thinnings, for a cumulative approximately 49,000 acres of thinning (about 24% of the watershed total acres) will cumulatively have short-term impacts to recreationists, either through disturbance from tree cutting activities, or visual quality of slash on the ground. This again is usually short-term. The cumulative effect to recreation components will not occur on all of the acres at one time and will vary by year, depending on how many acres are implemented annually. These projects all occur within the VQO of modification and will not cumulatively change this designation. Overall, the projects proposed within Alternative 2 are not expected to have a cumulative impact on recreation activities within the analysis area.

Effects of Alternative 3

Recreation Sites and activities

No effects to *developed sites* are expected; nor are any effects anticipated at the *Boating sites*. *Trails* in the area, especially the Barbershop Trail would experience positive changes. Where the Barbershop trail crosses and re-crosses the 321C road, the dispersed camping/ATV use would conflict less with intended use (horse/hiker/bikes) after the sites are moved away from the meadows, and the 321C road and ATV “roads” are obliterated near the trail. Along the Cabin Loop trail, the effects are the same as Alternative 2. Converting “roads to trails” would add to the total miles of trails that need maintenance each year, these can be added to the Mogollon Rim’s trail system as non-motorized trails.

Site specificity is included in this alternative for the activities relative to 321C road and the meadow system/*high use dispersed camping areas*. The pole fences and obliterated roads would impact dispersed campers, hunters and off-road vehicle users.

At first the recreationists may see these closures as a negative impact to their recreation activities (dispersed summer camping and fall game hunting camps); over the long term, they may become more accepting of the restrictions intended to keep the streams flowing, but more likely, they will move to other areas. As with the meadow closures installed at other locations around the district, these would need monitoring and repair to maintain their integrity. The people participating in these activities may either move elsewhere, and the improvements would need to be patrolled often to ensure the compliance with closures.

With the Holder Cabin Road and Dines Tank Area Closure, there would be no different effects from Alternative 2.

Recreation and Lands Special Uses

Anticipate that the effects would be similar to those in Alternative 2.

Wild and Scenic Rivers/Inventoried Roadless Areas

Similar effects to those noted for Alternative 2.

ROS

Returning meadows and riparian areas to a more natural state, may cause an area to appear more managed, or modified, the modifications themselves may become targets for vandalism. In each case, an opportunity exists for interpreting the management activities in the area. At the larger stream/road crossings, there is ample opportunity for interpretation during and after construction phase of restoration occurs. Alternative 3 has the most ambitious tree stand thinning component (nearly 11,000 acres to thin, and nearly 23,000 acres to burn) which would result in both an increase in short term scenic impacts and in long term improvement to scenic quality (assuming that thinning is of “dog hair” thickets, leaving bigger trees). No other effects are anticipated no changes to the landscape that would change the ROS classification, even though there is an increase in the miles of decommissioned and closed roads within the analysis area.

Cumulative Effects

The area of interest for cumulative effects is the East Clear Creek watershed. The duration of effects is 10 years based on the life of the decision.

In Alternative 3, the projects proposed within the analysis area for road related issues are the only proposed road related activities within the watershed, thus there are no cumulative road effects to add to. The cumulative effect of increasing population will create more potential for recreation effects to the analysis area. The on-going Arizona Off Highway Vehicle Forest Plan Amendment - For Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests analysis once completed and implemented will minimize the effects from Off Highway Vehicles (OHV’s) by limiting areas of use. This will aid in minimizing the potential impacts from OHV’s on forest resources. The designation of the open road system within this analysis will begin the implementation of this project. However, without enforcement and education of the public, there is a potential for increased damage from recreation use in the future.

Tables 10-14 above lists the past, present, and future projects that may effect visual quality in this analysis area. We will assume for this analysis that all of the past and present timber sales and thinnings will have 100% of the acres prescribed burned. We will also assume that only the Victorine project will have prescribed burning, so there will be an additional 8,000 acres of prescribed burning within the next 5-10 years.

Alternative 3 will add approximately 23,000 acres of burning, for a total of nearly 36,400-37,400 acres of prescribed burning watershed-wide. This is approximately 18% of the entire watershed being treated to minimize fuel loadings through prescribed burning over the past 10 years, as well as the next 5-10 years. The effect of burning on visual quality is short-term—usually brown needles for 1-2 years, so the 36,400-37,400 acre total is misleading. Actual implementation of burning is expected to be 2,000 to 8,000 acres per year, therefore the effect of visuals with brown needles is 4,000 to 16,000 acres in any 2 year period. There is a short-term potential for disturbance to recreation users during the actual ignition through smoke. The duration of this is usually 1 to 3 days after ignition, therefore there could be displacement of users from prescribed burning. Cumulatively, the effect of this is rather small watershed wide (2-8% of the area).

Alternative 2 will also add a approximately 11,000 acres of thinnings, for a cumulative approximately 50,000 acres of thinning (about 25% of the watershed total acres) will cumulatively have short-term impacts to recreationists, either through disturbance from tree cutting activities, or visual quality of slash on the ground. This again is usually short-term. The cumulative effect to recreation components will not occur on all of the acres at one time and will vary by year, depending on how many acres are implemented annually. These projects all occur within the VQO of modification and will not cumulatively change this designation. Overall, the projects proposed within Alternative 3 are not expected to have a cumulative impact on recreation activities within the analysis area.

Effects of Alternative 4

Recreation Sites and activities

The effects to *developed sites* and *Boating sites* are the same as Alternative 2. *Trails* in the area, especially the Barbershop Trail and the U-Bar trail would experience positive changes, where re-routing portions of the trail and restricting vehicle access would create benefits to the trail users, while reducing the impact trails have on streams in the watershed. Along the Cabin Loop trail, the effects are the same as Alternative 2 and 3, except there is the additional effect of the closing of FR 9616A, which the U-Bar trail follows. This closure would eliminate vehicular traffic along this portion of the trail near McClintock Springs and provide a more primitive setting for this portion of the trail.

The proposed change in the open road system will have the largest impact to recreationists. Access under this Alternative will be curtailed to the greatest extent under this Alternative. For those who drive the Forest for pleasure, this will restrict access over large portions of the analysis area. At first the recreationists may see these closures as a negative impact to their recreation activities (dispersed summer camping and fall game hunting camps); over the long term, they may become more accepting of the restrictions intended to keep the streams flowing, but more likely, they will move to other areas. Dispersed use at sites with open roads will more likely increase, causing a change in the recreation experience at these sites to a heavier use. At the same time,

recreationists that prefer solitude and off-road experiences will benefit greatly from this Alternative.

With the Holder Cabin Road and Dines Tank Area Closure, there would be no different effects from Alternative 2.

Recreation and Lands Special Uses

Anticipate that the effects would be similar to those in Alternative 2. Permit holders would need to be made aware of the larger prescribed fire and thinning activities, the changes to the meadow and road areas, and the additional vehicle closures as part of the permit application process.

Wild and Scenic Rivers/Inventoried Roadless Areas

Similar effects to those noted for Alternative 2, however, the reduction of road density around these sites will increase the potential solitude of these sites.

ROS

The effects of meadow restoration, thinning, and prescribed burning are the same as Alternative 3. This Alternative will increase a recreational setting that is less intrusive by motorized vehicles. The increase in the miles of closed roads to 186 miles of closed road and the reduction of the open road system from about 380 miles to approximately 225 miles of road will reduce the open road density across the landscape. However, the open road density will still be 2 miles/square mile, and the roads will still occur across the tops of each main ridge, therefore, a broad scale change in ROS class is not anticipated, especially around current Inventoried Roadless Areas.

Cumulative Effects

The area of interest for cumulative effects is the East Clear Creek watershed. The duration of effects is 10 years based on the life of the decision. As stated above, there are no cumulative effects from roads to add to.

In Alternative 4 there are very great changes in the open road density, however, the projects proposed within the analysis area for road related issues are the only proposed road related activities within the watershed, thus there are no cumulative road effects to add to. All other cumulative effects are the same as Alternative 3

Cultural Resources

Cultural Resource Affected Environment

Affected Environment

There are 7 identified cultural resource sites within the proposed treatment areas. Site types are all historic period sites. The General Crook Trail also traverses the southern portion of the analysis area. All of the sites are considered potentially eligible for the National Register under Criterion D of 36-CFR-60.4 and will be considered eligible for Section 106 purposes for this project [114].

Cultural Resources Environmental Consequences

Effects of Alternative 1

The no action alternative does not have any activities that could disturb the existing sites, therefore, there will be no direct effect to these sites. Long-term negative effects could happen to sites through continued bank erosion in drainages, particularly to Pinchot Cabin in Houston Draw. The long-term effects of increased fuel loading will be discussed in the cumulative effects portion of this section.

Effects of Alternative 2, 3, and 4

All proposed activities within Alternative 2 will have site specific cultural resource survey and approval completed prior to implementation to mitigate any potential impacts to cultural resources, so there will not be any direct effects to cultural resource sites. All sites will be protected from any disturbance. Long-term indirect effects to the Pinchot Cabin site could be realized through channel stabilization work that is occurring in Houston Draw for both alternatives. If any new sites are discovered during construction activities, they are to be reported to the Forest Archaeologist and ground-disturbing work will be halted. All 7 sites shall be protected pursuant to FSM 2361.1 (2) and FSM R-3 2361.21 (2) until testing or additional information is available that would allow for formal determination of eligibility to be made [114]. The prescribed burning projects have the greatest potential to harm the historic wooden structures and will all be protected under this action.

Cumulative Effects of Alternative 1, 2, 3 and 4

The cumulative effects area for recreation activities is the East Clear Creek Watershed. The duration of the effects will be 10 years. Because the project does not propose any activities in Alternative 1, there are no direct cumulative effects from this Alternative. Historic properties have potential for destruction from fire because they are generally wood structures. Thus, Pinchot Cabin, General Springs Cabin, Buck Springs Cabin, and Schneider Springs Cabin have the potential to be lost from high fuel loadings that have occurred from past fire exclusion policies and no action proposed within this Alternative. The potential increase in recreation activity within the analysis area does increase the potential to vandalism on historic sites.

Alternative 2 will add approximately 22,600 acres of burning, for a total of nearly 36,000-37,000 acres of prescribed burning watershed-wide. This is approximately 18% of the entire watershed being treated to minimize fuel loadings through prescribed burning. This, in combination with approximately 49,000 acres of thinning (24% of the watershed total acres) will cumulatively decrease the potential of stand replacing wildlfire which will increase the protection of the historic wooden structures at Pinchot Cabin, General Springs Cabin, Buck Springs Cabin, and Schneider Springs Cabin. Additional survey for site specific projects may also lead to additional cultural resources being located within the analysis area. Overall, the proposed actions within this Alternative will not have a positive net effect to the cultural resources.

Alternative 3 and 4 will add approximately 23,000 acres of burning, for a total of nearly 36,400-37,400 acres of prescribed burning watershed-wide. This is approximately 24% of the entire watershed being treated to minimize fuel loadings through prescribed burning. This, in combination with cumulative total of about 50,000 acres of thinning (25% of the watershed total acres) will cumulatively decrease the potential of stand replacing wildfire which will increase the

protection of the historic wooden structures at Pinchot Cabin, General Springs Cabin, Buck Springs Cabin, and Schneider Springs Cabin. Additional survey for site specific projects may also lead to additional cultural resources being located within the analysis area. Overall, the proposed actions within this Alternative will not have a positive net effect to the cultural resources.

Vegetation

Vegetation Affected Environment

The primary vegetation type within the approximately 70,000 acre analysis area is a ponderosa pine overstory with a variety of species in the understory, including, but not limited to, Arizona fescue, screwleaf muhly, gambel oak and buckbrush. This occurs on approximately 44,000 acres within the center portion of the analysis area. In the far northern portion of the analysis area the small amount of ponderosa pine/pinyon juniper type occurs on about 2,200 acres. In the southern portion of the analysis area, the elevation and precipitation increases and a mixed-conifer forest type occurs on approximately 23,500 acres.

A majority of the area is in trees on the average of 60-120 years old, with scatterings of openings and old growth timber (USDA 1996). Large portions of openings have filled in with young ponderosa pine regeneration that is 10-30 years old. An additional 412 acres of meadow occur within the analysis area, which are currently dominated by the non-native Kentucky bluegrass. Exceptions to this do occur in wetter sites (where channels have not downcut) and in elk exclosure areas. Within the wetter sites, sedge, rush and spikerush occur. A limited amount of woody riparian occurs within the watershed, with Arizona alder being the main woody species. Bebb's willow does occur in the watershed, but it is limited due to the palatability of the species to ungulates prevents it from spreading successfully. Bebb's willow occupies sites historically that has fine soil substrates and Arizona alder occupies sites with courser substrates.

Noxious weeds also occur within the analysis area on areas that have been previously disturbed. Bull thistle is the primary noxious weed present, with a small population of cheatgrass [109, 128]. Bull thistle is found primarily along roadsides in old log landing locations, as well as in Buck Springs meadow [109, 128].

The following sensitive plant species may occur within the analysis area:

Arizona bugbane *Cimicifuga arizonica;* Mogollon thistle *Cirsium parryi mogollonicum*; Cliff fleabane *Erigeron saxatilis*; Mt. Dellenbaugh sandwort *Arenaria aberrans*;
Rusby's milkvetch *Astragalus rusbyi*; Flagstaff pennyroyal *Hedeoma diffusm*;
Arizona sneezeweed *Helenium arizonicum*; Eastwood alum root *Heuchera eastwoodiae*; and Flagstaff beardtongue *Penstemon nudiflorus*.

Mogollon thistle, cliff fleabane and Arizona sneezeweed have been documented within the analysis area. Potential habitat occurs within the analysis area for Arizona fleabane, Mt. Dellenbaugh sandwort, Rusby's milkvetch, Eastwool alum root and Flagstaff beardtoungue. There also may be some small pieces of potential habitat for Flagstaff pennyroyal, however, the species has never been located south of West Clear Creek.

Vegetation Environmental Consequences

Effects of Alternative 1 on Vegetation

Under this Alternative, canopy cover would gradually increase and annual tree diameter growth will decrease due to increasing age and inter-tree competition due to stand density. This would cause an increase in tree crowns and root densities, and increased competition for water, nutrients, and sunlight. The end result would be increased levels of stress on all trees, increased density induced mortality, and increased crown fire hazard.

This decreases the ability of trees to survive during drought, or during attacks by bark beetles, and other pathogens. Dwarf mistletoe will continue to spread and intensify, affecting growth and longevity of ponderosa pine. The average rate of spread is 1 foot per year. Dwarf mistletoe infection may be reduced in areas affected by wildfire (Alexander, et al. 1975). In this alternative, susceptibility to western pine beetle would slowly increase over time. Areas with the greatest likelihood of infestation are those stands with densities greater than 120 BA and average stand diameters greater than 12” DBH. Susceptibility to Ips would continue to increase with activity most likely occurring in response to a drought or a snow or ice event that creates fresh pine debris. The end result would be an overall decline in forest health and vigor and an increase risk for high intensity fire.

The negative effect should a high intensity fire occur in the project area; would be almost a total devastation to all VSS tree size classes. Short-term direct effects to vegetation under this alternative are minimal if there is not a stand-replacing fire. Biodiversity will decrease over time as overstory vegetation continues to close the canopy and light decreases to the forest floor (Covington, 1994). Vegetation in meadows will continue to be dominated by Kentucky bluegrass and there will not be an increase in species diversity in meadows.

Negative direct effects to mid to late successional species if a large, stand replacing fire did occur within the analysis area. A stand replacing fire could improve the conditions for aspen regeneration, as well as other early successional species. This would improve biodiversity of the sites, but high soil temperatures associated with stand replacing fires would lengthen the succession to mid and late seral stages due to damaged soils. In addition, as the length of time increases, the threat of stand-replacing wildfire increases [102, 129], which would be a short-term negative effect to vegetation at the fire site.

The lack of disturbance within this alternative will not hasten the spread of noxious weeds within the analysis area [109, 129]. An indirect negative effect may occur if a large stand-replacing fire would occur that would be ripe for spreading noxious weeds on a large scale.

The effects to the sensitive species within the watershed would be minimal for direct, short-term effects. However, there may be negative long-term effects for riparian dependent species (Eastwood alum root, Arizona sneezeweed, Arizona bugbane, Mogollon thistle, and cliff fleabane) due to loss of habitat from continuing degradation of riparian habitat in meadows, roads affects, and the threat of large wildfire.

Effects of Alternative 2 on Vegetation

The activities with the greatest impact to vegetation are the prescribed burning and thinning, primarily due to the relatively large acreages involved compared to the other treatments within Alternative 2. The removal of some of the needlecast through prescribed burning will also provide more areas for seed-bearing plants to become established—this includes noxious weeds. Thus, prescribed burning on approximately 22,600 acres will provide the opportunity for increased plant diversity, which can be positive with native plant seeding, but can be negative through the establishment of noxious weeds. Prescribed burning will also provide a direct nutrient flush to species on-site that will be beneficial to plant growth [99,107]. Prescribed burning will also stimulate fire dependant species such as buckbrush (*Ceanothus fendleri*) and aspen, which will improve species diversity in the uplands (Brown and Smith, 2000).

Thinning to reduce fire risk on trees up to generally 12" in diameter (9,600 acres) and in the commercial thin blocks (670 acres) will have a direct effect through improved growth of the remaining overstory trees. This effect is minimized through time as the remaining trees re-occupy the site [102,129]. In addition, health of large yellow pines will be improved as thinning will decrease competition to these trees. Thinning around yellow pines on the Fort Valley Experimental Forest has resulted in increased water flow within the tree, allowing for trees to naturally pitch out bark beetles (Fulé 2004 personal communication). This affect is expected to occur within the analysis area on all thinned sites. Thus, a short-term positive effect to the overstory is gained through thinning in Alternative 2.

Understory vegetation in the thinning units will also receive a short-term positive effect through an open canopy that will allow for the germination of new plants. This will increase the biodiversity of understory species directly through increased sunlight to forest floor through a reduction in overstory canopy cover, increased available soil moisture, and ground disturbance. The increase in soil moisture may be tempered due to expected increased evaporation rates due to a more open forest canopy. There will be limited ground disturbance from mechanical operations (thought to be less than 5% of the area on 9,600 acres and 15-20% of the area on 670 acres) from the cutting activity that may be a source of seedling establishment. As stated above, this could be either native seed establishment or a noxious weed, therefore, there could be both positive and negative effects to the understory vegetation from this action. Thinning around Buck, Merritt and McFarland Springs will have similar effects as the thinning to reduce fire risk. The combination of thinning and burning on approximately 10,000 total acres will have the best chance of improving native understory diversity.

The action alternative will have some short-term direct negative effects to vegetation; particularly understory vegetation, where ground disturbing activities will take place (in-channel work, road obliterations, trail construction etc). The closure of 18.5 miles of road and the decommissioning of 17.9 miles of road will limit the potential spread of noxious weeds to these sites after they have recovered, but the actual activities to close/decommission these sites have the potential to spread noxious weeds. The cleaning of equipment and revegetation BMP's will mitigate this potential.

The ground-disturbing activity will remove live vegetation and will make the disturbed site susceptible to invasion of noxious weeds [104,126]. Noxious weeds, once established, make it difficult for native vegetation to occupy the site and are generally shallow rooted which will contribute to a decline in soil productivity (and also a corresponding decrease in plant productivity) through an increase in erosion potential. Best Management Practices that are

designed to re-establish vegetation, implementing the Forest's noxious weed strategy and to protect new plants from grazing are key to minimizing the nefarious effects of noxious weeds [104,126]. Long-term indirect effects to understory plants are expected to improve plant diversity through improved water-regimes (keeping water on-site longer to favor sedge/rush/spike-rush communities) [104,126]. Further improvements in understory vegetation will apply to the vehicle closure areas, but will be on small acreages and will likely not be detectable for the analysis area as a whole, but will be important on-site to minimize sediment movement.

The effects to sensitive species will be similar to other understory vegetation. There can be a direct negative effect if the plant is in a project area. This is not the case now, but this will be mitigated through thorough plant surveys prior to construction to ensure the plants are not on-site as they are now. The actions designed to improve watershed condition will have an effect to improved habitat for Mogollon thistle, especially the Dane Springs exclosure where a known population exists [99,107]. Arizona sneezeweed may be negatively impacted from construction activities at the tank removal sites (which they are not known to exist at now), but improved habitat conditions in the long-term will improve the possibility for these species to occupy sites within the analysis area [99,107].

Cliff fleabane and Arizona bugbane will not show a direct effect due to the location of their habitat, but could show an indirect positive effect if improved watershed conditions keep water on-site longer than the present [99,107]. Potential habitat exists for Mt. Dellenbaugh sandwort, Rusby's milkvetch, Flagstaff pennyroyal, Eastwood alum root and Flagstaff beardstongue and the only project that would potentially affect them is the prescribed burn proposals. This effect is not thought to be a great enough effect to push any of the species towards federal listing [99,107]. Other proposed projects are not expected to affect these species [99,107].

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project to vegetation will include timber sales, thinning, prescribed burning and riparian improvement projects. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code). The timeframe for past actions is 10 years. The ten year time frame is used because vegetation has been re-established for many years on these sites within this time frame.

Table 28: Summary of Effects to Vegetation from all Proposed Activities, Alternatives 1-4

ACTIVITY	OVERSTORY EFFECTS	UNDERSTORY EFFECTS	RIPARIAN EFFECTS
No Watershed Health Actions (Alternative 1)	Direct effect of overstory canopy closure increases, increased competition for water and nutrients, understory vegetation diversity and abundance decreases. Increased potential for bark beetle infestation beyond endemic levels. Indirect effect of increased potential for stand-replacing wildfire.	No treatment, so no reduction of canopy or nutrient flush to understory. Direct effect of overstory canopy closure increases, understory vegetation diversity and abundance decreases.	No improvement. Riparian vegetation remains static or downward trend from headcuts and road impacts.
Prescribed burn 22,600 acres to reduce fuel hazard (Alternative 2).	No acres treated directly in overstory, some small pockets of overstory burned to increase sunlight to ground. Some potential increase in VSS class 1 and 2 in created openings.	Understory response tied to nutrient flush. Some improvement in understory vegetation through nutrient flush and improveed conditions for germination of fire-dependant species (ceanothus/aspen). Some potential to increase noxious weeds on small pockets of high intensity burns on about 200 to 1,110 acres.	No direct effect, but indirect effect of decreased threat of wildfire that will minimize large runoff events that could affect riparian vegetation.
Prescribed burn 23,000 acres to reduce fuel hazard (Alternative 3 and 4)	No acres treated directly in overstory, some small pockets of overstory burned to increase sunlight to ground. Some potential increase in VSS class 1 and 2 in created openings.	Understory response tied to nutrient flush. Some improvement in understory vegetation through nutrient flush and improveed conditions for germination of fire-dependant species (ceanothus/aspen). Some potential to increase noxious weeds on small pockets of high intensity burns on about 200 to 1,110 acres.	No direct effect, but indirect effect of decreased threat of wildfire that will minimize large runoff events that could affect riparian vegetation.
Thin to reduce fuel hazard on 9,600 acres generally up to 12" and improve understory biodiversity (Alternative 2,3, and 4)	Reduction of crown base heights and crown bulk density on 9,600 acres will decrease stand-replacing wildfire potential. Decreased potential for insect and disease infestation through reduction of competition for moisture and nutrients. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk. Overall tree growth will improve for up to 10-15 years.	Improved light to understory will improve understory vegetation diversity and abundance. Depending on if trees are cut and left on-site, or are removed through commercial operation, some ground disturbance may occur that would be susceptible to noxious weed invasion (approximately 0 to 1,870 acres, depending on the tree removal method). BMP's will minimize the potential infestation of noxious weeds.	No direct effect, but indirect effect of decreased threat of wildfire that will minimize large runoff events that could affect riparian vegetation.
Commercial thin trees generally 5-20" dbh on 670 acres to reduce fuel hazard and improve understory biodiversity (Alternative 2,3,and 4)	Reduction of crown base heights and crown bulk density on 670 acres will decrease stand-replacing wildfire potential. Decreased potential for insect and disease infestation through reduction of competition for moisture and nutrients. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk. Overall tree growth will improve for up to 10-15 years.	Improved light to understory will improve understory vegetation diversity and abundance. Depending on if trees are cut and left on-site, or are removed through commercial operation, some ground disturbance may occur that would be susceptible to noxious weed invasion (approximately 100 to 170 acres,). BMP's will minimize the potential infestation of noxious weeds.	No direct effect, but indirect effect of decreased threat of wildfire that will minimize large runoff events that could affect riparian vegetation.
Commercial thin trees generally 5-18 in dbh on approximately 1,050 acres to reduce fuel hazard and improve understory biodiversity (Alternative 3 and 4)	Reduction of crown base heights and crown bulk density on 1,050 acres will decrease stand-replacing wildfire potential. Decreased potential for insect and disease infestation through reduction of competition for moisture and nutrients. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk. Overall tree growth will improve for up to 10-15 years.	Improved light to understory will improve understory vegetation diversity and abundance. Depending on if trees are cut and left on-site, or are removed through commercial operation, some ground disturbance may occur that would be susceptible to noxious weed invasion (approximately 160 to 260 acres,). BMP's will minimize the potential infestation of noxious weeds.	No direct effect, but indirect effect of decreased threat of wildfire that will minimize large runoff events that could affect riparian vegetation.
Thin fuelbreaks along main roads on approximately 1,250 acres (alter natives 3 and 4)	Reduction of crown base heights and crown bulk density on 1,250 acres will decrease stand-replacing wildfire potential. Decreased potential for insect and disease infestation through reduction of competition for moisture and nutrients. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk. Overall tree growth will improve for up to 10-15 years.	Improved light to understory will improve understory vegetation diversity and abundance. All will be felled by hand and little to no ground disturbance will occur, minimizing the risk of noxious weed spread.	No direct effect, but indirect effect of decreased threat of wildfire that will minimize large runoff events that could affect riparian vegetation.
Remove tanks and rehabilitate site @ Dick Hart (Alternative 2-4)	No direct effect to overstory species.	Ground disturbance will occur on nearly 3 acres, thus providing for potential noxious weed infestation. BMP's to minimize soil loss and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).	Treatment will maintain water on-site longer, thus improving riparian habitat potential. BMP's to minimize soil loss and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).
Natural channel design, layback banks/hydromulch Barbershop Canyon, Houston Draw, Lockwood Draw, East Bear Canyon, Buck Springs, Dick Hart Draw, Kinder Draw, and Bill McClintock Draw meadows (Alternative 2-4)	No direct effect to overstory species.	Ground disturbance will occur on nearly 75-100 acres, thus providing for potential noxious weed infestation. BMP's to minimize soil loss and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).	Treatment will maintain water on-site longer, thus improving riparian habitat potential. BMP's to minimize soil loss and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).

ACTIVITY	OVERSTORY EFFECTS	UNDERSTORY EFFECTS	RIPARIAN EFFECTS
Thin trees up to 16 inches DBH on a total of approximately 83 acres in upland areas above Merritt, McFarland, Limestone Tank and Upper Buck Springs to increase flow duration of springs (Alternative 2-4)	Reduction of crown base heights and crown bulk density on 83 acres will decrease stand-replacing wildfire potential. Decreased potential for insect and disease infestation through reduction of competition for moisture and nutrients. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk. Overall tree growth will improve for up to 10-15 years.	Improved light to understory will improve understory vegetation diversity and abundance. Depending on if trees are cut and left on-site, or are removed through commercial operation, some ground disturbance may occur that would be susceptible to noxious weed invasion (approximately 12 to 16 acres,). BMP's will minimize the potential infestation of noxious weeds.	No direct effect, but indirect effect of decreased threat of wildfire that will minimize large runoff events that could affect riparian vegetation.
Raise culverts to create ponded wetlands 321C (Alternative 2-4)	No direct effect to overstory species.	Ground disturbance will occur on nearly 1 acre, thus providing for potential noxious weed infestation. BMP's to minimize soil loss and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).	Treatment will maintain water on-site longer, thus improving riparian habitat potential. BMP's to minimize soil loss, protect the site, and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).
Rehabilitate or remove any stream channel wood structures located in Buck Springs and Houston Draw that are not functioning properly (Alternative 2-4)	No direct effect to overstory species.	Ground disturbance will occur on nearly 1-2 acres, thus providing for potential noxious weed infestation. BMP's to minimize soil loss and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).	Treatment will maintain water on-site longer, thus improving riparian habitat potential. BMP's to minimize soil loss, protect the site, and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).
Stabilize stream crossings (Alternative 2-4)	No direct effect to overstory species.	Ground disturbance will occur on nearly 1-2 acres, thus providing for potential noxious weed infestation. BMP's to minimize soil loss and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).	No direct effect to riparian vegetation-- will minimize sediments and slow water, thus potentially providing an indirect improvement in riparian habitat potential.
Install pole fence along 321C at meadow sections (Alternative 2-4)	Minor tree removal to create poles will have little affect on competition for soil moisture and nutrients, so little improvement expected in tree health where trees are removed. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk.	Ground disturbance will occur on nearly 1-2 acres, thus providing for potential noxious weed infestation. BMP's to minimize soil loss and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years). Improved meadow conditions will occur at sites where vehicles have compacted the soils.	No direct effect to riparian vegetation-- will improve meadow conditions in Bill McClintock Draw and may store water on-site longer that before due to reduced compaction, which may improve downstream riparian conditions in Bill McClintock Draw
Relocate 643A road w/ semi-permeable fill road (Alternative 2-4)	No direct effect to overstory species.	Ground disturbance will occur on nearly 1-2 acres, thus providing for potential noxious weed infestation. BMP's to minimize soil loss and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).	Treatment will maintain water on-site longer, thus improving riparian habitat potential. BMP's to minimize soil loss, protect the site, and regenerate the site will improve understory species composition from non-native Kentucky bluegrass to native riparian and upland species over time (1-5 years).
Pave locations on 95/96 roads (Alternative 2-4)	No direct effect to overstory species.	Ground disturbance will occur on less than 1 acre, thus providing for potential noxious weed infestation. BMP's will minimize this effect.	No direct effect to riparian vegetation-- will minimize sediments and slow water, thus potentially providing an indirect improvement in riparian habitat potential.
Remove encroaching conifers in meadow systems up to 9 inches in Bear Canyon, Houston Draw, Barbershop Canyon, Buck Springs, Bill McClintock Draw, Kinder Draw, East Bear Canyon, General Springs, Holder Cabin, Merritt Draw, Middle Leonard Canyon, West Leonard Canyon, and McClintock Springs meadows. Slash would be lopped and scattered to a 2-foot height across meadows (Alternative 2-4)	Removal of trees out of meadows will maintain meadow conditions. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk.	Improved light to understory will improve understory vegetation diversity and abundance. Slash left on site will create microclimates and protect plants from ungulate grazing, thus plants that are normally grazed will occur on-site.	Improved meadow conditions will improve water storage capabilities---thus riparian habitat potential is enhanced.
Create area closures at Dane Springs and Dines Tank for protection of spinedace habitat (Alternative 2-4)	No direct effect to overstory species.	Ground disturbance will occur on nearly 1-5 acres, thus providing for potential noxious weed infestation. BMP's to minimize soil loss and regenerate the site will improve understory species composition on disturbed sites over time (1-5 years).	Remvoal of road stressor will improve riparian habitat conditions at both Dane Springs and Dine's Tank.
Designate open road system (Alternative 2)	No direct effect to overstory species.	No direct effect to understory species.	No direct effect to riparian species.

ACTIVITY	OVERSTORY EFFECTS	UNDERSTORY EFFECTS	RIPARIAN EFFECTS
Reopen 3.1 miles of currently closed road to create a recreation loop (Alternative 2 and 3)	No direct effect to overstory species.	Road currently has some grass that has come in, this will be when re-opened.	No direct effect to riparian species.
If Close 18.5 miles of currently open roads (Alternative 2)	Some trees may be felled in the vicinity of roads to aid in disguising the road for closure efforts. Minimal amount of trees used will have little affect on competition for soil moisture and nutrients, so little improvement expected in tree health where trees are removed. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk. Over time, trees may occupy these sites.	Initial ground disturbance on approximately 15-20 acres will have potential for noxious weed infestation. BMP's will minimize this threat. In 1 to 5 years time, understory species will occupy the closed roads and there will be an improvement in understory species composition on the closed roads.	No direct effect to riparian streamcourses, but some closure activities are within non-riparian filter strips that may affect how water moves through the system. No quantifiable change in stream flows.
Decommission and obliterate 17.9 miles of currently open roads (Alternative 2)	Some trees may be felled in the vicinity of roads to aid in disguising the road for decommissioning efforts. Minimal amount of trees used will have little affect on competition for soil moisture and nutrients, so little improvement expected in tree health where trees are removed. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk.	Initial ground disturbance on approximately 35-45 acres will have potential for noxious weed infestation. BMP's will minimize this threat. In 1 to 5 years time, understory species will occupy the closed roads and there will be an improvement in understory species composition on the decommissioned roads.	Direct effect on 19 different road segments that are scheduled for decommissioning. Removal of road stressor will improve water flow and improving potential for riparian habitat.
Decommission and obliterate 14.7 miles of currently closed roads (Alternative 2-4)	Some trees may be felled in the vicinity of roads to aid in disguising the road for decommissioning efforts. Minimal amount of trees used will have little affect on competition for soil moisture and nutrients, so little improvement expected in tree health where trees are removed. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk.	Initial ground disturbance on approximately 25-30 acres will have potential for noxious weed infestation. BMP's will minimize this threat. In 1 to 5 years time, understory species will occupy the closed roads and there will be an improvement in understory species composition on the decommissioned roads.	Direct effect on 9 different road segments that are scheduled for decommissioning. Removal of road stressor will improve water flow and improving potential for riparian habitat.
Relocate .8 miles of currently open road (Alternative 2 and 3)	Some trees will be cleared in the new road corridor. Minimal amount of trees used will have little affect on competition for soil moisture and nutrients, so little improvement expected in tree health where trees are removed. Green slash is mixed conifer, little chance of Ips beetle infestation from created slash.	New road will have dog-hair thicket of white fir removed, not much loss of understory habitat. Old road will be rehabilitated and will provide for improved understory plant community over present road. Some potential for noxious weed infestation through ground disturbance on 1-2 acres; effect minimized through BMP's.	No direct effect to riparian vegetation-- will improve meadow conditions in Bill McClintock Draw and may store water on-site longer that before due to reduced compaction, which may improve downstream riparian conditions in Bill McClintock Draw
Designate open road system of 322 miles (Alternative 3)	No direct effect to overstory species.	No direct effect to understory species.	No direct effect to riparian species.
Close 36.7 miles of currently open roads (Alternative 3)	Some trees may be felled in the vicinity of roads to aid in disguising the road for closure efforts. Minimal amount of trees used will have little affect on competition for soil moisture and nutrients, so little improvement expected in tree health where trees are removed. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk.	Initial ground disturbance on approximately 35-45 acres will have potential for noxious weed infestation. BMP's will minimize this threat. In 1 to 5 years time, understory species will occupy the closed roads and there will be an improvement in understory species composition on the closed roads.	No direct effect to riparian streamcourses, but some closure activities are within non-riparian filter strips that may affect how water moves through the system. No quantifiable change in stream flows.
Decommission and obliterate 30.9 miles of currently open roads (Alternative 3)	Some trees may be felled in the vicinity of roads to aid in disguising the road for decommissioning efforts. Minimal amount of trees used will have little affect on competition for soil moisture and nutrients, so little improvement expected in tree health where trees are removed. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk.	Initial ground disturbance on approximately 45-60 acres will have potential for noxious weed infestation. BMP's will minimize this threat. In 1 to 5 years time, understory species will occupy the closed roads and there will be an improvement in understory species composition on the decommissioned roads.	Direct effect on 19 different road segments that are scheduled for decommissioning. Removal of road stressor will improve water flow and improving potential for riparian habitat.
Designate open road system of 225 miles (Alternative 4)	No direct effect to overstory species.	No direct effect to understory species.	No direct effect to riparian species.
Close 125.4 miles of currently open roads (Alternative 4)	Some trees may be felled in the vicinity of roads to aid in disguising the road for closure efforts. Minimal amount of trees used will have little affect on competition for soil moisture and nutrients, so little improvement expected in tree health where trees are removed. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk.	Initial ground disturbance on approximately 120-160 acres will have potential for noxious weed infestation. BMP's will minimize this threat. In 1 to 5 years time, understory species will occupy the closed roads and there will be an improvement in understory species composition on the closed roads.	Direct effect on 22 different road segments that are scheduled for decommissioning. Removal of road stressor will improve water flow and improving potential for riparian habitat.

ACTIVITY	OVERSTORY EFFECTS	UNDERSTORY EFFECTS	RIPARIAN EFFECTS
Decommission and obliterate 36.7 miles of currently open roads (Alternative 4)	Some trees may be felled in the vicinity of roads to aid in disguising the road for decommissioning efforts. Minimal amount of trees used will have little affect on competition for soil moisture and nutrients, so little improvement expected in tree health where trees are removed. Green slash can become a host for Ips beetles, and cause small outbreaks. BMP to regulate timing of thinning will minimize this risk.	Initial ground disturbance on approximately 70-100 acres will have potential for noxious weed infestation. BMP's will minimize this threat. In 1 to 5 years time, understory species will occupy the closed roads and there will be an improvement in understory species composition on the decommissioned roads.	No direct effect to riparian streamcourses, but some closure activities are within non-riparian filter strips that may affect how water moves through the system. No quantifiable change in stream flows.

Table 28: Summary of proposed treatments by measures to vegetation attributes.

Upper Clear Creek

Table 10 above displays the past, present and future and ongoing timber sale and precommercial thinning projects that occur within the Upper Clear Creek watershed. Table 15 above displays the future and foreseeable timber sale and precommercial thinning projects within the Upper Clear Creek watershed. Table 13 displays the past riparian area improvements within the Watershed in the last 10 years

Within the past timber sale and thinning projects (approximately 28,000 acres), there were tree canopy removal projects have improved overall forest health and increased crown base heights. The Victorine Wildland Urban Interface Project is expected to have approximately 8,200 acres of thinning within the watershed. With this alternative, an additional 10,600 acres of tree canopy treatments will take place, for a total of approximately 49,000 acres of canopy treatments cumulatively for the watershed over the last 10-years from tree harvest projects. The Pack Rat Salvage project and Maple Draw Project were done by primarily within the Pack Rat fire in 100% fire killed trees. A reduction of tree canopies to reduce competition and opening crowns so that sunlight gets to the ground does not apply on these sites, so the acres of these treatments are not included. Overall, approximately 24% of the watershed have had, or will have overstory treatments that will be beneficial to overall tree health, improved light to the forest floor for understory plant response. There is a low to moderate risk of spread of noxious weeds through tree removal projects proposed in this analysis. The use of mitigation measures outlined is designed to minimize the risk of spread on noxious weeds. The ECC Watershed Health Improvement Project will move the watershed as a whole to an improved forest condition.

Each of the timber sales listed above had fuel treatments for activity fuels, so for this analysis the assumption is that 100% of the treatment areas had activity fuels treated through machine piling. It is thought that this burning occurred on 1-5% of the previously treated sites. The Blue Ridge Urban Interface project has approximately 5,400 acres of burning treatments within the watershed. The Victorine Wildland Urban Interface Project is also expected to have approximately 8,200 acres of burning treatments. This analysis adds an additional 22,600 acres of fuel treatment through prescribed burning, for a total of about 36,000-37,000 acres of fuels reduction within the Upper Clear Creek Watershed. Overall, approximately 18% of the watershed have had, or will have prescribed burn treatments that will be beneficial to reducing fire risk and stimulating fire dependent species. There is a low to moderate risk of spread of noxious weeds through prescribed burning projects proposed in this analysis. The use of mitigation measures outlined is designed to minimize the risk of spread on noxious weeds. The ECC Watershed Health Improvement Project will move the watershed as a whole to an improved forest condition.

There are approximately 32 acres of past riparian health projects that have been completed within the watershed in the last 10 years. The ECC Watershed Health Improvement Project will add an additional 325 to 380 acres of riparian area improvements within the analysis area, for a total of nearly 350 to 410 acres of riparian area improvement. There is a potential for the spread of Bull thistle on projects within and adjacent to Buck Springs meadow, and these proposed projects will need the implementation of the mitigation measures outlined in Table 8 above. Overall, the treatments proposed within the ECC Watershed Health Improvement Project are expected to greatly improve riparian vegetation attributes within the Upper Clear Creek watershed.

Effects of Alternatives 3 on Vegetation

The only difference in effects between this Alternative and Alternative 2 are the additional effects from burning an additional 400 acres, the additional harvest of 1,052 acres, the addition of 1,250 acres of thinning to create fuelbreaks along major roads, and a different road management scheme—effects for all other proposed activities are the same as Alternative 2. Table 28 above summarizes these effects.

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project to vegetation will include timber sales, thinning, prescribed burning and riparian improvement projects. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code). The timeframe for past actions is 10 years. The ten year time frame is used because vegetation has been re-established for many years on these sites within this time frame.

Upper Clear Creek

Table 10-14 displays the past, present and future and ongoing timber sale and precommercial thinning projects that occur within the Upper Clear Creek watershed, the past riparian area improvements within the Watershed in the last 10 years and the future and foreseeable timber sale and precommercial thinning projects within the Upper Clear Creek watershed.

Within the past timber sale and thinning projects (approximately 28,000 acres), there were tree canopy removal projects have improved overall forest health and increased crown base heights. The Victorine Wildland Urban Interface Project is expected to have approximately 8,200 acres of thinning within the watershed. With this alternative, an additional 12,000 acres of tree canopy treatments will take place, for a total of approximately 50,000 acres of canopy treatments cumulatively for the watershed over the last 10-years from tree harvest projects. The Pack Rat Salvage project and Maple Draw Project were done by primarily within the Pack Rat fire in 100% fire killed trees. A reduction of tree canopies to reduce competition and opening crowns so that sunlight gets to the ground does not apply on these sites, so the acres of these treatments are not included. Overall, approximately 25% of the watershed have had, or will have overstory treatments that will be beneficial to overall tree health, improved light to the forest floor for understory plant response. There is a low to moderate risk of spread of noxious weeds through tree removal projects proposed in this analysis. The use of mitigation measures outlined is designed to minimize the risk of spread on noxious weeds. The ECC Watershed Health Improvement Project will move the watershed as a whole to an improved forest condition.

Each of the timber sales listed above had fuel treatments for activity fuels, so for this analysis the assumption is that 100% of the treatment areas had activity fuels treated through machine piling. It is thought that this burning occurred on 1-5% of the previously treated sites. The Blue Ridge Urban Interface project has approximately 5,400 acres of burning treatments within the watershed. The Victorine Wildland Urban Interface Project is also expected to have approximately 8,200 acres of burning treatments. This analysis adds an additional 23,000 acres of fuel treatment through prescribed burning, for a total of about 36,400-37,400 acres of fuels reduction within the Upper Clear Creek Watershed. Overall, approximately 18% of the watershed have had, or will have prescribed burn treatments that will be beneficial to reducing fire risk and stimulating fire dependent species. There is a low to moderate risk of spread of noxious weeds through prescribed

burning projects proposed in this analysis. The use of mitigation measures outlined is designed to minimize the risk of spread on noxious weeds. The ECC Watershed Health Improvement Project will move the watershed as a whole to an improved forest condition.

There are approximately 32 acres of past riparian health projects that have been completed within the watershed in the last 10 years. The ECC Watershed Health Improvement Project will add an additional 325 to 380 acres of riparian area improvements within the analysis area, for a total of nearly 350 to 410 acres of riparian area improvement. There is a potential for the spread of Bull thistle on projects within and adjacent to Buck Springs meadow, and these proposed projects will need the implementation of the mitigation measures outlined in Table 8 above. Overall, the treatments proposed within the ECC Watershed Health Improvement Project are expected to greatly improve riparian vegetation attributes within the Upper Clear Creek watershed.

Effects of Alternatives 4 on Vegetation

The only difference in effects between this Alternative and Alternative 3 are the different road management scheme—effects for all other proposed activities are the same as Alternative 2. Table 28 above summarizes these effects.

Cumulative Effects

Cumulative Effects for the proposed East Clear Creek Watershed Health Improvement project to vegetation will include timber sales, thinning, prescribed burning and riparian improvement projects. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code). The timeframe for past actions is 10 years. The ten year time frame is used because vegetation has been re-established for many years on these sites within this time frame.

Upper Clear Creek

Table 10-14 displays the past, present and future and ongoing timber sale and precommercial thinning projects that occur within the Upper Clear Creek watershed, the past riparian area improvements within the Watershed in the last 10 years and the future and foreseeable timber sale and precommercial thinning projects within the Upper Clear Creek watershed. The cumulative effects from thinning, burning, and stream restoration efforts are the same as Alternative 3

Economics

Affected Environment

Northern Arizona's economy has long been tied to agricultural-based activities such as ranching and logging. With urbanization and the associated changes in values have come changes in the economic base of this area. Tourism is now considered the leading industry in Northern Arizona. Recreation users contribute to the economy when they purchase hunting and fishing licenses and permits, pay fees at the campgrounds and purchase goods and services needed for particular activities. Indeed the revenues generated by hunting and fishing in Arizona alone are estimated by Congressional Sportsman's Foundation as equal to $140/resident, with added tax revenues equal to $16/resident. Many of these purchases are made locally, but may be made at other locations throughout the State and region. As stated in the recreation section of this chapter, total recreation

use will not change within the analysis area by any of the proposed activities but it will be shifted to different locations. The main discussion within this section will be to display the costs of the proposed alternatives. There may be a possibility for income to come from the sale of wood materials; however, there currently is little demand for wood products due to a general lack of manufacturing capability. The cost section below assumes that all wood products do not have a market and are treated with appropriated dollars, either through force account work, or through a stewardship contract.

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Effects of Alternative 1

There are no costs associated with this alternative, nor are there any monetary benefits from this alternative. There will be no improvement in the non-market benefits derived from the project.

Effects of Alternative 2, 3, and 4

Costs Costs associated with Alternative 2, 3, and 4 are displayed in Table 29 below. For the cost analysis, assumptions were made for the timing of each treatment. The timing of the actual implementation of each activity within each alternative may not meet the schedule listed within the EA due to funding considerations. Appropriated dollars are not guaranteed from year to year and implementation is subject to these dollars. If grants are attained for project implementation, the projects may be implemented before the scheduled date.

The costs of the commercial component of the thinning of 670 acres in Alternative 2 and thinning a total of 1,722 acres in Alternative 3 and 4 were assuming a Service Contract and not a Commercial Timber Sale Contract. If this portion of the project were to be a Commercial Timber Sale Contract, then the Forest Service would not be paying to have the material removed and there would be a return to the Treasury, rather than a cost. This trade off in expenditures could speed up the implementation of other projects within the analysis area.

Benefits All benefits for this analysis are non-market benefits, and as such are subjective to each individual. The majority of the products created from this analysis are trees less than 12” diameter at breast height and there currently is not a market for small trees. This analysis does not preclude commercial sale of these products, but past history and present markets dictate that the assumption be used in this analysis that the 9,600 acres be a cost, rather than showing an economic return. As stated above, there is a commercial component to the 670 acres of thinning in Alternative 2 and 1,722 acres in Alternative 3 and 4, respectively, but the lack of a market and milling capacity for larger material makes selling commercial products difficult. In the last four commercial offerings on the Mogollon Rim District, only one (Pack Rat Salvage sold at bid offering). If this changes in the future, a revenue stream could be realized for these products. As such, a narrative discussion follows on non-market benefits for each alternative. The following narrative discusses the non-market benefits resulting from the implementation of the different alternatives. Non-market benefits are either consumptive or non-consumptive. Consumptive benefits are those things that require something physical be removed from the site or have the potential to physically affect the site. Non-consumptive benefits are those in which nothing physical is removed from the site and there is no potential to physically affect the site.

Soil and Watershed Conditions Improved soil and water conditions through improved watershed conditions are both consumptive and non-consumptive in nature. Consumptive benefits include an increase in water flow and a longer duration of flow. This benefit would primarily aid downstream users of the water (Winslow and tribal users), as well as anglers (primarily downstream of the dam).

Non-consumptive benefits of improved soil and watershed conditions are tied to recreation benefits. Improved flow and duration of flow would allow recreationists an increased opportunity to visit sites with water. Also, with improved riparian conditions comes an increase in biodiversity. Examples of non-consumptive benefits of improved riparian conditions include recreational camping, sightseeing, birding, hiking, and wildlife viewing.

Improved soil stability and productivity benefits result when the existing soil remains in place or conditions are created so as to enhance either on-site soil creation or retention of soil deposited from off-site. This leads to improved soil productivity, which in turn would lead to increasing vegetative biomass and species diversity.

Other non-market benefits include ceremonial and medicinal benefits from improved soil and watershed conditions, and in particular improvements in native plant biodiversity, and educational opportunities. Consumptive ceremonial and medicinal benefits include the gathering of ceremonial and medicinal items. Opportunities for this activity would be expected to increase as riparian habitat improves. Non-consumptive uses include the passing on of ceremonial and medicinal knowledge to younger generations. Educational non-consumptive benefits include research opportunities and improving the level of awareness about the function of properly functioning watersheds, soils, and riparian areas.

Research and knowledge is another non-market benefit that can be assigned to the analysis area, however, either implementing an action alternative or not implementing an action alternative does not preclude research activities from occurring within the analysis area. Therefore, all alternatives considered can consider this as a non-market benefit.

Environmental Justice

The Forest Service explored the social, economic, and environmental impacts of this project and determined that none of the alternatives considered in this analysis would have a disproportionate impact on any minority population in the immediate area, within the surrounding counties, or in the Northern Arizona region [100].

Table 29: Summary of Present Value of Proposed Treatments for Alternatives 2, 3, and 4

Treatment	Assumption	Unit	Unit Cost	# units	Total Cost	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
Prescribed burning (Alternative 2)	burn 1/10 of total per year	acres	$50	22,600	$1,130,000	$113,001	$117,521	$122,222	$127,111	$132,195	$137,483	$142,982	$148,702	$154,650	$160,836
Prescribed burning (Alternative 3 and 4)	burn 1/10 of total per year	acres	$50	23,047	$1,152,350	$115,236	$119,845	$124,639	$129,625	$134,810	$140,202	$145,810	$151,643	$157,708	$164,017
Thinning approx 12" and under (Alternatives 2,3, and 4)	thin 1/10 of total per year	acres	$100	9,600	$960,000	$96,001	$99,841	$103,835	$107,988	$112,308	$116,800	$121,472	$126,331	$131,384	$136,639
Commercial thinning (Alternative 2)	thin all in second year	acres	$250	670	$167,500		$174,201								
Commercial thinning (Alternative 3 and 4)	thin 670 acres year 2, thin 1,052 acres year 3	acres	$250	1,722	$430,500		$174,201	$284,462							
Thin fuelbreaks along main roads (Alternatives 3 and 4)	thin 1/10 of total per year	acres	$100	1,250	$125,000	$12,501	$13,001	$13,521	$14,062	$14,624	$15,209	$15,818	$16,451	$17,109	$17,793
Remove tanks and rehabilitate site @ Dick Hart (Alternatives 2,3, and 4)	implement in year 2	sites	$17,500	4	$70,000		$72,801								
Construct elk exclosure fences in Bear Canyon, Buck Springs, Houston Draw, Dick Hart Draw, Bill McClintock Draw, Lockwood Draw, Kinder Draw, and Barbershop Canyon.(Alternatives 2,3, and 4)	implement in year 1,3,5,and 7	miles	$20,000	22.5	$450,000	$112,501		$121,681		$131,610		$142,350			
Natural channel design (Alternatives 2,3, and 4)	implement approximately 2.5 miles in years 1,3,5, and 7	miles	$75,000	10	$750,000	$187,501		$202,801		$219,350		$237,249			
Thin trees up to 16 inches DBH in upland areas above springs (Alternatives 2,3, and 4)	implement in year 3 and 5	acres	$150	83	$12,450			$6,734		$7,284					
Raise culverts to create ponded wetlands Dick Hart and 321C (Alternatives 2,3, and 4)	implemennt 1 site /yea rin years 2, 3, and 4	sites	$10,000	3	$30,000		$10,401	$10,817	$11,250						
Rehabilitate or remove any stream channel wood structures located in Buck Springs and Houston Draw (Alternatives 2,3, and 4)	implement in year 2 w/ natural channel design at these sites	sites	$1,000	22	$22,000		$22,881								
Stabilize stream crossings (Alternative 2, 3, and 4)	implemement 10 sites yr 1, 9 sites/year years 2-5	sites	$1,000	46	$46,000	$9,201	$9,569	$9,952	$10,350	$10,764					
Install pole fence along 321C at meadow sections (Alternatives 2,3, and 4)	implement year 2 w/ raise culverts	miles	$10,000	1.2	$12,000		$12,481								
Relocate 643A road w/ semi-permeable fill road (Alternatives 2,3, and 4)	implement year 2	miles	$22,000	0.5	$11,000		$11,441								
Pave locations on 95/96 roads (Alternatives 2,3, and 4)	implement 2 sites/yr in year 3 and 4	sites	$7,500	4	$30,000			$16,225	$16,874						
Remove encroaching conifers in meadow systems (Alternatives 2,3, and 4)	implement 100 acres/yr in years 1-3	acres	$50	300	$15,000	$5,001	$5,201	$5,409							
Designate open road system (Alternative 2)	sign in years 1-3	miles	$25	347	$8,675	$2,901	$3,017	$3,138							
Reopen currently closed road to create a recreation loop (Alternative 2 and 3)	implement in year 2	miles	$1,000	3.1	$3,100		$3,225								

Treatment	Assumption	Unit	Unit Cost	# units	Total Cost	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
Close currently open roads (Alternative 2)	implement in equal miles year 1-5	miles	$1,000	18.5	$18,500	$3,701	$3,849	$4,003	$4,163	$4,330					
Decommission and obliterate currently open roads (Alternative 2)	implement in equal miles year 1-5	miles	$2,000	17.9	$35,800	$7,161	$7,447	$7,745	$8,055	$8,377					
Decommission and obliterate currently closed roads (Alternative 2, 3, and 4)	implement in equal miles year 1-5	miles	$1,250	14.7	$18,375	$3,676	$3,823	$3,976	$4,135	$4,300					
Relocate currently open road (Alternative 2 and 3)	implement in year 2	miles	$5,000	0.8	$4,000		$4,161								
Designate open road system (Alternative 3)	sign in years 1-3	miles	$25	322	$8,050	$2,686	$2,793	$2,905							
Close currently open roads (Alternative 3)	implement in equal miles year 1-5	miles	$1,000	36.7	$36,700	$7,341	$7,635	$7,940	$8,258	$8,588					
Decommission and obliterate currently open roads (Alternative 3)	implement in equal miles year 1-5	miles	$2,000	30.9	$61,800	$12,361	$12,855	$13,370	$13,904	$14,461					
Designate open road system (Alternative 4)	sign in years 1-3	miles	$25	225	$5,625	$1,876	$1,951	$2,029							
Close currently open roads (Alternative 4)	implement in equal miles year 1-5	miles	$1,000	125.4	$125,400	$25,101	$26,105	$27,149	$28,235	$29,365					
Decommission and obliterate currently open roads (Alternative 4)	implement in equal miles year 1-5	miles	$2,000	36.7	$73,400	$14,701	$15,289	$15,901	$16,537	$17,198					
Create area closures at Dane Springs and Dines Tank (Alternative 2, 3, and 4)	implement Dines in year 2, Dane in year 3	sites	$20,000	2	$40,000		$20,801	$21,633							
TOTALS ALTERNATIVE 2					$3,834,400	$540,645	$582,663	$640,172	$289,926	$630,518	$254,283	$644,053	$275,032	$286,034	$297,475
TOTALS ALTERNATIVE 3					$4,288,325	$564,006	$606,958	$949,901	$316,446	$658,099	$272,212	$662,698	$294,424	$306,201	$318,449
TOTALS ALTERNATIVE 4					$4,379,100	$583,296	$619,634	$970,765	$339,056	$681,613	$272,212	$662,698	$294,424	$306,201	$318,449

Table 29: Table 30 lists a summary of the costs associated with implementing Alternatives 2, 3 and 4 of this analysis. All costs display are displayed in the future value using an annual interest rate of 4%.

CHAPTER 4 CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, Federal, state and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

Core Team Members

Dick Fleishman: Watershed Specialist	Team Leader/Soil and Water
Cathy Taylor: Wildlife Biologist	Wildlife/editor
Jerry Gonzales: Range Conservationist	Range/editor
Mark Whitney: Fisheries Biologist (deceased)	Fisheries

Additional FS Input

Larry Sears: District Ranger	Consultant/Reviewer
Liz Blake: NEPA Specialist	NEPA input/note taker
Katherine Farr: NEPA Specialist	Reviewer/NEPA input
Trish Callaghan: District Recreation Staff	Recreation input
Jim Beard: Landscape Architect	Recreation input
Ed Freed: Engineering Technician	Roads input
Jason Jerman: Fire Ecologist	Fire/Air/Smoke
Ed Paul: Fire Ecologist	Fire/Air/Smoke
Angela Crossley: Archaeologist	Cultural Resources
Kristen Martine: Archaeologist	Cultural Resources
Peter Pilles: Forest Archeologist	Tribal liaison
Debbie Crisp: Wildlife Technician	Note Taker

Outside Representatives

Rick Miller:	Az Game and Fish Wildlife
Chuck Benedict:	Az Game and Fish Fisheries
Mr..Phillip K. Knight	Range Permittee Buck Springs Allotment
Mr. Tim Flood	Friends of Arizona Rivers
Mr. Charles Ester	Salt River Project
Mr. Brian Segee	Center for Biological Diversity
Mr. Kirsten Stade	Forest Guardians
Mr. Ed Smith	Nature Conservancy
Ms. Kelly Janecek	Grand Canyon Trust
Ms. Jeanette Cassa	San Carlos Apache Tribe
Mr. John Smith	Precision Pine
Mr. Don Cox	
Ms. Peggy Randall	
Mr. David Harlow	US Fish and Wildlife Service
Mr. Robert Barris	
Ms. Shaula Hedwall	US Fish and Wildlife Service
Mr. Clifford Finch	Crooked H Ranch
Mr. Jeff Burgess	
Ms. Karen Goodwin	Southwest Forest Watch
Mr. Kim Crumbo	Grand Canyon Wildlands Council

Mr. Larry Phoenix	Arizona Game and Fish Department
Mr. Tom Mackin	Coconino Sportsman
Mr. Veldon Lee	Clear Creek Pine Property Owners Assoc.
Mr. Bruce Johnson	
Ms. Kate Klein	District Ranger, Black Mesa RD
Ms. Mandy Metzger	The Diablo Trust
Ms. Marcy Mattson	Fort McDowell Yavapai Nation
Mr. Clinton Pattea	Fort McDowell Mohave Apache
Ms. Vivian Burdette	Tonto Apache Tribe
Mr. Dallas Massey Sr.	White Mountain Apache Tribe
Ms. Mae Franklin	Tribal Liason, Kaibab National Forest
Ms. Leigh Kuwanwisiwma	Hopi Cultural Preservation Office
Mr. Johnny Murphy Lehi, Sr.	San Juan Southern Paiute Council
Ms. Linda Blan	Yavapai-Prescott Indian Tribe
Mr. Christopher Coder	The Yavapai-Apache Nation
Ms.Louise Benson	Hualapai Tribe
Mr. Steven Begay	Navajo Traditional Cultural Program
Mr. Roland Manakaja	The Havasupai Tribe
Mr. Cyrus Chino	The Pueblo of Acoma
Mr. Jonathon Damp	Zuni Heritage/Historic Preservation Office
Mr. Dale Gazzolo	Arizona OHV Association
Mr. Norman Peterson	Arizona State Association of 4 Wheel Drive Clubs Inc
Mr. Bob Halla	Verde Valley 4-Wheelers
Mr. Lamoyn Swendon	Payson Motorsports Club
Ms. Liz Boussard	Grand Canyon Wildlands Council

APPENDICES

APPENDIX A

Treatment Maps by Alternative

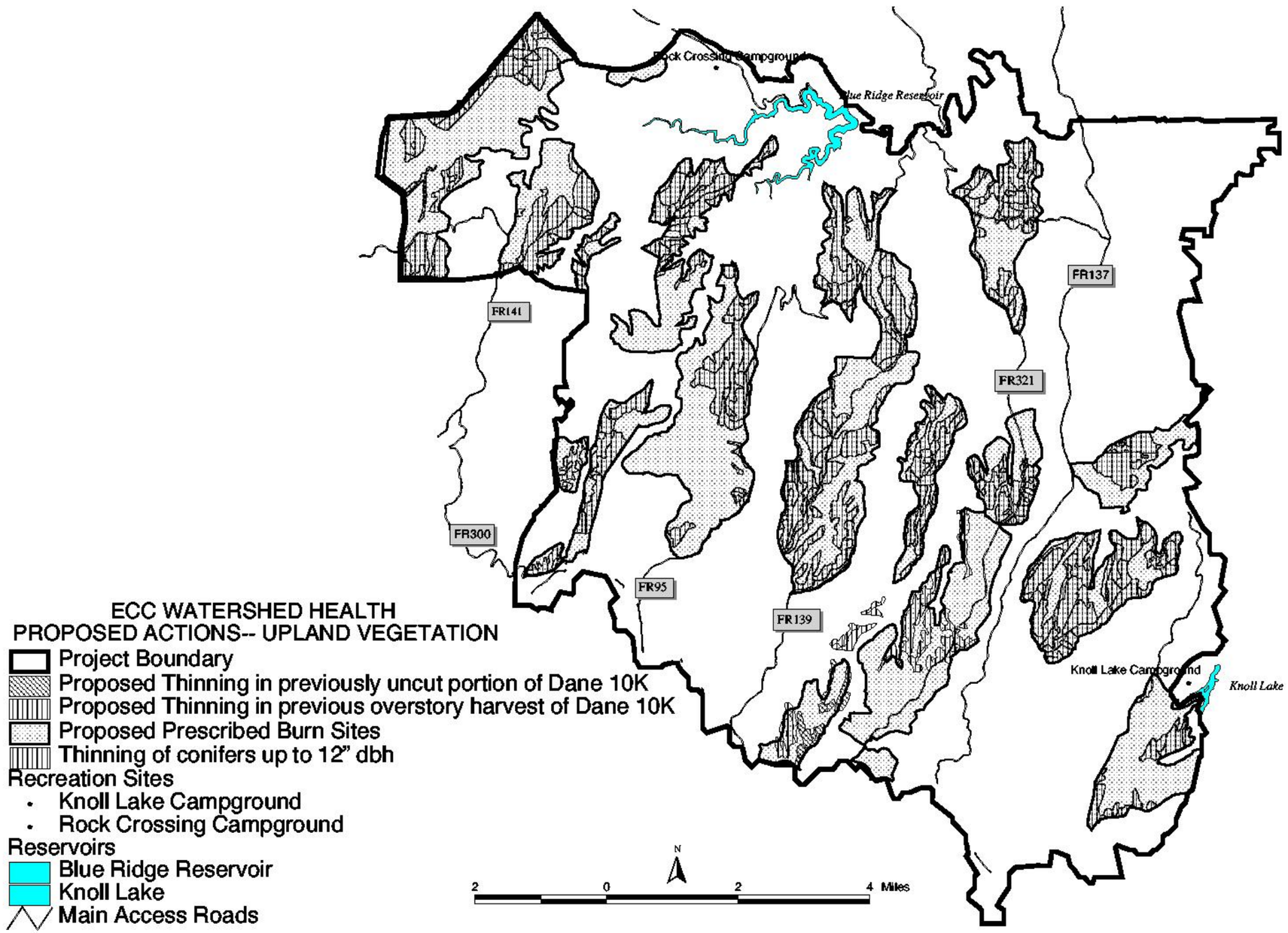


Figure 5: Planned Upland Vegetation Treatments in the Proposed Action (Alternative 2)

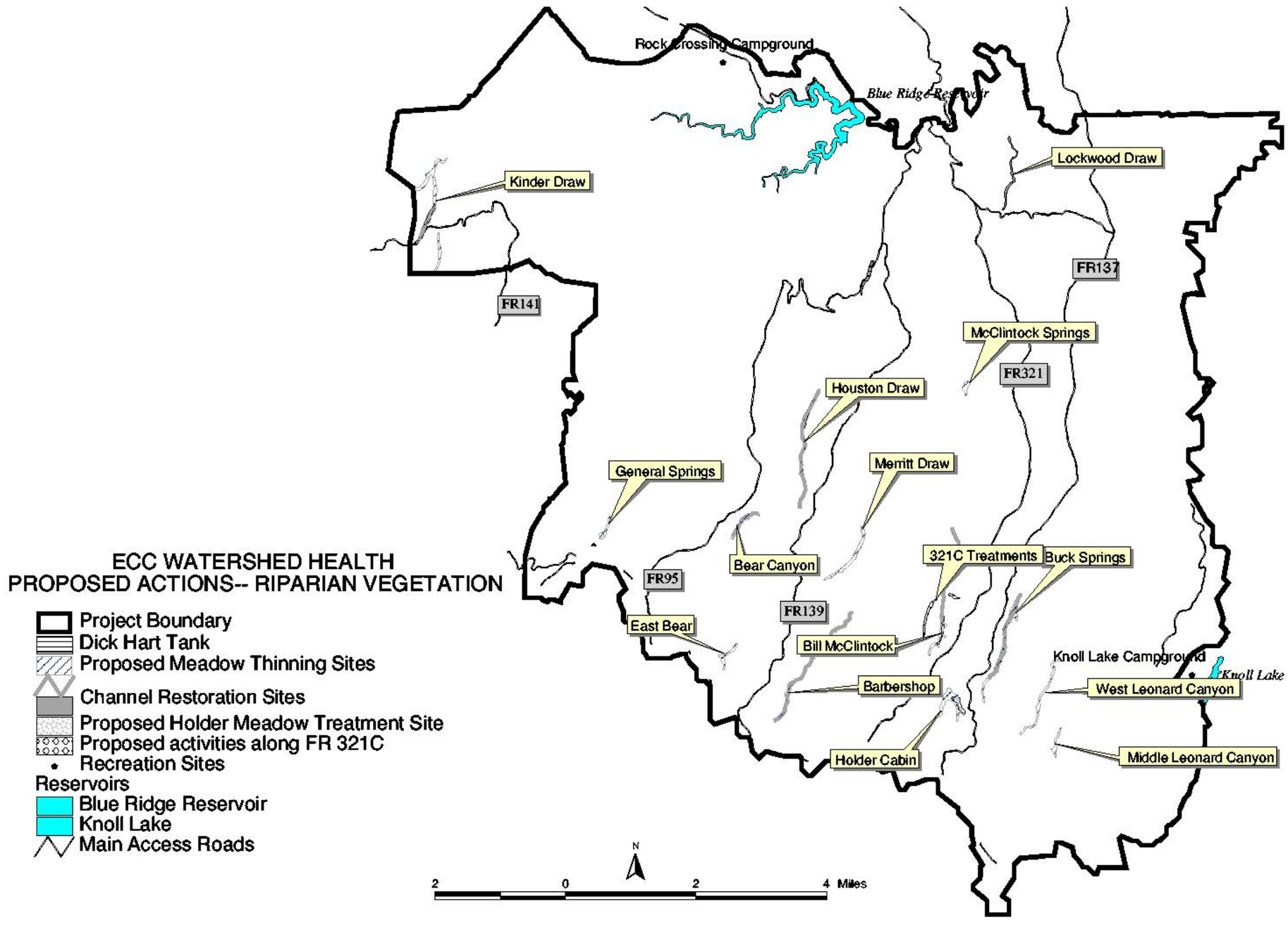


Figure 6: Planned Riparian Vegetation Treatments in the Proposed Action (Alternative 2)

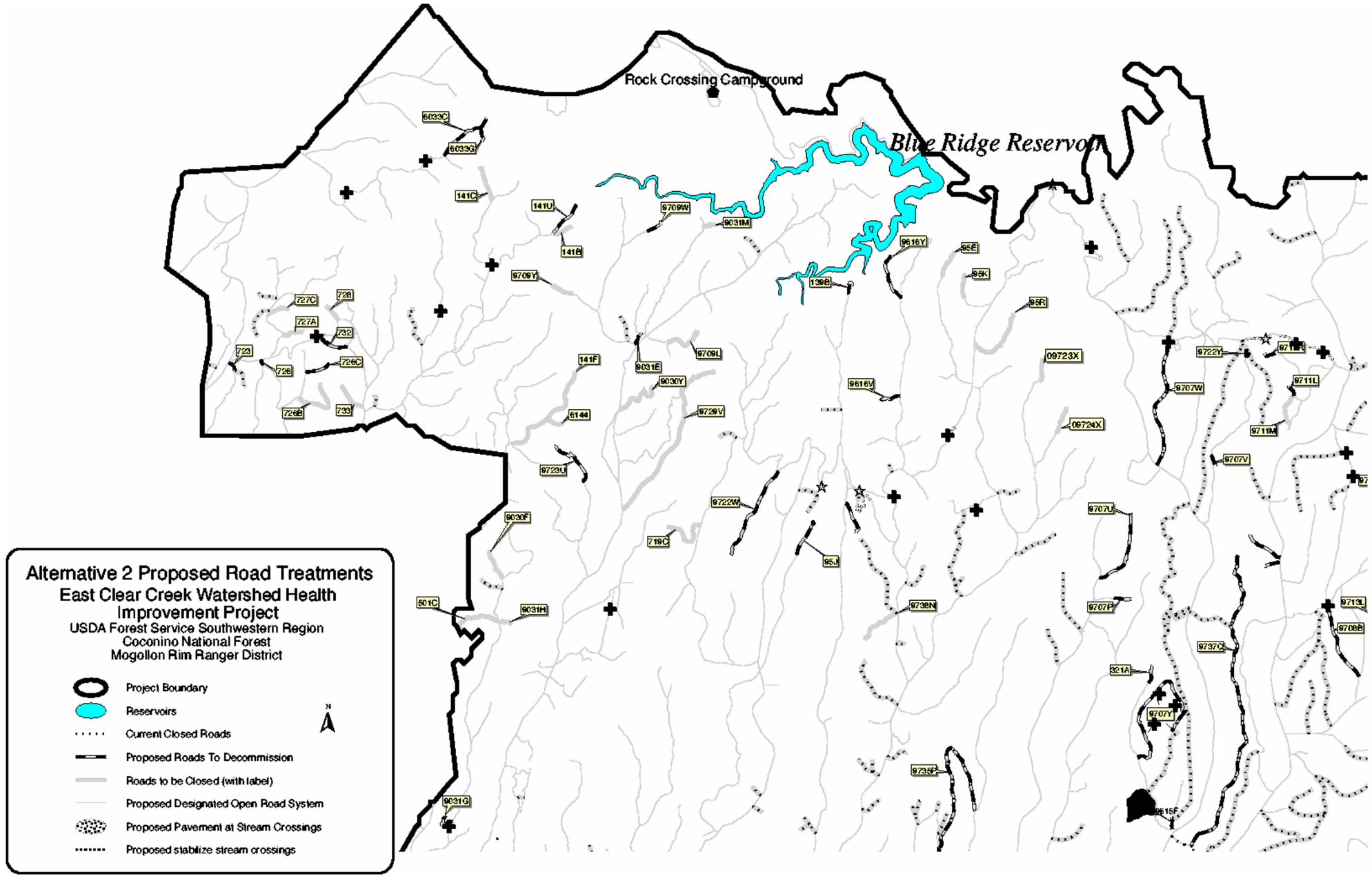


Figure 7: Planned Road Treatments and Open Road System in the Proposed Action (Alternative 2), Northwest Portion of the Analysis Area

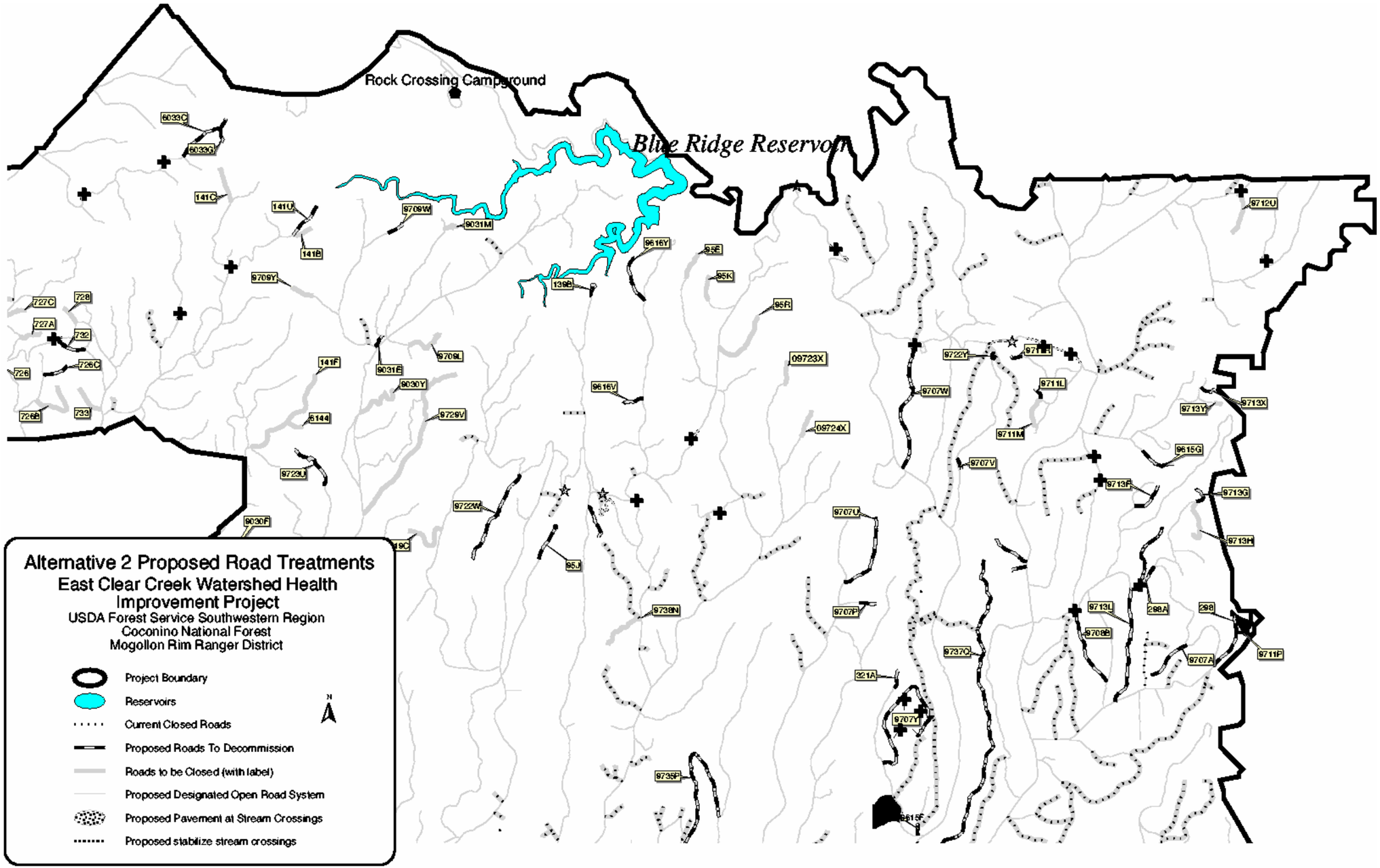


Figure 8: Planned Road Treatments and Open Road System in the Proposed Action (Alternative 2), Northeast Portion of the Analysis Area

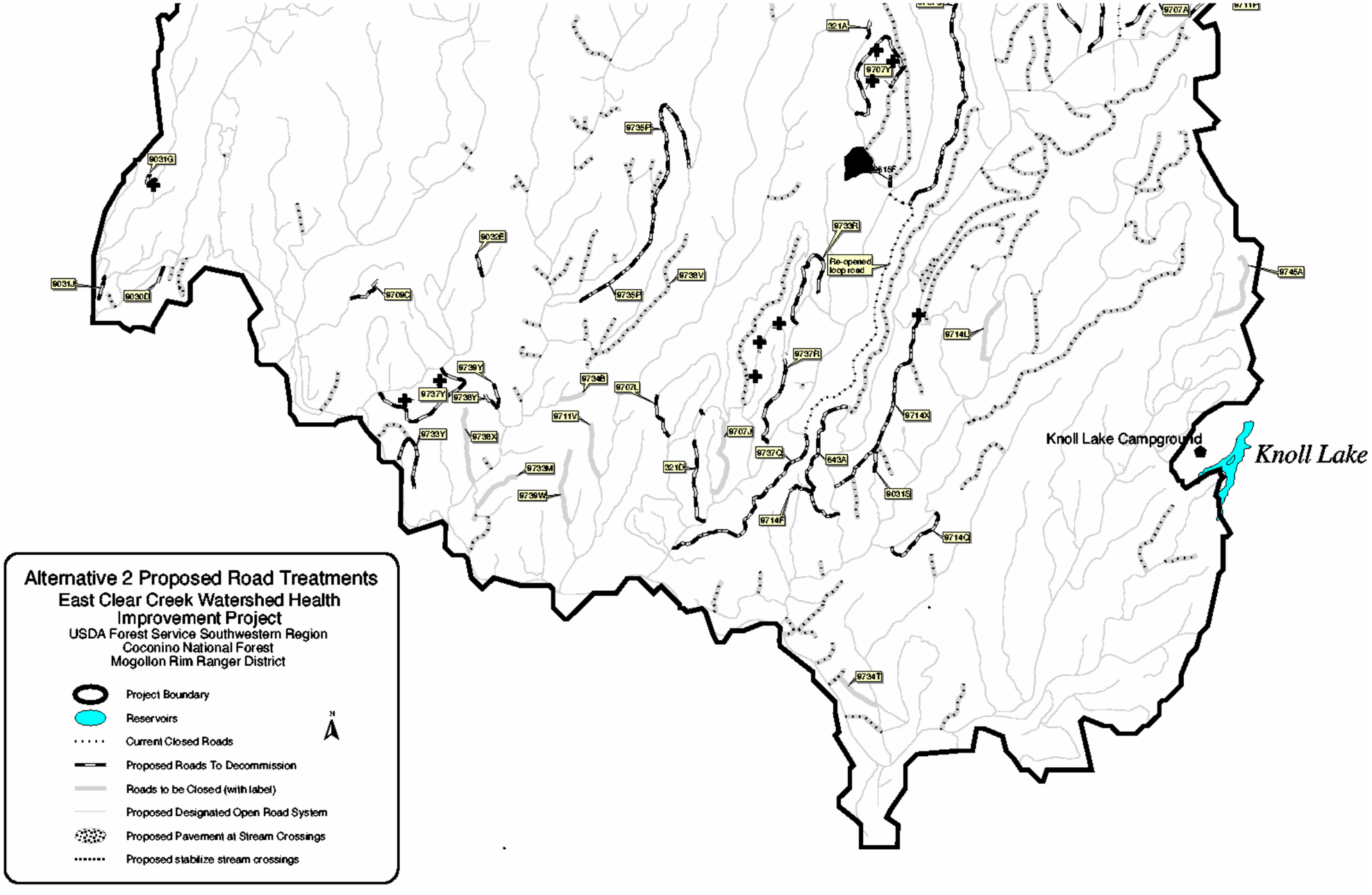


Figure 9: Planned Road Treatments and Open Road System in the Proposed Action (Alternative 2), South Half of the Analysis Area

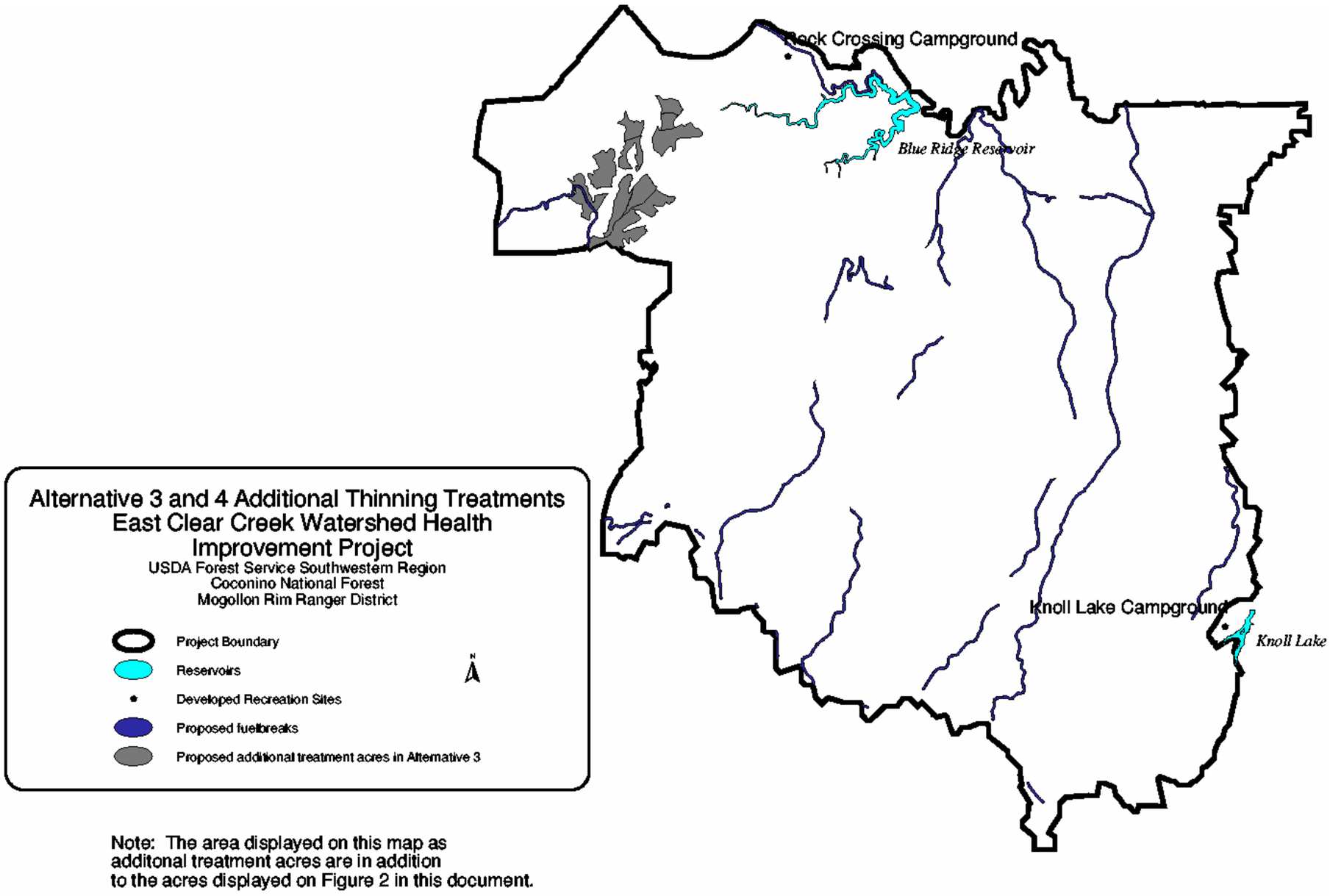


Figure 10: Proposed additional tree removal projects in Alternatives 3 and 4.

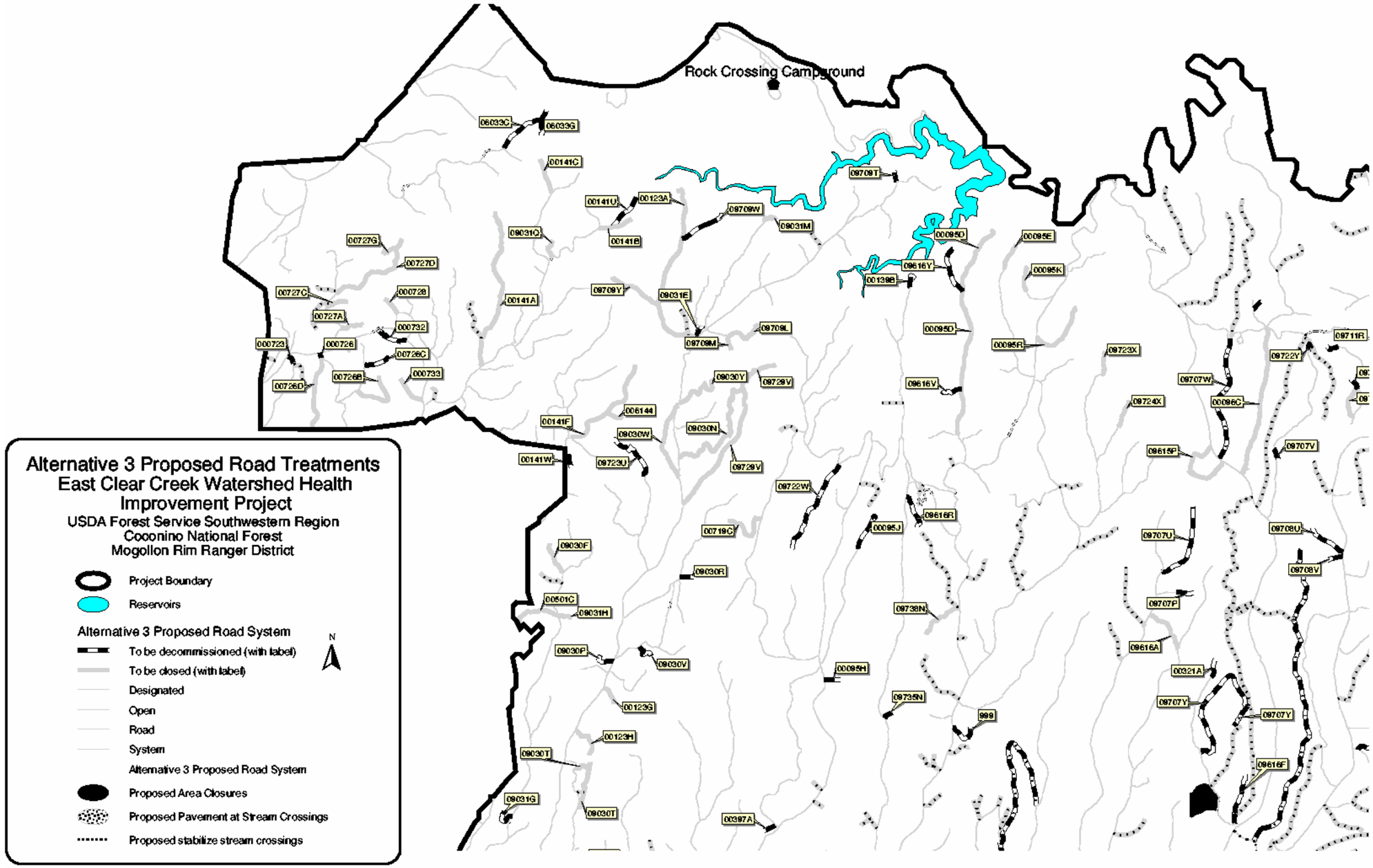


Figure 11: Proposed road treatments and open road system for Alternative 3, northwest portion of the analysis area.

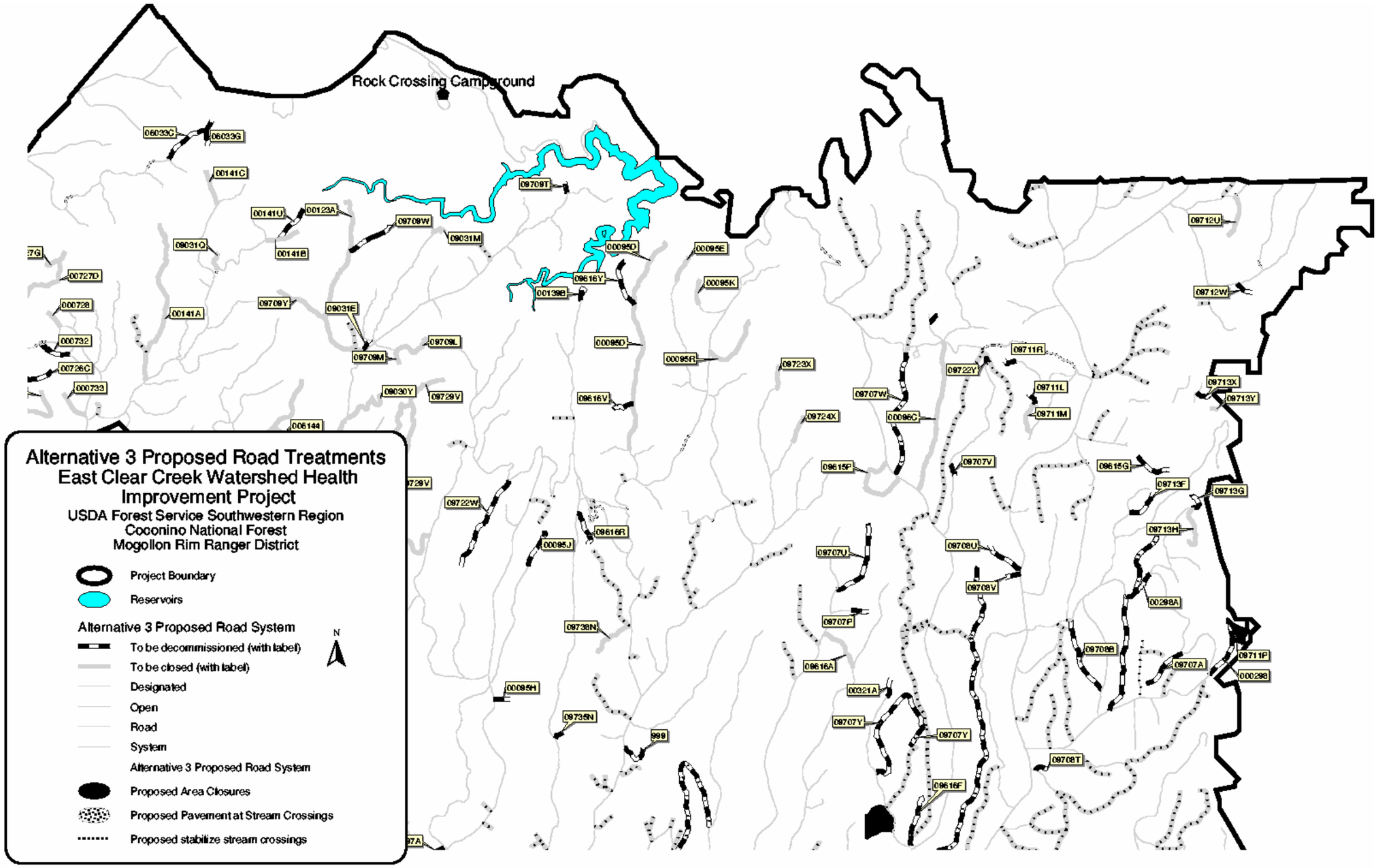


Figure 12: Proposed road treatments and open road system for Alternative 3, northeast portion of the analysis area.

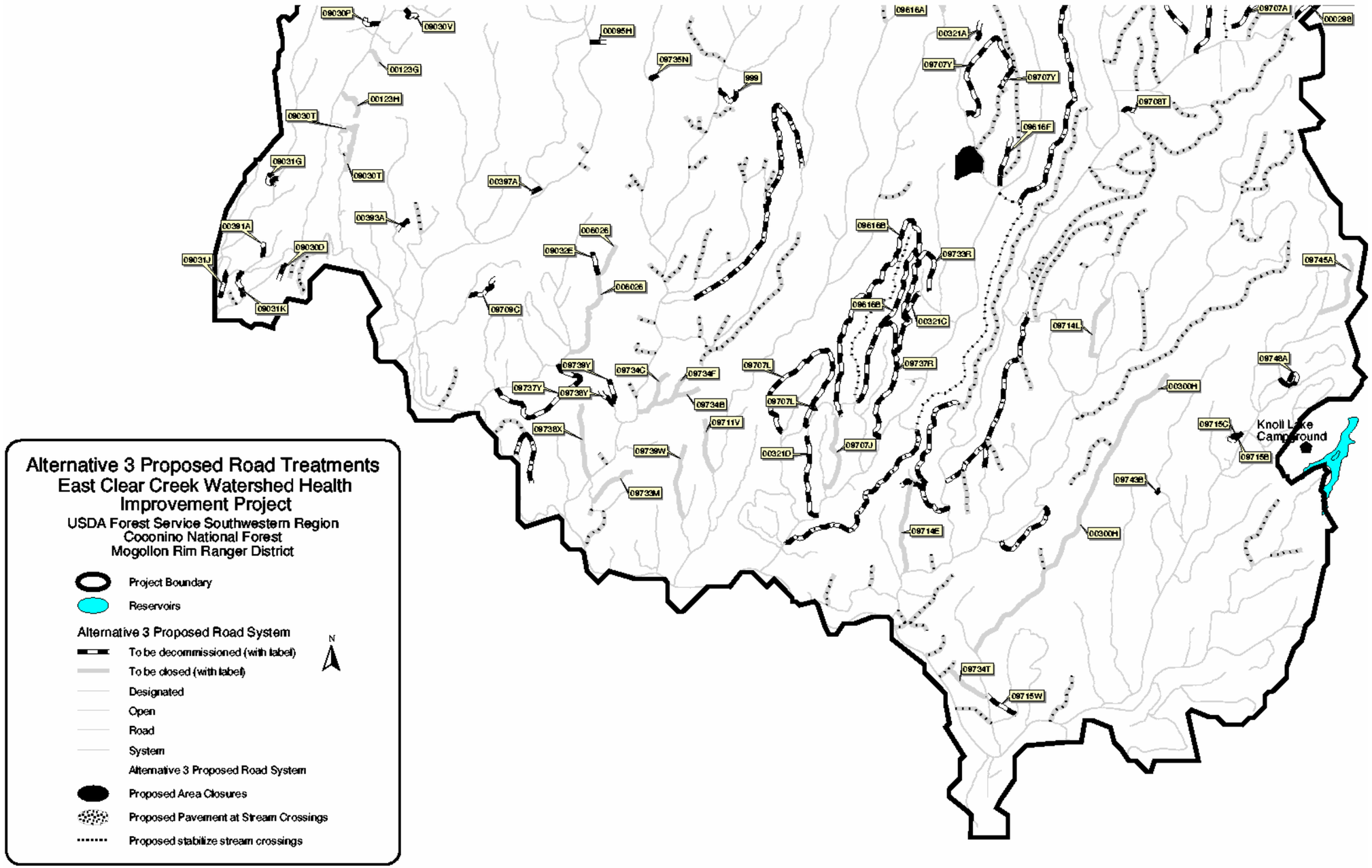


Figure 13: Proposed road treatments and open road system for Alternative 3, south half of the analysis area.

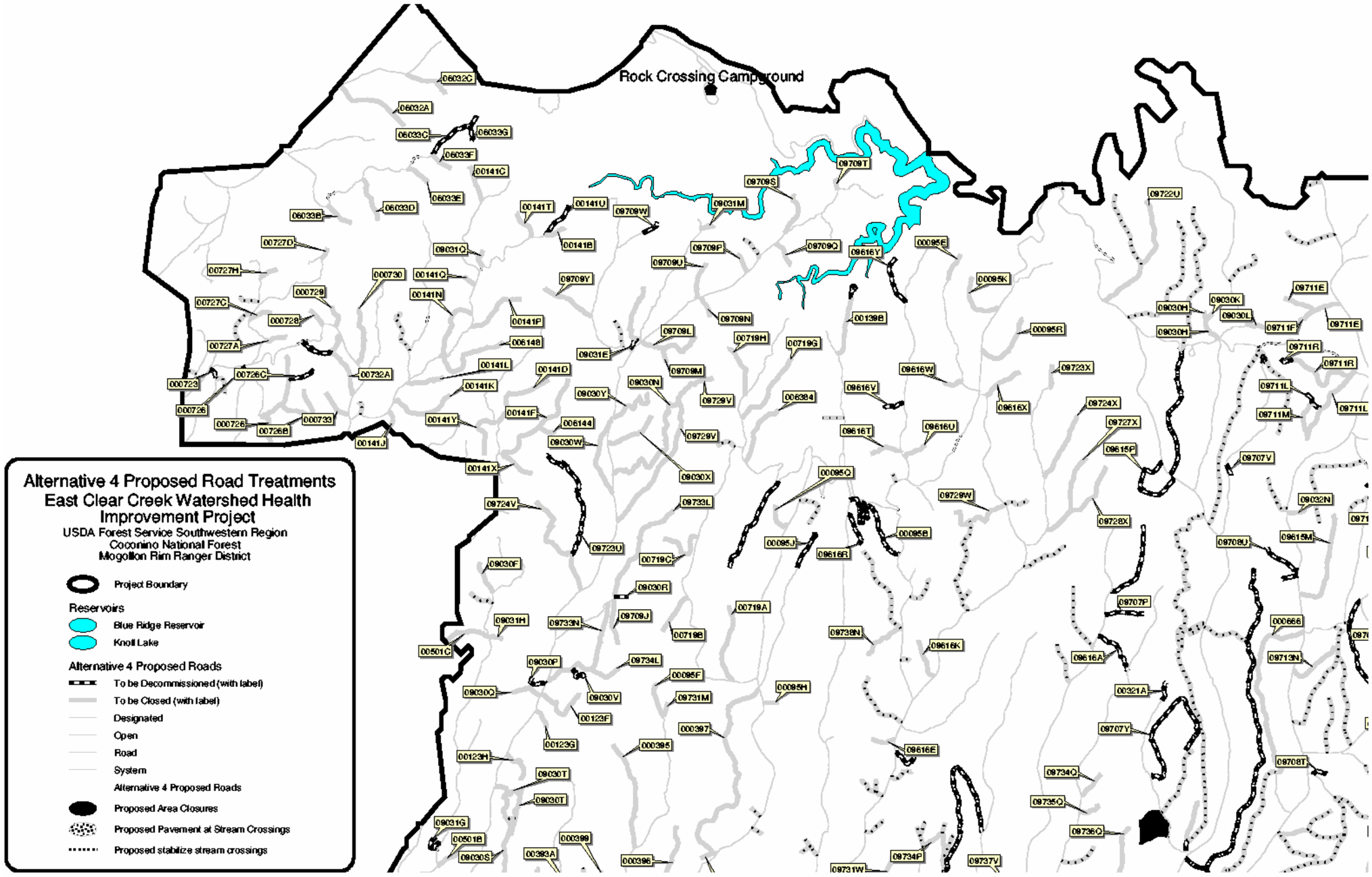


Figure 14: Proposed road treatments and open road system, northwest portion of the analysis area.

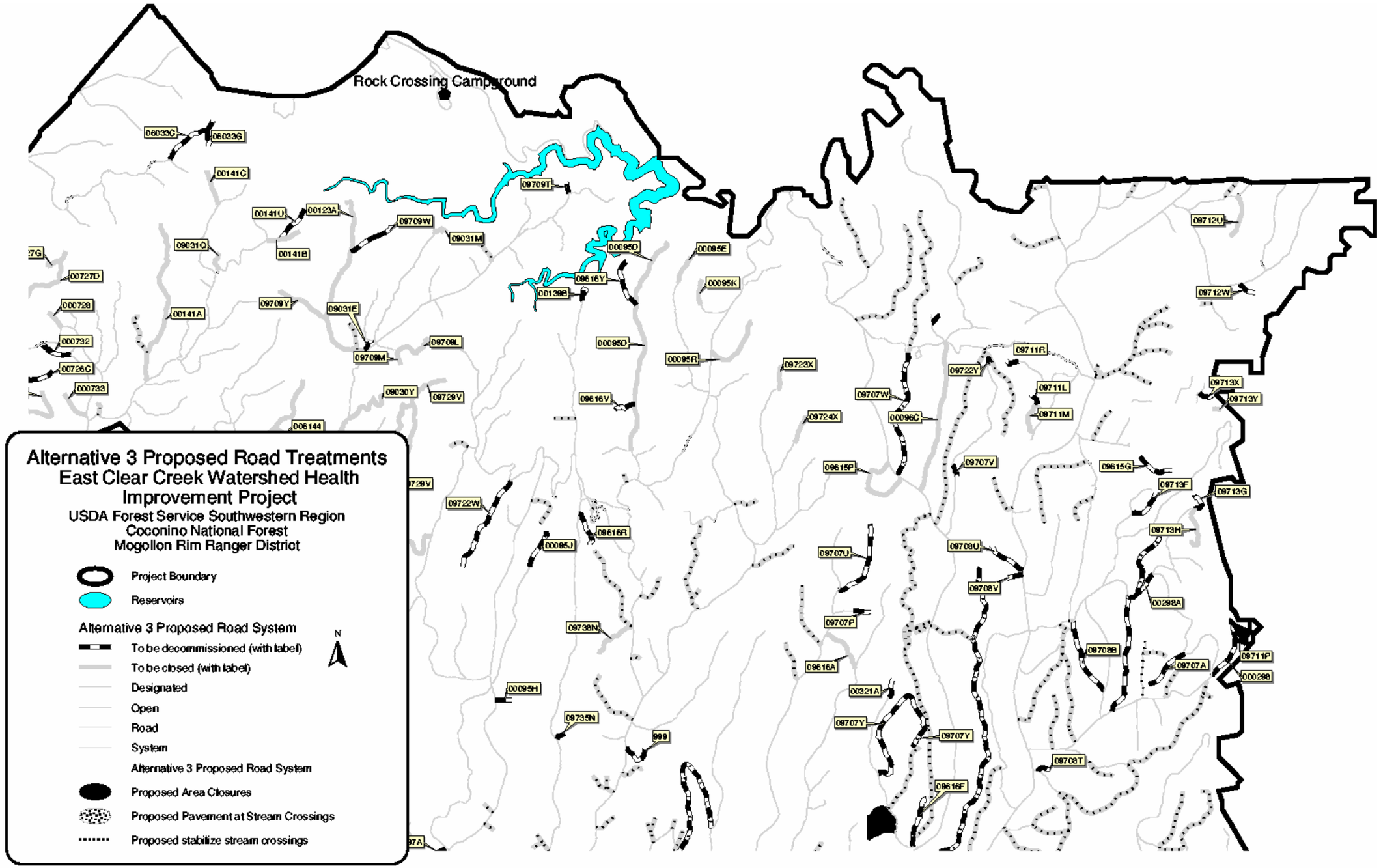


Figure 15: Proposed road treatments and open road system, northeast portion of the analysis area.

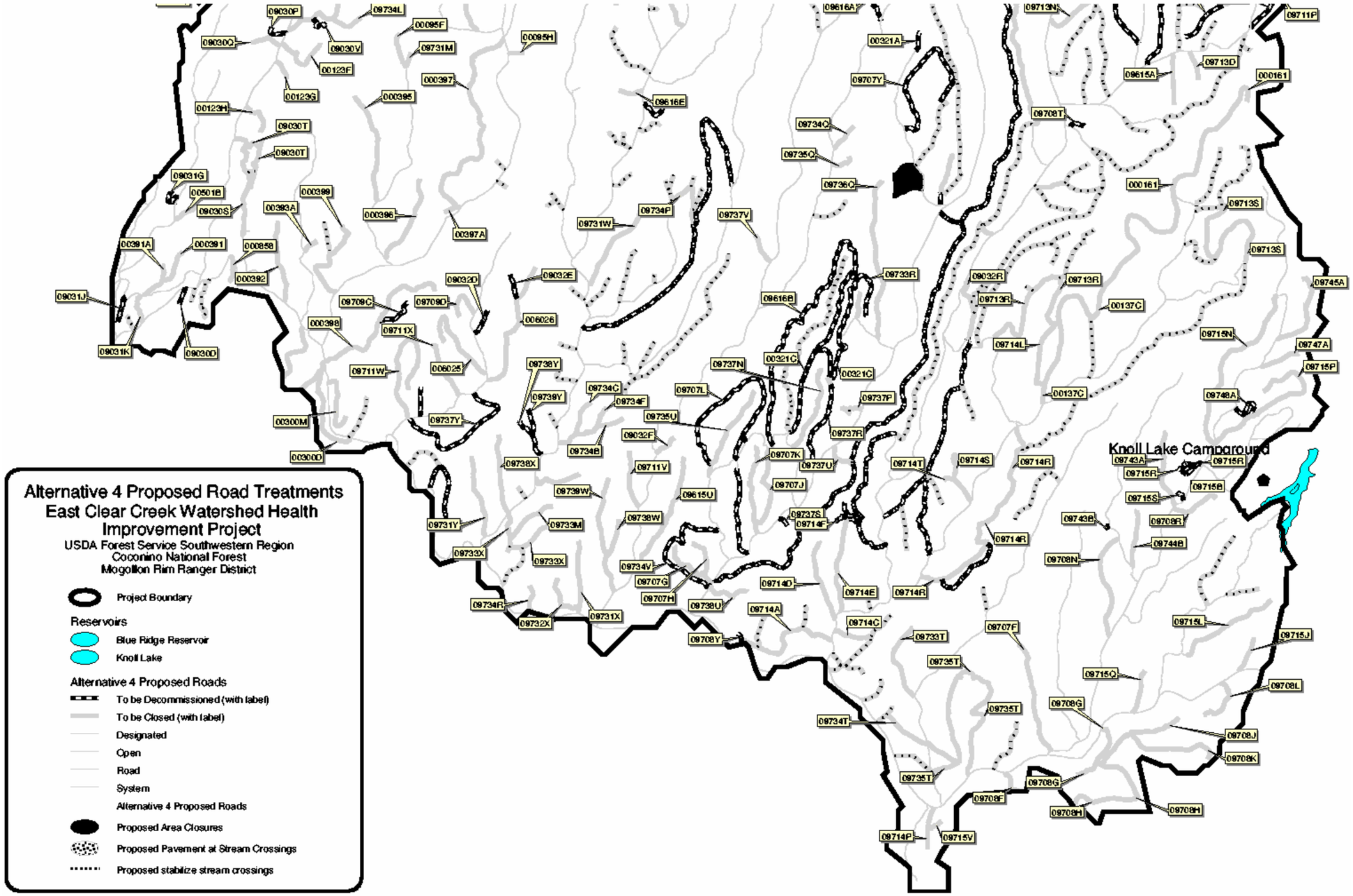


Figure 16: Proposed road treatments and open road system, south half of the analysis area.

APPENDIX B

Location/sites to be thinned generally up to 12” in Alternatives 2, 3 and 4.

Location	Site	Acres
757	7	53
	9	16
	24	69
	25	16
	27	111
	29	29
	30	13
	31	16
	32	12
	34	27
	39	8
	40	43
	42	49
	43	43
	44	41
759	3	97
	6	52
	10	4
	15	29
	16	35
	17	81
	22	42
760	15	7
	18	108
	19	5
761	2	94
	3	141
	5	102
	11	74
	13	23
	16	18
762	9	31
	10	44
	11	18
763	3	50
	5	16
	7	20
	12	4
	19	66
	21	29
	22	3
	23	3

Location	Site	Acres
764	2	23
	5	13
	6	31
	8	8
	10	16
	11	16
	13	26
	15	22
	19	54
	20	17
	22	26
	24	77
	42	67
	43	13
	44	12
765	1	89
	9	41
	10	35
	22	3
766	4	53
	10	6
	20	68
	36	4
	47	9
767	10	33
	12	156
	17	57
769	9	14
	10	2
	12	7
	15	7
	17	9
	18	9
	19	4
770	2	41
771	5	228
	8	148
	11	22
	12	49
	16	124
	17	55
	18	48

Location	Site	Acres
773	11	184
	13	8
	14	28
	29	54
	30	21
	31	14
	32	9
	33	37
774	1	13
	2	51
	4	45
	6	92
	7	28
	20	10
	21	5
	22	47
	24	13
	25	2
775	2	48
	4	78
	5	63
	6	67
	9	42
	10	29
	11	111
	12	88
	13	34
	16	86
	17	48
	18	27
	20	66
	21	4
	22	79
	32	78
	35	8
	36	16
	38	18
	39	20
	43	7
	45	21

Location	Site	Acres
	30	4
	32	9
	41	8
	44	73
776	6	18
	22	12
	24	7
	26	4
	27	8
	28	9
	30	39
	32	18
777	6	117
	12	1
	16	65
	18	121
780	9	7
	10	18
	18	41
	20	44
	21	79
	23	15
	24	36
	26	48
	27	7
	28	11
	30	11
	35	9
	36	18
	37	26
	38	17
	39	35
	40	43
	45	33
	46	17
	69	24
	72	23
782	1	14
	3	13
	6	31
	16	2
	40	6
783	9	7
	12	32
	14	26
	17	32
	26	20
	27	23
	29	42

Location	Site	Acres
	19	6
772	11	32
	13	14
	14	8
783	35	29
	36	25
	41	11
	44	4
	45	3
	57	2
	61	18
	62	70
	63	4
784	2	44
	5	7
	7	10
	9	37
	10	16
	12	15
	20	39
785	15	24
	16	28
	17	10
	18	47
	21	45
	22	32
	23	14
	28	22
	29	9
	30	16
	35	7
	37	3
	38	10
	39	6
	43	3
	44	9
	55	29
	56	26
	57	14
	58	25
	60	3
791	4	72
	9	9
	10	27
	11	4
	17	17
	32	9
793	8	19
	29	18

Location	Site	Acres
793	34	23
795	1	42
	2	5
	3	41
	4	80
	16	4
	19	29
	20	20
	21	30
	23	77
	24	20
	27	2
	30	14
	31	59
	35	35
796	2	48
	3	9
	4	27
	5	49
	6	12
	7	11
	8	101
	9	40
	13	35
	16	26
	17	88
	18	59
	20	0
	21	59
	22	46
	23	14
	24	26
	25	5
	26	22
	27	40
	28	23
	29	8
	30	5
	31	13
798	21	17
	22	29
	26	23
	27	8
	29	3
	31	71

Location	Site	Acres
	30	77
	33	7
	34	16

Location	Site	Acres
	30	19
	31	15
	33	73

Location	Site	Acres
	61	144
	67	2
	68	4

APPENDIX C

Location/sites to be commercially thinned from below. Thins in Locations 779, 780, 786, and 787 are in Alternative 2 only. The location/sites in the entire table are to be thinned in Alternative 3 and 4.

Location	Site	acres
779	23	16
	24	25
	25	15
	26	27
	27	9
	29	14
780	54	11
	56	46
	57	22
	58	13
	66	15
786	15	41
	16	24
	23	4
	23	31
	26	21
	27	52
	28	24
787	1	18
	2	24
	3	98
	5	24
	7	23
	8	44
	10	16
	80	4
	109	5
760	1	127
	2	58
	9	61
	16	67
	18	107
	20	72
761	3	158

APPENDIX D

Location sites to be thinned in an uneven-aged prescription in Alternative 3 and 4 only.

Location	Site	acres
761	2	94
761	11	82
761	13	136
761	17	52
761	18	38

APPENDIX E

Location/Sites to be prescribed burned Alternative 2

Location	Site	Acres
756	12	14
	16	71
	17	16
	24	8
757	5	12
	6	37
	7	53
	8	45
	9	16
	10	5
	11	3
	12	26
	13	81
	14	23
	15	4
	16	40
	17	22
	18	20
	19	62
	20	72
	21	16
	22	189
	23	12
	24	69
	25	16
	26	17
	27	111
	28	45
	29	29
	30	13
	31	16
	32	12
	33	52
	34	27
	37	3
	39	14
	40	43
	41	54
	42	49
	43	43
	44	41
764	1	8
	2	23

Location	Site	Acres
758	1	50
	2	81
	3	8
	4	29
	5	38
	6	26
	7	25
	8	10
	9	18
	10	30
	11	48
	12	25
	13	11
	14	11
	15	17
	16	14
	17	50
	18	13
759	1	54
	2	51
	3	97
	4	38
	5	98
	6	52
	7	82
	10	5
	11	9
	14	4
	15	24
	16	35
	17	81
	18	2
	21	41
	22	42
760	1	62
	4	2
	8	100
	9	40
	12	46
	13	34
	14	24
766	3	0
	4	53

Location	Site	Acres
	15	7
	16	3
	18	107
	19	5
	20	70
761	1	13
	2	94
	3	142
	4	8
	5	102
	11	74
	13	23
	14	148
	15	8
	16	18
762	6	18
	7	22
	8	27
	9	31
	10	44
	11	18
	13	2
	14	2
763	3	47
	5	16
	7	20
	8	18
	12	4
	19	66
	21	29
	22	3
	23	3
	26	7
	27	6
	28	10
	30	3
	32	9
	41	8
	44	72
769	3	11
	7	8

Location	Site	Acres
	5	13
	6	31
	7	109
	8	8
	9	7
	10	16
	11	16
	12	15
	13	26
	14	37
	15	22
	16	3
	19	57
	20	18
	22	26
	24	77
	42	67
	43	13
	44	12
	45	2
765	1	100
	2	2
	4	8
	5	12
	6	93
	7	26
	8	9
	9	40
	10	37
	13	6
	15	59
	17	153
	18	73
	19	42
	20	13
	22	3
	23	6
	25	3
	26	0

Location	Site	Acres
	7	27
	8	16
	10	6
	16	3
	18	22
	20	68
	21	21
	23	13
	24	3
	25	4
	26	3
	36	4
	40	32
	47	9
767	3	3
	7	2
	8	6
	9	31
	10	33
	11	13
	12	156
	13	7
	14	6
	15	5
	16	18
	17	57
	18	22
	19	17
	20	11
	21	37
	22	7
	25	26
	26	2
	27	2
	28	36
768	9	30
	11	53

Location	Site	Acres
	8	9
	9	14
	10	2
	11	14
	12	7
	13	9
	14	3
	15	7
	16	8
	17	9
	18	9
	19	4
	20	5
	21	21
	22	25
	23	5
	24	7
	25	16
	26	21
	27	50
	28	8
	43	36
	44	101
	45	13
	46	52
770	1	57
	2	41
	4	3
	5	123
	6	48
	8	96
	9	71
	10	194
	11	39
	12	29
	13	41
	14	18
	15	91
	16	10
	17	11
	18	7
	19	20

Location	Site	Acres

Location	Site	Acres

Location	Site	Acres

	2	26
	3	22
	4	47
	5	228
	8	148
	9	107
	10	65
	11	22
	12	49
	16	124
	17	55
	18	48
	19	6
	25	51
772	1	126
	9	90
	11	32
	12	3
	13	13
	14	8
	17	2
	25	10
	28	24
773	10	17
	11	185
	12	89
	13	8
	14	28
	29	54
	30	22
	31	14
	32	9
	33	43
	40	3
774	1	11
	2	52
	3	89
	4	45
	5	89
	6	98
	7	33
	8	6
	20	9
	21	5
	22	47
	24	12
	25	2

775	1	54
	2	48
	3	61
	4	78
	5	63
	6	65
	7	28
	8	10
	9	42
	10	29
	11	111
	12	88
	13	34
	14	46
	15	150
	16	86
	17	48
	18	27
	19	99
	20	57
	21	3
	22	79
	26	112
	28	11
	30	128
	31	0
	32	78
	33	95
	34	51
	35	8
	36	16
	37	33
	38	18
	39	18
	43	7
	45	21
776	6	15
	8	31
	12	2
	22	12
	24	7
	26	4
	27	7
	28	9
	30	40
	32	18

777	5	15
	6	117
	7	84
	8	122
	9	2
	12	1
	16	65
	18	122
	19	17
	20	38
779	3	11
	4	36
	5	37
	6	24
	9	4
	10	8
	11	10
	13	4
	14	10
	15	31
	16	8
	17	19
	18	19
	19	16
	20	16
	21	21
	22	12
	23	16
	24	25
	25	7
	26	21
	27	9
	28	8
	29	13
	30	9
	31	7
	33	2
	34	4
	35	19
	36	16
	43	34
	45	25
	46	23
	48	2
	49	6
	50	3
	51	2

Location	Site	Acres
780	9	7
	10	18
	12	18
	15	17
	17	42
	18	41
	19	4
	20	44
	21	79
	22	18
	23	15
	24	36
	25	57
	26	48
	27	7
	28	11
	30	11
	33	1
	35	9
	36	18
	37	26
	38	17
	39	35
	40	43
	41	18
	45	33
	46	17
	69	24
	70	53
	72	28
782	1	12
	3	13
	5	104
	6	31
	8	9
	16	2
	18	10
	40	2

Location	Site	Acres
783	9	7
	12	33
	13	23
	14	26
	15	17
	16	9
	17	32
	18	50
	26	20
	27	23
	28	12
	29	42
	30	77
	31	11
	32	37
	33	7
	34	16
	35	33
	36	29
	37	5
	38	15
	41	11
	44	4
	45	3
	57	2
	61	19
	62	73
	63	4
784	1	162
	2	37
	3	52
	4	21
	5	7
	6	38
	7	10
	9	37
	10	17
	12	16
	14	3
	20	43

Location	Site	Acres
785	7	14
	9	7
	10	33
	11	42
	12	38
	13	20
	14	51
	15	24
	16	28
	17	10
	18	46
	19	2
	20	11
	21	45
	22	32
	23	14
	24	42
	25	18
	28	22
	29	9
	30	16
	32	4
	33	3
	34	2
	35	7
	36	7
	37	3
	38	9
	39	6
	42	3
	43	3
	44	9
	45	4
	46	2
	47	63
	49	2
	50	6
	51	2
	53	6
	54	7
	55	29
	56	26
	57	14
	58	25
	60	3

Location	Site	Acres
786	1	11
	2	32
	3	16
	4	43
	5	44
	6	22
	7	31
	8	20
	9	13
	10	22
	11	2
	12	42
	13	7
	14	4
	15	41
	16	10
	17	2
	19	28
	20	13
	21	8
	22	39
	23	46
	24	15
	26	21
	27	52
	28	23
	29	11
	30	18
	31	5
	32	4
	33	4
	34	5
	35	5
	36	11
	37	5
	38	3
	39	6
	40	2
	41	5
	43	18
	44	4
	45	5
	46	6
	47	10
	50	46
	51	4
	53	7

Location	Site	Acres
786	55	11
	57	62
	58	41
	59	61
	60	30
	61	12
	62	4
787	1	24
	2	24
	3	98
	4	6
	5	23
	6	24
	7	23
	8	44
	9	9
	10	1
	11	3
	12	35
	13	7
	14	6
	15	7
	16	12
	17	24
	18	39
	19	14
	20	10
	21	6
	22	16
	23	11
	24	11
	25	24
	26	8
	27	25
	28	25
	30	6
	31	23
	32	5
	33	14
	38	2
	39	3
	40	5
	41	5
	44	8
	45	24
	46	34
	47	21

Location	Site	Acres
787	49	13
	50	4
	51	6
	52	4
	53	7
	54	5
	55	9
	56	5
	57	3
	58	28
	59	4
	61	13
	62	9
	63	2
	64	10
	65	7
	66	5
	69	7
	70	6
	71	10
	72	9
	73	15
	74	13
	75	2
	76	6
	78	3
	79	8
	80	4
	81	12
	82	9
	83	4
	84	18
	85	4
	86	8
	87	4
	88	2
	89	6
	90	5
	91	6
	92	30
	93	28
	95	2
	96	42
	98	2
	99	28
	101	8
	109	62

Location	Site	Acres
787	110	8
	111	18
	114	8
	117	32
	118	19
	122	21
791	1	63
	2	17
	3	90
	4	72
	5	36
	6	23
	7	23
	8	11
	9	9
	10	27
	11	4
	17	17
	18	17
	19	16
	20	16
	21	22
	22	5
	23	12
	24	10
	25	60
	26	9
	27	9
	28	46
	29	27
	30	10
	31	58
	32	9
	34	39
	46	7
793	7	16
	8	19
	9	78
	22	6
	23	6
	24	12
	25	49
	26	7
	27	6
	28	7
	29	18
	30	20

Location	Site	Acres
793	31	16
	32	2
	33	73
	34	23
	35	10
	36	11
	37	9
	41	7
	42	161
	44	2
	45	3
795	1	42
	2	5
	3	41
	4	80
	16	4
	19	29
	20	20
	21	30
	23	77
	24	20
	25	30
	26	95
	27	2
	30	14
	31	59
	33	0
	35	35
796	2	48
	3	9
	4	27
	5	49
	6	12
	7	11
	8	101
	9	40
	10	96
	11	21
	12	85
	13	35
	14	21
	15	83
	16	26
	17	88
	18	59
	19	82
	21	59

Location	Site	Acres
796	22	46
	23	14
	24	26
	25	5
	26	21
	27	40
	28	23
	29	8
	30	5
	31	14
	33	4
798	21	17
	22	29
	23	48
	24	20
	25	12
	26	21
	27	7
	28	7
	29	2
	30	26
	31	69
	38	4
	39	14
	40	37
	41	14
	42	21
	43	2
	50	43
	52	11
	53	43
	60	132
	61	142
	67	2
	68	4
799	46	4

Additional Location/sites to be burned in Alternative 3 and 4

Location	Site	acres
760	2	58
	16	67
761	3	158
	17	52
	18	38

APPENDIX F

Proposed Road Actions in Alternatives 2

Table 1. Roads Currently Closed Proposed for Decommissioning

Forest Road	Miles
00321D	0.8
00643A	1.5
09707W	1.2
09714Q	0.7
09714X	1.9
09733Y	0.7
09735P	2.9
09737Q	5.0

Table 2. Roads Currently Closed Proposed to be Re-opened

Forest Road	Miles
09707B	0.5
09737Q	2.6

Table 3. Change in Proposed Maintenance Level from High Clearance Vehicle to Passenger Vehicle Standards

Forest Road	Miles
137	12.0

Table 4. Change in Proposed Maintenance Level from Passenger Vehicle standard to High Degree of Comfort Standards

Forest Road	Miles
300	15.0

Table 5. Roads Currently Open Proposed for Decommissioning

Forest Road	Miles
298	0.6
723	0.1
726	0.1
732	0.2
00095J	0.4
00139B	0.2
00141U	0.4
00298A	0.3
00321A	0.2
00726C	0.2
06033C	0.6
06033G	0.1
09030D	0.2

Forest Road	Miles
09031E	0.1
09031G	0.2
09031J	0.2
09031S	0.2
09032E	0.2
09615G	0.4
09616F	0.1
09616V	0.2
09616Y	0.5
09707A	0.5
09707L	0.5
09707P	0.2
09707U	0.8
09707V	0.1
09707Y	1.4
09708B	0.7
09709C	0.4
09709W	0.2
09711L	0.1
09711P	0.1
09711R	0.1
09713F	0.3
09713G	0.2
09713L	1.1
09713X	0.2
09714F	0.2
09722W	0.9
09722Y	0.1
09723U	0.5
09733R	1.2
09737R	0.9
09737Y	1.4
09739Y	0.2

Table 6. Roads Currently Open Proposed for Closure

Forest Road	Miles
728	0.2
733	0.3
6144	0.2
00095E	0.3
00095K	0.2
00095R	0.6
00141B	0.2
00141C	0.3
00141F	1.1
00501C	0.5
00719C	0.5
00726B	0.6
00727A	0.2
00727C	0.2

Forest Road	Miles
09030F	0.3
09030Y	0.6
09031H	0.1
09031M	0.1
09707J	0.8
09709L	0.4
09709Y	0.2
09711M	0.3
09711V	0.5
09712U	0.4
09713H	0.5
09713Y	0.1
09714L	0.7
09729V	1.8
09733M	0.5
09733N	0.7
09734B	0.2
09734B	0.2
09734T	0.5
09738N	0.4
09738V	1.6
09738X	0.7
09738Y	0.2
09739W	0.7
09745A	0.8

APPENDIX G

Proposed Road Actions in Alternatives 3, the Modifeid Proposed Action

Table 1. Roads Currently Closed Proposed for Decommissioning

Forest Road	Miles
00321D	0.8
00643A	1.5
09707W	1.2
09714Q	0.7
09714X	1.9
09733Y	0.7
09735P	2.9
09737Q	5.0

Table 2. Roads Currently Closed Proposed to be Re-opened

Forest Road	Miles
09707B	0.5
09737Q	2.6

Table 3. Change in Proposed Maintenance Level from High Clearance Vehicle to Passenger Vehicle Standards

Forest Road	Miles
137	12.0

Table 4. Change in Proposed Maintenance Level from Passenger Vehicle standard to High Degree of Comfort Standards

Forest Road	Miles
300	15.0

Table 5. Roads Currently Open Proposed for Decommissioning

Forest Road	Miles
298	0.6
723	0.1
726	0.1
732	0.3
999	0.3
00095H	0.1
00095J	0.4
00139B	0.2
00141U	0.4
00141W	0.1
00298A	0.3
00321A	0.2
00321C	1.9
00321D	0.8

Forest Road	Miles
00391A	0.1
00393A	0.2
00397A	0.1
00726C	0.2
06033C	0.6
06033G	0.1
09030D	0.2
09030K	0.1
09030P	0.2
09030R	0.1
09030V	0.2
09031E	0.1
09031G	0.2
09031J	0.2
09031K	0.3
09031S	0.2
09032E	0.2
09615G	0.4
09616B	3.4
09616F	0.5
09616V	0.2
09616Y	0.5
09707A	0.5
09707L	1.8
09707P	0.2
09707U	0.8
09707V	0.1
09707Y	1.3
09708B	0.7
09708T	0.1
09709C	0.4
09709T	0.1
09709W	0.5
09711L	0.1
09711P	0.1
09711R	0.1
09712W	0.2
09713F	0.3
09713G	0.2
09713L	1.1
09713X	0.1
09714F	0.2
09715B	0.1
09715C	0.1
09715W	0.3
09722W	0.9
09722Y	0.1
09723U	0.5
09733R	1.2

Forest Road	Miles
09735N	0.1
09737R	1.0
09737Y	1.3
09738Y	0.2
09739Y	0.2
09743B	0.0
09748A	0.4

Table 6. Roads Currently Open Proposed for Closure

Forest Road	Miles
728	0.2
733	0.3
6026	1.2
6144	0.2
00095D	2.1
00095E	0.3
00095K	0.2
00095R	0.6
00096C	1.4
00123A	1.8
00123G	0.2
00123H	0.4
00141A	1.6
00141B	0.3
00141C	0.3
00141F	1.0
00300H	3.3
00501C	0.5
00719C	0.5
00726B	0.6
00726D	0.7
00727A	0.2
00727C	0.2
00727D	1.0
00727G	0.2
09030F	0.3
09030N	1.3
09030T	0.7
09030W	0.8
09030Y	0.6
09031H	0.1
09031M	0.1
09031Q	0.2
09615P	0.8
09616A	0.5
09707J	0.8
09709L	0.4
09709M	0.1
09709Y	0.5
09711M	0.3

Forest Road	Miles
09711V	0.5
09712U	0.4
09713H	0.5
09713Y	0.1
09714E	0.9
09714L	0.7
09723X	0.2
09724X	0.3
09729V	1.8
09733M	0.5
09734B	0.5
09734C	0.5
09734F	0.2
09734T	0.5
09738N	0.4
09738X	0.7
09739W	0.7
09745A	0.8

APPENDIX H

Proposed Road Actions in Alternatives 4

Table 1. Roads Currently Closed Proposed for Decommissioning

Forest Road	Miles
00321D	0.8
00643A	1.5
09707W	1.2
09714Q	0.7
09714X	1.9
09733Y	0.7
09735P	2.9
09737Q	5.0

Table 2. Roads Currently Closed Proposed to be Re-opened

Forest Road	Miles
N/A	0

Table 3. Change in Proposed Maintenance Level from High Clearance Vehicle to Passenger Vehicle Standards

Forest Road	Miles
137	12.0

Table 4. Change in Proposed Maintenance Level from Passenger Vehicle standard to High Degree of Comfort Standards

Forest Road	Miles
300	15.0

Table 5. Roads Currently Open Proposed for Decommissioning

Forest Road	Miles
298	0.6
600	0.2
723	0.1
726	0.1
732	0.3
999	0.3
00095B	0.9
00095J	0.4
00139B	0.2
00141U	0.4
00298A	0.7
00321A	0.2
00321C	1.5
00321D	0.8
00600A	0.0
00726C	0.2
06033C	0.6

Forest Road	Miles
06033G	0.1
09030D	0.2
09030P	0.2
09030R	0.1
09030V	0.2
09031E	0.1
09031G	0.2
09031J	0.2
09031S	0.7
09032D	0.2
09032E	0.2
09615G	0.4
09615P	0.8
09616A	0.5
09616B	3.4
09616F	0.1
09616S	0.2
09616V	0.2
09616Y	0.5
09707A	0.5
09707L	1.8
09707P	0.4
09707U	0.8
09707V	0.1
09707Y	1.3
09708B	0.7
09708T	0.1
09708Y	0.1
09709C	0.4
09709W	0.2
09711L	0.2
09711P	0.1
09711R	0.1
09713F	0.3
09713G	0.2
09713L	1.1
09713X	0.1
09714F	0.2
09714G	0.2
09715B	0.1
09715C	0.1
09715R	0.3
09715S	0.1
09722W	0.9
09722Y	0.1
09723U	1.1
09733R	1.2
09734V	1.3
09735P	0.3

Forest Road	Miles
09736Y	0.3
09737R	0.9
09737S	0.1
09737Y	1.3
09738Y	0.4
09739Y	0.2
09743B	0.0
09748A	0.4

Table 6. Roads Currently Open Proposed for Closure

Forest Road	Miles
161	1.4
391	0.6
392	0.8
394	0.6
395	1.0
396	0.8
397	2.1
398	1.5
399	0.9
666	1.7
726	0.3
728	0.2
729	0.2
730	0.6
732	0.2
733	0.3
858	0.3
6025	0.9
6026	1.2
6144	0.2
6148	0.8
6384	0.6
00095E	0.3
00095F	0.3
00095H	0.1
00095K	0.5
00095Q	0.3
00095R	0.6
00123F	0.6
00123G	0.2
00123H	0.4
00137C	3.3
00137D	0.2
00139B	0.6
00141B	0.2
00141C	0.3
00141D	0.7
00141F	1.0
00141J	0.2
00141K	0.6

Forest Road	Miles
00141L	0.3
00141N	0.7
00141P	0.6
00141Q	0.1
00141T	0.3
00141X	0.3
00141Y	0.5
00300D	1.0
00300L	0.3
00300M	0.6
00391A	0.1
00393A	0.2
00397A	0.1
00501B	0.3
00501C	0.5
00719A	0.8
00719B	0.4
00719C	0.5
00719G	0.8
00719H	0.5
00726A	0.7
00726B	0.6
00727A	0.2
00727C	0.2
00727D	0.1
00727H	0.2
06032A	0.7
06032C	0.4
06033B	0.3
06033D	0.4
06033E	0.2
06033F	0.2
09030F	0.3
09030H	0.3
09030K	0.1
09030L	0.2
09030N	1.3
09030Q	0.3
09030S	1.0
09030T	0.7
09030W	0.8
09030X	0.5
09030Y	0.6
09031H	0.1
09031K	0.3
09031M	0.1
09031Q	0.2
09031R	0.2
09032F	0.2

Forest Road	Miles
09032N	0.2
09032R	0.3
09615A	0.5
09615M	1.0
09615U	1.2
09616E	0.2
09616F	0.4
09616K	0.4
09616T	0.3
09616U	0.2
09616W	0.2
09616X	0.4
09707F	1.1
09707G	0.6
09707H	0.4
09707J	0.8
09707K	0.8
09708D	0.6
09708F	0.2
09708G	0.6
09708H	1.2
09708J	0.9
09708K	0.9
09708L	0.5
09708N	1.0
09708R	0.5
09709D	0.4
09709J	0.4
09709L	0.6
09709M	0.1
09709N	0.2
09709P	0.2
09709Q	0.3
09709S	0.4
09709T	0.1
09709U	0.4
09709V	0.6
09709Y	0.5
09711E	0.6
09711F	0.2
09711L	0.5
09711M	0.3
09711Q	0.3
09711R	0.7
09711V	0.5
09711W	1.3
09711X	0.6
09712T	0.9
09712U	0.4
09712W	0.2

Forest Road	Miles
09713A	0.3
09713D	0.3
09713E	0.7
09713G	1.0
09713H	0.5
09713J	0.3
09713N	0.5
09713R	1.6
09713S	1.5
09713T	0.1
09713Y	0.1
09714A	1.1
09714C	0.4
09714D	0.8
09714E	0.9
09714L	0.7
09714P	0.4
09714R	2.1
09714S	0.5
09714T	0.1
09715J	0.3
09715L	1.0
09715N	1.7
09715P	1.5
09715Q	0.4
09715V	0.1
09715W	0.3
09722U	1.2
09723X	0.2
09724V	1.1
09724X	0.7
09727X	0.5
09728X	0.9
09729V	1.8
09729W	0.7
09731M	0.1
09731W	0.8
09731X	0.7
09731Y	0.8
09732X	0.4
09733L	1.1
09733M	0.5
09733N	0.7
09733T	0.8
09733X	0.8
09734B	0.5
09734C	0.5
09734F	0.2
09734L	0.8

Forest Road	Miles
09734P	0.6
09734Q	0.3
09734R	0.3
09734T	0.5
09735Q	0.2
09735T	2.5
09735U	0.9
09736Q	1.5
09737N	0.8
09737P	0.2
09737R	0.1
09737U	0.3
09737V	0.3
09738N	0.4
09738T	0.5
09738U	0.4
09738W	0.3
09738X	0.7
09739W	1.1
09743A	0.7
09744B	0.5
09745A	0.8
09747A	0.4
09763R	0.3

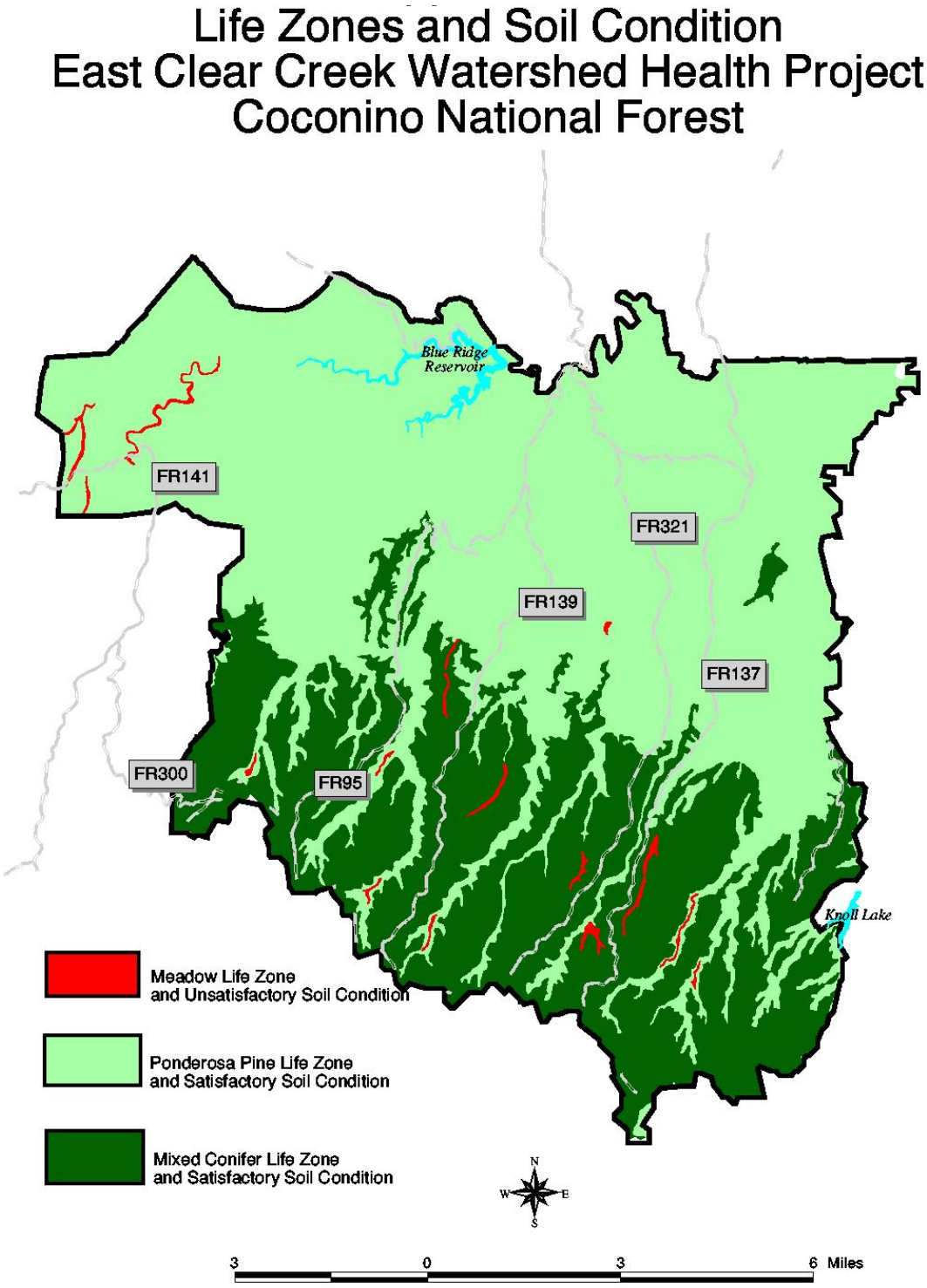
APPENDIX I

Summary of proposed channel treatment in Alternatives 2, 3 and 4

Stream Reach Name	Proper Functioning Condition	Channel Restoration[1]	Restoration Miles	Miles of Fence[2]	Acres of Revegetation[3]	Acres of Meadow Thinning
Bear Canyon	at-risk	yes	0.6	1.3	7	11
Houston Draw	at-risk	yes	2	4.4	24	28
Barbershop Canyon	at-risk	yes	2.3	5	28	14
Buck Springs	nonfunctional	yes	1.5	3.3	18	55
Bill McClintock	at-risk	yes	1.6	3.5	19	20
Lockwood Draw	at-risk	yes	1.1	2.4	13	n/a
Dick Hart Draw	at-risk	yes	0.5	1.1	6	n/a
Kinder Draw	at-risk	yes	0.7	1.5	8	67
East Bear	at-risk	no	n/a	n/a	n/a	12
General Springs	at-risk	no	n/a	n/a	n/a	11
Holder Cabin	at-risk	no	n/a	n/a	n/a	38
Merritt Draw	at-risk	no	n/a	n/a	n/a	29
Middle Leonard Canyon	nonfunctional	no	n/a	n/a	n/a	10
West Leonard Canyon	nonfunctional	no	n/a	n/a	n/a	27
McClintock Springs	pfc	no	n/a	n/a	n/a	9
SUMMARY			10.3	22.5	123	331

[1] Channel restoration would be primarily natural channel design which promotes new channel development. Hardened structures (i.e. headcut drop structures) can be included in the design if needed.
[2] Exclosure fences would be 8 feet tall to protect the site from ungulate grazing. The total miles of fence are the estimate maximum amount to protect the entire reach. Actual implementation may include the construction of several smaller fences with gaps in between them to allow for ungulate passage.
[3] Revegetation includes hydromulching, hand seeding of native grass, placement of erosion matting to minimize soil movement and provide a microclimate, and hand planting native plugs of riparian species. The acreage figure displayed is for the entire area within exclosure fences. Revegetation activities would only be applied to areas where ground disturbing activities have taken place, so the actual acres of revegetation will be less than the figure displayed here.

APPENDIX J


Life Zones and Soil Condition
East Clear Creek Watershed Health Project
Coconino National Forest
Blue Ridge Reservoir
FR141
FR321
FR139
FR137
FR300
FR95
Knoll Lake
Meadow Life Zone and Unsatisfactory Soil Condition
Ponderosa Pine Life Zone and Satisfactory Soil Condition
Mixed Conifer Life Zone and Satisfactory Soil Condition
N
W
E
S
3
0
3
6 Miles

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