Appendix A - Transportation System

Road designations in the Proposed Action column include open roads, administratively closed roads, and decommissioned roads.

Table A-1. Proposed Transportation System

Forest Road Number	Beginning Point	End Point	Length (miles)	Current Status	Existing Condition	Proposed Action	Surface Type
235B	Barrier	235J	2.7	EXISTING	2	ADMIN	NAT
716	Barrier	132	0.2	EXISTING	2	ADMIN	IMP
716B	716	132	0.4	EXISTING	2	ADMIN	NAT
235	TH	Barrier	1.5	DECOM	1	DECOM	NAT
235B	TH	Barrier	1.5	DECOM	1	DECOM	NAT
700J	700	DE	0.3	DECOM	1	DECOM	IMP
700K	700	DE	0.3	DECOM	1	DECOM	IMP
867C	867A	DE	0.5	EXISTING	1	DECOM	IMP
9456X	3T	867	0.9	EXISTING	1	DECOM	NAT
9423U	237A	DE	0.18	IN USE	1	DECOM	IMP
3G	3E	DE	0.7	IN USE	1	DECOM	IMP
3H	3J	DE	0.7	IN USE	1	DECOM	IMP
3J	3E	DE	0.8	IN USE	1	DECOM	IMP
3L	3E	707D	0.3	IN USE	1	DECOM	IMP
3M	3E	DE	0.3	IN USE	1	DECOM	IMP
3R	3N	DE	0.2	IN USE	1	DECOM	IMP
700M	700	PVT	0.3	DECOM	2	DECOM	NAT
714E	714	DE	0.5	DECOM	2	DECOM	NAT
762M	762	PVT	0.5	DECOM	2	DECOM	NAT
9420N	867A	PVT	0.3	EXISTING	2	DECOM	NAT
9420N	PVT	PVT	0.75	EXISTING	2	DECOM	NAT
9420N	3E	PVT	0.1	EXISTING	2	DECOM	NAT
3K	3E	DE	0.3	EXISTING	2	DECOM	IMP
235	Corner	235A	0.8	EXISTING	2	DECOM	NAT
235C	235	235A	1.3	EXISTING	2	DECOM	NAT

Forest Road Number	Beginning Point	End Point	Length (miles)	Current Status	Existing Condition	Proposed Action	Surface Type
700A	700	DE	0.4	EXISTING	2	DECOM	IMP
700B	700	DE	0.5	EXISTING	2	DECOM	IMP
700C	700	DE	0.3	EXISTING	2	DECOM	IMP
700G	235K	7OOL	0.8	EXISTING	2	DECOM	IMP
700L	700G	PVT	0.6	EXISTING	2	DECOM	IMP
703	700H	700	1.3	EXISTING	2	DECOM	AGG
707A	707	707	1.1	EXISTING	2	DECOM	IMP
707B	707A	707	0.5	EXISTING	2	DECOM	IMP
707C	707A	762	0.5	EXISTING	2	DECOM	IMP
707D	3N	DE	0.8	EXISTING	2	DECOM	IMP
714A	714	DE	0.6	EXISTING	2	DECOM	IMP
714C	714	DE	1.1	EXISTING	2	DECOM	IMP
714D	714	DE	1	EXISTING	2	DECOM	IMP
716	714	Barrier	1.2	EXISTING	2	DECOM	IMP
716A	716B	132	1.2	EXISTING	2	DECOM	NAT
762E	762	762D	0.6	EXISTING	2	DECOM	IMP
866	Tank	867	1.8	EXISTING	2	DECOM	IMP
866A	866	DE	1.1	EXISTING	2	DECOM	IMP
867A	9420N	867D	0.4	EXISTING	2	DECOM	IMP
9419R	9486X	DE	0.6	EXISTING	2	DECOM	NAT
9419S	716	DE	0.7	EXISTING	2	DECOM	NAT
9419T	714D	DE	0.7	EXISTING	2	DECOM	NAT
9419V	9483W	DE	0.8	EXISTING	2	DECOM	NAT
9420M	762	PVT	0.2	EXISTING	2	DECOM	NAT
9420R	235C	PVT	0.2	EXISTING	2	DECOM	NAT
9456P	867	DE	0.7	EXISTING	2	DECOM	NAT
9456Q	9456P	DE	0.3	EXISTING	2	DECOM	NAT
9456Y	866	DE	0.3	EXISTING	2	DECOM	NAT
9478B	FH3	DE	0.6	EXISTING	2	DECOM	NAT
9483W	132	DE	1.3	EXISTING	2	DECOM	NAT

Forest Road Number	Beginning Point	End Point	Length (miles)	Current Status	Existing Condition	Proposed Action	Surface Type
9484T	762D	PVT	0.1	EXISTING	2	DECOM	NAT
235F	235A	DE	0.8	EXISTING	OPEN	DECOM	IMP
235G	235A	DE	0.6	EXISTING	OPEN	DECOM	IMP
UN225	3N	9420P	0.08	EXISTING	1	OPEN	NAT
9420P	237A	DE	0.8	EXISTING	1	OPEN	NAT
9419U	762	235	1.6	EXISTING	1	OPEN	NAT
867D	867	867A	1.1	DECOM	2	OPEN	IMP
867A	866	867D	1.6	EXISTING	2	OPEN	IMP
867A	9420A	867	0.2	EXISTING	2	OPEN	IMP
3E	Boundary	762	2.7	EXISTING	2	OPEN	AGG
3N	3E	DE	1.1	EXISTING	2	OPEN	IMP
235	132	TH	0.4	EXISTING	2	OPEN	AGG
235	Barrier	PVT	1.7	EXISTING	2	OPEN	NAT
235	PVT	Corner	0.4	EXISTING	2	OPEN	IMP
235	235A	235K	0.4	EXISTING	2	OPEN	NAT
235	235K	Boundary	2.3	EXISTING	2	OPEN	NAT
235A	235	Corner	2.3	EXISTING	2	OPEN	NAT
235H	235A	235	0.8	EXISTING	2	OPEN	IMP
235J	235	235	2.7	EXISTING	2	OPEN	NAT
235K	700	235	1	EXISTING	2	OPEN	IMP
707	762	237A	1.8	EXISTING	2	OPEN	IMP
714	867	PVT	2.1	EXISTING	2	OPEN	IMP
762	Boundary	PVT	0.4	EXISTING	2	OPEN	NAT
762	PVT	762D	1.5	EXISTING	2	OPEN	NAT
762	762D	867	0.4	EXISTING	2	OPEN	AGG
762	867	707	1.5	EXISTING	2	OPEN	NAT
762	707	236C	0.8	EXISTING	2	OPEN	NAT
762B	235	PVT	0.6	EXISTING	2	OPEN	AGG
762D	762	762B	0.6	EXISTING	2	OPEN	IMP
762L	762	235	1	EXISTING	2	OPEN	NAT

Forest Road Number	Beginning Point	End Point	Length (miles)	Current Status	Existing Condition	Proposed Action	Surface Type
866	3E	Tank	0.4	EXISTING	2	OPEN	IMP
867	FH3	762	3.1	EXISTING	2	OPEN	AGG
132	FH3	Boundary	5.7	EXISTING	3	OPEN	AGG
237A	236C	Boundary	1.9	EXISTING	3	OPEN	AGG
700	236C	Boundary	3.4	EXISTING	3	OPEN	AGG
700H	I-17	700	0.7	EXISTING	3	OPEN	AGG
236C	I-17	PVT	1.5	EXISTING	4	OPEN	BST

Appendix B – Responses to Scoping Comments

This analysis provides a description of how the Mountainaire HFRA Project Proposed Action meets the requirements set forth under the Healthy Forests Restoration Act of 2003 (HFRA). The HFRA was written to expedite the preparation and implementation of hazardous fuels reduction projects on federal lands. Because HFRA requirements are different than projects authorized under traditional NEPA authority, this document serves as a road map for educating the public on these differences.

Responses to Scoping Comments

Comment 2-1

The natural fire regime for this ecosystem includes frequent surface fires that generally do not burn much of the tree canopy. These fires occurred historically at 3 to 15 year intervals. These fires are a necessary function of the ecosystem. The probability of the area experiencing a severe wildfire increases each year. Fuels that have accumulated to an unnatural level contribute to more severe fire effects and smoke impacts when wildfires occur. The project area will burn either under human ignitions as prescribed fires or as wildfires. For air quality and public safety, it is necessary to undertake some fuel reduction activities now than to delay and let the fuel situation worsen. Air quality standards are likely to be exceeded when a wildfire occurs, but not likely to be exceeded during prescribed burning. See the Fire and Fuels section in Chapter 3 for full analysis of fire and air quality effects.

Comment 2-2

Prescribed-burns are conducted during weather and fuel conditions when it is easier to control fire use and effects. The fuel and weather conditions that occur around the Mountainaire community during fire season necessitate prescribed burning to keep private property as well as the forest safer from destructive wildfires. The Coconino National Forest has an excellent record in conducting prescribed fires in a safe and effective manner. Prescribed fire operations include mitigation and safety measures to minimize the risk of losing control of prescribed fires.

There is a need for fuel reductions in the project area. See Chapter 1 (Purpose and Need) and the Fire and Fuels section in Chapter 3 for a more complete analysis of the current fire risk and threat to communities. Fuel and fire hazard conditions are in an unnatural state and present a threat to communities within the project area and adjacent to it. While implementation of burning is costly, (see the Economics section in Chapter 3 for an estimated cost), property damage, fire recovery efforts, and social and economic impacts of a wildfire in the area and near the communities exceed the costs associated with pro-active preventative fuels treatment.

Comment 3-1

Some roads in the project area are proposed for closure and decommissioning. See Appendix A for a complete list of open and decommissioned roads in the project area. Figure 2-3 is a map of the open road network after implementation. Changes in access and travel management related to cross-country motorized travel are outside the scope of this project.

The Forest Service is in the process of issuing a nation-wide ban on cross-country motorized travel, limiting motorized use to designated routes only. This national direction, when finalized, will be implemented in future Coconino National Forest planning efforts. Signing and mapping efforts for open system roads will be included in future road management decisions.

Comment 4-1

Approximately 275 acres in the southeast portion of the project have been identified as elk calving areas. None of the action alternatives would cause disturbance in these areas. Mitigation measures for all action alternatives include timing restrictions that ensure no thinning or burning will occur in the two known elk calving stands between May 15 and June 30 to limit disturbance to elk in these key reproductive areas. Alternatives 2 and 3 would have less impact to elk calving as these stands will have an uneven-age stand structure designed to maintain both thermal and

hiding cover for elk. Alternative 4 would result in an even-age structure that would reduce hiding cover in 99 acres of elk calving habitat and would limit effective cover for young elk calves.

Thinning will reduce cover for elk around communities but will increase and distribute forage across the project area. Fire danger around the communities ranges from low to high fire hazard ratings. Short term impacts to elk that may calve in these areas are a tradeoff to reducing fire hazard to the communities and protecting other, more ecologically important calving areas away from communities. Elk populations are stable on the Forest and this project will not impact forest-wide population trends for elk.

All action alternatives will maintain hiding cover at least 200 feet wide around dependable waters and along the travel corridor identified in the northeast portion of the project. All action alternatives will still provide cover for elk and will meet Forest Plan direction. See the Management Indicator Species and Wildlife Cover subsections in the Wildlife section of Chapter 3 for more analysis on effects to Elk from treatment activities.

Comment 4-2

This project is designed to address certain ecological components of the project area surrounding the Mountainaire community. Since this project is being analyzed under authority of the Healthy Forest Restoration Act, some activities, such as recreation management, are outside the scope of the project proposal. Some trail construction and management activities are proposed in the Mountainaire Community Trails project, a separate analysis on the Mormon Lake Ranger District.

Elk will most likely be displaced up to one-quarter mile either side of a trail (foot or bike trail) where it passes though forested areas. The amount of cover provided by vegetation and topography influences the actual displacement distance. Elk will commonly use areas at night after humans have left.

All special use permits for events, such as bike races, go through an environmental analysis process that depends on the impact and significance of environmental effects.

Comment 4-4

Road closures proposed in this project are in two forms, administrative closures and decommissioning. Roads administratively closed are gated and remain for official use, such as firefighting access, but are closed to public use to reduce resource impacts. Decommissioned roads are closed and rehabilitated to a natural state by various techniques including the release of compacted soils, recontouring the road prism, and reseeding. While some historic road closures in the project area have been ineffective or become re-opened and used in recent years, more recent work in the project area (Priest and Howard draws) has proven effective. Fencing or barricading decommissioned roads and the placement of logging slash or rocks in the road beds aids in preventing public access and new roads from forming in these areas.

Comment 5-1

Thinning activities will not affect pasture use in the allotment. The Mountainaire, Saganaw, and East Kelly pastures may all be part of one contract area. Cutting units have not been designated yet, so this may change. The Kelly pasture outside of the project area will also be available for use by project implementation. Contracts will ensure that thinning operations don’t disturb key fences so cattle remain within pastures.

Prescribed burning activities will be limited to one or portions of one pasture at a time and timed so grazing can be rotated through pastures without damaging recently burned pastures.

Comment 5-2

After decommissioning, road beds may be re-contoured, re-seeded, have slash piled on them, and blocked at their entry points. These road beds will not be suitable for moving cattle. Existing fences and open roads should provide adequate tools, however, for moving herds within the project area. Road access from Kelly Canyon will remain open for access.

Comment 6-1

Forest Road 762 is currently in poor condition and while it is not the intent of this project to encourage public use of the road or surrounding area, increased use of this road may occur due to displaced traffic from other currently used routes proposed for decommissioning. The road is a necessary part of the transportation network for the project and will be reconstructed to at least the minimum standards necessary for timber removal and public safety. This road does not currently meet recommended road management standards.

Comment 7-1

Alternative 3 was developed in response to the wildlife research proposal. See Chapter 2 for a complete description of actions proposed under Alternative 3.

Comment 7-2

The Forest Service has worked with ForestERA data throughout the planning process duiring pro-NEPA planning of this project. Specific comparison documents are found in the Project Record. Sections in Chapter 3 of the EA also discuss existing conditions context for the project area. Grand Canyon trust and GFFP met with the Forest Service to best determine how to deal with these requests. The District agreed to look at landscape context surrounding the Mountainaire HFRA project area and, where possible and applicable, use ForestERA datasets to complement the Cumulative Effects analysis in the EA.

See Appendix D for a comparison of CWPP recommendations (using ForestERA models) and the proposals in this project.

Comment 8-1

A clarification letter was sent to Grand Canyon Trust to verify whether or not these comments are truly consistent with the GFFP scoping comments. In a response, the Grand Canyon Trust letter was not intended to fully represent GFFP, however several of the Trust's comments are consistent with comments offered by GFFP.

Comment 8-2

Please refer to the response to Comment 7-1

Comments 8-3 and 8-4

Please refer to the response to Comment 7-2

Comment 8-5

The Mormon Lake Ranger District responded to the Grand Canyon Trust in a letter dated June 27, 2005 to clarify the intent regarding the use of historical tree evidences to guide thinning activities. Proposed thinning activities common to Alternatives 2 and 4 will not use proximity to historical tree evidences as the primary basis for selecting leave tree locations. The original proposed action intent was to develop a diverse forest structure in terms of tree spacing and distribution and one that exhibited clump and group patterns. The activities are aimed at getting away from traditional even tree spacing or "tree farm" management. This patchy tree distribution would be similar to the structure that occurred prior to interruption of the historic fire regime. Trees retained will be selected on existing structure conditions such as existing groups, tree height, canopy position, diameter, tree distances within groups, crown form, health, and vigor.

The only situation where proximity to historical evidences will guide thinning activities is under Alternative 3, which includes "full restoration" treatments on 610 acres that both GFFP and the Grand Canyon Trust support. Chapter 2 has new language in the Forest Structure and Composition sections of the Alternative descriptions.

Comment 8-6

Projects planned under authority of the Healthy Forests Restoration Act requires the Forest Service to carry out projects modifying fire behavior by focusing largely on the removal of small diameter trees, thinning strategic fuels breaks, and prescribed fire. Projects should also maximize the retention of large trees, as appropriate for the forest type, to the extent that the trees promote fire-resilient stands (Sec. 102(f)).

Vegetation treatments in the scoped proposed action (now Alternative 2) were designed to focus primarily on the thinning of small diameter trees to meet the Purpose and Need for Action. The proposed action was designed to best balance the need for reducing fuels and restoring forest health, which includes protecting wildlife and their habitat, meadows and grasslands, and watershed function. A healthy, large tree population is an essential component of a healthy forest.

While the Forest Service is not purposely targeting the removal of any large trees (defined as trees greater than 16 inches DBH for this project), it recognizes the need to remove some large trees to manage for overall forest health in a sustained manner, not just the health of the current large tree component. Thinning smaller trees can achieve fuel reduction objectives, yet there are situations where the removal of large trees may need to occur to meet other forest structure needs and Forest Plan direction. The Purpose and Need for Action is described in Chapter 1 of this EA and is based on the Mountainaire Project Need for Change Report (November 2004). Appendix C includes much background information and management rationale and criteria concerning large trees management under HFRA direction.

The majority of trees planned for thinning within the project area are less than 16 inches DBH. A limited number of trees greater than 16 inches dbh will only be thinned to meet specific project objectives developed in coordination with GFFP, including the creation of openings (appropriate for the ponderosa pine forest type), the creation of an uneven-aged forest structure (appropriate for the ponderosa pine forest type), and attainment of canopy cover goals (promotes fire resilient stands). The Vegetation section in Chapter 3 includes a detailed analysis of tree thinning effects in the project area, including large tree effects.

Stand structures representative of wood production-oriented diameter distribution are not an objective of this project. Uneven-age management objectives are included in this project to create

a diverse stand structure which existed historically and one that is sustainable in the face of drought, fire, insects, and disease.

Thinning in full restoration areas within the GFFP and Arizona Game and Fish Department proposed Abert Squirrel research areas will remove numerous large trees to meet historic densities. This proposal was supported by Grand Canyon Trust in their scoping comments. These areas will result in stand structures most similar to known historic densities and structural patterns.

Comment 8-7

The Mormon Lake Ranger District responded to Grand Canyon Trust in a letter dated June 27, 2005 to clarify the Trust's comments on large tree thinning criteria. Specific feedback was requested from Grand Canyon Trust on the adequacy of large tree management rationale and criteria that GFFP (including Grand Canyon Trust) and the Forest Service developed collaboratively. The district planned on incorporating this requested information to modify proposals for thinning if possible. Grand Canyon Trust responded with criteria on September 9, 2005, more than two months after the requested reply date of July 7, 2005. This reply, although late, was addressed by the District.

In response to the three criteria for large tree management planning, the District has worked with GFFP and Grand Canyon Trust to try and address large tree management concerns for the Mountainaire project since July 2004. Numerous field trips and meetings were held to facilitate those discussions. The GFFP Board of Directors (of which the respondent is a member of) offered their letter of support for the proposed action, which included large tree management rationale.

Due to the nature of the activities the District is proposing (i.e. creating openings, clump and group structure, grassland restoration), it is not possible to model all outputs for treatment actions. This concern has been disclosed to GFFP and Grand Canyon Trust on numerous occasions and in the scoping letter. The Forest Service does not have the capability to demonstrate all effects to the large tree component quantitatively, nor is it feasible to create a stem map of every large tree in the project area. Forest Vegetation Simulator, the Forest Service's vegetation growth model can predict some values for large tree effects. These results are found in the Vegetation section of Chapter 3.

Alternative 4 was developed to address the recommendations for a 16 inch diameter limit. Under HFRA, the Deciding Official is authorized to select an additional action alternative to address public concerns. Because large tree thinning diameters and "full restoration" treatments have opposing management direction for large trees, the District Ranger decided to include two additional action alternatives for full analysis. Since comments from Grand Canyon Trust asked for additional collaboration and large tree management discussions, the District was unclear on the Trust's actual view on the large tree management rationale included in the Proposed Action. To ensure that the District fully understood the Trust's concerns and thoughts on large tree rationale and criteria, The District held off on forming another or modifying an alternative until this conversation could occur. Because of the late response from the Trust, the District moved forward with addressing the four alternatives in this EA.

The District did modify its large tree management strategy in alternatives 2 and 3, however, to try and incorporate some elements of the Trust's clarification letter. Please see the responses to Comments 13-1 through 13-5 at the end of this section for information on Grand Canyon Trust's reply.

Comment 8-8

See the Vegetation, Wildlife, and Fire and Fuels sections of Chapter 3 and corresponding specialist reports for effects of prescribed fire on the listed resource elements.

The fire and fuels effects were projected 20 years into the future since this timeframe is longer than the fire cycle that would occur naturally for this fire regime. It would be more appropriate to conduct a new analysis after 20 years as the forest is constantly growing and fuel and fire hazard variables change.

Comment 8-9

Prescribed burning under controlled conditions has a slight probability of tree mortality. However, a wildfire that occurs prior to or without prescribed burning has a greater risk of tree mortality. Prescribed burning under these trees actually increases their chance of survival. The burn plan prescription identifies parameters to minimize the loss of desired trees such as lining old trees.

Burning is a disturbance that can release nutrients, reduce plant competition, increase the amount of available sunlight light and increase bare soil. Management actions proposed for various areas of the project include machine piling and burning or broadcast burning. Broadcast burning may occur in areas where trees have been cut to meet the fuel reduction objectives of this project as well as in some areas where burning is the only treatment used. The effects of broadcast burning are similar to those of tree removal and may contribute to expansion of existing noxious weed populations and introductions of new populations. Pile burning will create locally severely burned areas at pile sites. Consequences include, but are not limited to the reduction or loss of the seed bank on these sites (Korb, 2001; Crisp, 2004); death or reduction of soil organisms on the pile sites (Raison, 1979; Ballard, 2000; Korb et al., 2004) and development of hydrophobic soil (Ballard, 2000). Slash pile sites are more prone to invasion from invasive exotic plants than surrounding areas and may contribute to the persistence and spread of invasive exotic plants in treated areas. A possible mitigation for these effects is to use previously disturbed areas including old pile sites or previously used decking areas where available instead of creating new sites within the forest.

Comment 8-10

While there is research being conducted currently regarding old tree mortality rates associated with various forms of tree raking, there are no conclusive studies to date that assist the district in adopting a threshold value for trees with minimal duff depths requiring raking. Mitigation measures common to all action alternatives include raking older yellow-barked pines with duff layers greater than 12 inches. Raking costs and a lack of volunteers needed to successfully rake trees make raking trees with lower duff layer depths prohibitively expensive.

Comments 9-1 and 9-2

The Wildland-Urban Interface, as defined in the Community Wildfire Protection Plan for Flagstaff, covers a majority of the project area. The District interprets “large, old growth” trees as trees older than 150 years, often yellow barked, since there is no common definition of an old-growth tree. In Forest Plan direction, old growth is representative of a forest structure, not individual trees.

No yellow-barked pines or trees greater than 24 inches DBH will be thinned. The majority of trees proposed for thinning are less than 16 inches DBH. Acknowledging that 16 inches is a size threshold for large tree definitions and social and ecological concerns, Alternative 4 was developed to address these concerns. Appendix C describes large tree concerns and planning efforts, and rationale and criteria to provide the public with a more detailed of how and why some large trees would be thinned under Alternatives 2 and 3.

Comments 9-2 (continued) and 9-3

According to FVS, an estimated 8,800 trees between 16 and 18 inches DBH and 750 trees between 18 and 20 inches DBH would be thinned on approximately 500 acres to reach canopy cover and/or uneven-aged structural objectives (Locations/sites: 325/11, 326/05, 348/14, 356/07, 356/10, 358/01, 358/08, 358/09). These values represent 0.6% of the total number of trees to be thinned within the project area to meet canopy cover and/or uneven-aged structural objectives. In some of these stands, removal of all trees less than 16 inches DBH would fail to meet canopy cover objectives for fuels reduction objectives. In other stands, the removal of all large trees less than 16 inches DBH would meet canopy cover objectives, but at the expense of creating an uneven-aged structure.

Due to a lack of data and models, the number of large trees removed for grassland and savannah restoration cannot be estimated. Modeling limitations (Inability of FVS to display data spatially) also prevents the District from predicting the number of large trees removed for the creation and enhancement of openings. Stem mapping of every large tree would be required to accurately count the number of trees to be thinned. For a analysis of the acres and percent of the project area's VSS distribution, please refer to the Vegetation section of Chapter 3.

Comment 9-4

All alternatives including the proposed action are consistent with the Coconino Forest Plan. All applicable forest-wide and management area standards have been incorporated. The Forest Service uses many mitigation and preventive measures in the planning and implementation of land management activities. The application of these measures began during the planning and design phases of the project. Additional direction comes from the Regional Guide, and applicable Forest Service manuals and handbooks.

Thinning up to 12 inches DBH on 147 acres in the Mexican spotted owl Protected Activity Center (PAC) is proposed under all action alternatives. See Chapter 2 for a description of proposed activities. The Forest Plan guidelines state that harvest of trees can be performed in PACs in such a way that minimizes effects on the owl. Harvest in these areas should be from trees 9 inches or below DBH to abate fire risk.

Guidelines are defined in the Forest Plan as "preferred or advisable courses of action." Standards are defined as "performance criterion indicating acceptable norms or specifications that actions must meet to maintain the minimum conditions for a particular resource." While guidelines and standards have been interpreted on past projects to mean the same thing, there is a notable difference in their definition.

The proposed thinning is outside of the Forest Plan's preferred 9 inch limit but meets the intent and goals of the MSO recovery plan and Forest Plan. This proposal is truly a habitat-oriented and fuel reduction approach that was developed in collaboration with US Fish and Wildlife Service and GFFP to improve habitat, foraging, and fuel conditions in one portion of the PAC outside the

nest stand. These guidelines are only being exceeded to better meet the goals and objectives of habitat recovery as outlined in the recovery plan that can't be met within the 9-inch limit. See the description of effects to the MSO PAC in the Wildlife section of Chapter 3 for a thorough analysis of the differences in thinning treatments. A comparison of effects of thinning up to 9 inches and 12 inches was conducted to show differences in meeting habitat improvement and fuel reduction needs. After close analysis, it was determined that the benefits to owls were far greater when trees up to 12 inches in diameter were cut. Impacts would not likely adversely affect the owl or its critical habitat. The District will continue to work with the US Fish and Wildlife Service in completing prescriptions, marking trees, and monitoring the PAC.

With regard to this one exception, all applicable forest-wide and management area guidelines have been incorporated.

Comment 10-1

In most years, the pine engraver beetle (*Ips pini*) is not an aggressive tree killer. Large populations commonly infest logging slash. When beetles populations are low, the beetle may kill widely scattered trees or small groups usually including less than ten trees. Often these trees have been previously damaged or stressed. In outbreak years, beetles may kill groups of 50 to more than 500 trees, often killing unthinned, susceptible young stands with trees 5-8 inches DBH. Trees in thinned, vigorous stands are infrequently colonized by *Ips*. The percentage of normal precipitation between April and July may be used to predict the intensity of pine engraver outbreaks later in the season. If precipitation is 75% of normal or less, moderate to heavy tree mortality may be expected in overstocked pine stands. Outbreaks are usually of short duration, seldom lasting more than one season. During extreme drought conditions, damage may continue for 2-3 years. The optimum period for logging is late summer to early winter so slash will dry sufficiently to be resistant to *Ips* the following spring.

The creation of slash is undesirable during the early winter through late spring. When it is not practical to avoid creating slash, several mitigation measures can be used to reduce the risk of *Ips* attack. Slash can be bulldozer trampled, chipped, lopped and scattered in openings, or green chained. Green chaining is a technique in which new slash is produced continuously for each beetle generation in a season to keep them out of live trees. The creation of large slash piles (20 feet wide by 10 feet deep) keeps interior pieces from drying out and attracts emerging beetles deeper into the pile and away from live trees. Additionally, felling trees into openings and avoiding any damage to residual trees reduces *Ips* attacks. Trees that are damaged should be removed as soon as possible. Thinning will occur with an awareness of bark beetle life cycles and mitigation measures will be used to reduce the risk of attack.

Comment 11-1

Roughly 40% of the project area is within the Oak Creek watershed, particularly the Pumphouse Wash sub-basin of Oak Creek. The remaining 60% is within the Walnut Canyon watershed including the Lake Mary area, a source of municipal drinking water for Flagstaff. Attention to water resources has been well integrated into the project's mitigation measures and BMPs and will be a primary consideration as the project is implemented.

Much attention was given to protection and improvement of water resources, particularly Oak Creek, in the recent Flagstaff/Lake Mary Ecosystem Analysis (FLEA) Area Forest Plan Amendment.

The Southwestern Region of the Forest Service has a Memorandum of Understanding with the State of Arizona that identifies the Forest Service as the designated management agency for managing nonpoint source pollution on National Forest System lands. To gain this designation, the Region and Arizona Department of Environmental Quality (ADEQ) have taken the approach of using Soil and Water Conservation Practices (FSH 2509.22) in the development of site specific Best Management Practices (BMP's) through the NEPA process for enhancing and protecting water quality. The ADEQ has entered into several Memorandums of Understanding (MOUs) with federal partners in the State to respond to mutual water quality objectives. These MOUs help identify responsibilities and activities to be performed by each agency and foster a collaborative effort in meeting natural resource and public health goals to sustain healthy conditions in Arizona's watersheds.

Best Management Practices (BMP's) are *"a practice or a combination of practices, that is determined by a State (or designated area-wide planning agency) after problem assessment, examination of alternative practices and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals"* (FSH 2509.22). Authority and guidance to prescribe and implement BMP's is defined in FSM 2501, 2530, FSH 2509.22 and the Forest Plan.

Comments 11-2 and 11-7

Oak Creek was designated as a Unique Water by the Arizona State Legislature in 1991 on the basis of (1) its popularity and accessibility as a water recreation resource; (2) its aesthetic, cultural, educational, and scientific importance; and (3) its importance as an agricultural and domestic drinking water resource in the Verde Valley. The Coconino National Forest supports the State designation, and is highly active in managing and protecting this valuable resource.

As stated in the Oak Creek Canyon Section 319 National Monitoring Program Project, biological, nutrient, and vehicular pollutants pose the most serious and pressing current threat to Oak Creek water quality. Oak Creek water quality is impaired by high fecal coliform levels, probably resulting from residential septic systems and the high usage of the campgrounds and day-use swimming areas by over 350,000 people during a concentrated period of time extending from May through September. Excessive nutrients, particularly phosphorus, which exceeds the 0.10 standard, threaten the water integrity of two impoundments located well below Oak Creek that provide a major source of drinking water for the City of Phoenix. The third type of pollution impairing Oak Creek is associated with motor vehicles and consists of heavy metals (such as lead and zinc), petroleum hydrocarbons, and total organic carbons. The pollution originates from the estimated four million vehicles traveling along State Highway 89A each year, as well as from drainage of numerous parking lots in the Oak Creek Canyon area during rainstorms and snow melts. This threatens all designated uses.

Recently, Oak Creek has been the study of Total Maximum Daily Load (TMDL) analysis for nitrogen, phosphorus, and fecal coliform levels. Turbidity has been removed as a standard, and monitoring is scheduled to determine whether suspended sediment or bottom deposit violations are occurring.

According to the Arizona Department of Environmental Quality Antidegradation Implementation Procedures, Unique waters are given more stringent surface water quality protections than other surface waters under the State's antidegradation rule A.A.C. R18-11-107(D). Under antidegradation implementation procedures, activities that may result in a new or expanded

discharge of pollutants to Unique Water (or its tributaries) are prohibited if the discharge would cause degradation of existing water quality. Discharges include those caused by land use activity (e.g., construction, mining, grazing, and agriculture) as well as discharges requiring a surface water discharge permit (e.g., wastewater treatment plant discharge, dredge and fill activity). Generally, if nonpoint source activities comply with the conditions or BMPs noted in their respective individual or general permit, they are presumed to meet antidegradation requirements and no detailed antidegradation review is required.

Nonpoint sources are subject to antidegradation requirements. In general, nonpoint source activities that (1) demonstrate proper selection, design, installation, and maintenance of cost effective and reasonable best management practices; and (2) adhere to best management practices that prevent or minimize degradation of surface waters are deemed to be in compliance with antidegradation requirements.

All action alternatives as well as the ongoing Kachina Valley Forest Health project contains many elements that are designed to protect and even enhance water quality in the Pumphouse and Oak Creek basins. Attention has been given to managing existing roads and trails to rehabilitate disturbed areas. Riparian and ephemeral stream channels have been identified for protection and/or stabilization. Probably the most important watershed protection element in the project proposal is the reduced risk of large scale, watershed disturbing wildfire. These elements include thinning to remove excess fuels.

The ADEQ states that an *"increasingly large source of NPS pollution that cannot be overlooked from forest lands is wildfire occurrence, especially during long drought periods. Arizona is currently experiencing it's worst drought in over 100-years and these extremely dry conditions are exacerbating the likelihood of wildfires. An infamous example of this is the Rodeo-Chediski wildfire that occurred in late June 2002. The economic and social impacts to the wildland-urban interface and the entire Mogollon Rim area will be enduring for many years. The aesthetic impacts of burnt trees and newly created moonscapes are not easily overlooked in these burned areas and will probably last for a very long time. However, less obvious to the public are the negative impacts that can devastate the downstream water resources and natural ecosystems caused by wildfires. When wildfires occur in Arizona's pine forests, the after effects on soil conditions, hardening of the surface soils and removal of vegetation buffer areas can increase erosion rates exponentially. Sometimes 5-year flooding events can act like 100-year flooding events when wildfires consume most of the vegetative buffers that formerly slowed the rate of water naturally flowing."*

We recognize that any treatment activities will produce some level of disturbance that can result in short term increases in soil detachment. In the Soils and Watershed section of Chapter 3, we considered soil properties, topography, stream channel characteristics, proximity to perennial waters, and a host of other factors when assessing the potential on-site, off-site, and cumulative impacts associated with proposed treatments. Best Management Practices are prescribed to reduce the likelihood of negative impacts as required and encouraged by our Memorandum of Understanding with the Arizona Department of Environmental Quality.

Comments 11-3 through 11-6

The proposed activities are not regulated under the Arizona Pollution Discharge Elimination System (AZPDES) program. The primary focus of the AZPDES individual permitting program is municipal/domestic and non-domestic (industrial) direct dischargers. While provisions of the

AZPDES program do address certain specific types of agricultural activities (e.g., feedlots, Concentrated Area Feeding Operations), the majority of agricultural facilities are defined as nonpoint sources and are exempt from AZPDES regulations.

As referenced, 40 CFR Sections 122.27 and 123.25 refer to silvicultural activities regulated under NPDES. *"Silviculture point source" means any discernible, confined, and discrete conveyance related to rock crushing, gravel washing, log sorting, or log storage facilities that are operated in connection with silvicultural activities and from which pollutants are discharged into navigable waters."*

However, Section 122.27 adds that *"The term does not include nonpoint source silvicultural activities such as nursery operations, site preparation, reforestation and subsequent cultural treatment, thinning, prescribed burning, pest and fire control, harvesting operations, surface drainage, or road construction and maintenance from which there is natural runoff."*

Similarly, a Storm Water Pollution Prevention Plan (SWPPP) is not appropriate for the activities outlined in the proposal.

Comment 11-8

The Vegetation section in Chapter 3 was revised to include both ranges and averages for existing and desired values.

Comment 11-9

Over 80% of the project area has moderately closed (40-60% canopy cover) or closed (>60% canopy cover) canopies. Please reference the Affected Environment subsection of the Vegetation section in Chapter 3 for a more complete description of current stand conditions. Under the current high stand densities, the majority of the project area has low understory productivity and diversity. Research has shown that tremendous declines in understory productivity and diversity occur as stand densities increase due to decreased sunlight to the forest floor, decreased soil temperatures, the abundance of pine litter, and altered decomposition rates.

Comment 11-10

Closed canopies contribute to the initiation of crown fire by allowing heat to accumulate below the canopy without venting adequately. By the time the area experiences fire weather, the difference in site moisture is so small that it has no effect on crown fire initiation or crown fire spread.

Comment 11-11

Fire behavior modeling for this project as well as previous GFFP projects has been based on actual weather conditions recorded for the Flagstaff area over the last 25 years. The most destructive wildfires have occurred during extreme weather conditions that pass through the area each year, but occur only 10% of the time. See the Fire and Fuel section in Chapter 3 for additional modeling information and rationale.

Comment 11-12

Thinning and prescribed burning activities address a matrix of fire characteristics, not just height to the bottom of the live crown. While a height of 20' is generally desirable, this will not be

achieved throughout the project area with any of the action alternatives. Sufficient canopy openings combined with surface fuel reduction can often mitigate the need for the 20'crown base height. Stand structure will vary throughout the project area, but in most cases the resultant fire behavior characteristics will meet the fuel treatment objectives. See the Fire and Fuel section in Chapter 3 for additional effects of treatments.

Comment 11-13

Pruning lower tree limbs does not result in the desired fire behavior characteristics since pruning only addresses ladder fuels and does not prevent fire from climbing tree trunks under closed canopy conditions. A "more open forest" as stated in the comment is necessary and desirable to meet the fire hazard reduction goals for the project area.

Comment 11-14

The desired condition for much of the project area is an open or moderately closed canopy. However, there will be areas that retain high canopy covers for wildlife species after treatment. Northern goshawk nest stands will maintain, where existing, a 60% canopy closure after treatment and will not be thinned. Under Alternative 3, meso – reserves will retain 228 acres in three patches with canopy covers ranging from 55-72%. The MSO PAC has an average of 58% canopy cover, which will be maintained. Steep slopes on 53 acres outside of the PAC will maintain closed canopies.

Canopy cover objectives are averaged across stands. Numerous clumps and groups of trees within the stands will have interlocking crowns where canopy cover can approach 100%. The fire hazard of such a condition is mitigated by the canopy breaks around these groups.

Comment 11-15

The Vegetation section in Chapter 3 was revised to include both ranges and averages.

Comment 11-16

From a fire hazard perspective, 1-3 tons per acre of woody debris is the desired condition within ½ mile of residential and commercial development. A surface fuel load of 5-7 tons per acre is a dangerous volume to leave in those areas. The Forest Plan states that 5-7 tons per acre of woody debris will be retained across the landscape. The Forest Plan also directs managers to construct fuel breaks that are necessary for protecting life and property.

The desired future condition for the project area is 3-7 tons per acre since many areas do not have 5-7 tons currently. While all logs consumed by prescribed burns will be replaced with felled logs, the District cannot fell logs on every acre where woody debris is currently lacking. Fire crews can only mitigate effects from prescribed fire and do not have resources to create the desired condition. As snags and dead trees fall on the ground in time, logs and woody debris will be replenished. Forest plan guidelines for woody debris can be met on a larger scale, not necessarily on each acre. While much of the project area is ponderosa pine forest, a substantial amount is savannah grassland which contains little woody debris currently.

Please see the Wildlife section in Chapter 3 for more information on snag and log effects from treatments.

Comment 11-17

Please see response to Comment 9-4.

Comment 11-18

The Forest Plan requires an average canopy cover in VSS4 to be 1/3 60+% canopy cover and 2/3 50+% canopy cover. In VSS 5 and VSS 6 classes, average canopy cover percentage should be 50+%. Canopy cover in the PFA's is current lacking for both VSS 4 and VSS 6 and does not meet Forest Plan direction currently. All action alternatives will reduce (or maintain at existing low levels) canopy cover below recommended levels in the Forest Plan. However, this reduction is a trade off for reducing fire risk and increasing diameter growth in a shorter time frame. Treatment in these areas will help achieve desired future conditions sooner than Alternative 1. These canopy cover levels are expected to return to pre-treatment levels in the PFA's within approximately fifty years. All alternatives will move forest structure toward the desired condition for northern goshawks.

Comment 11-19

The majority of yellow pines located in moderately closed to closed canopies (over 80% of the project area) have duff greater than 4 inches at their base. While there is research being conducted currently regarding old tree mortality rates associated with various forms of tree raking, there are no conclusive studies to date that assist the district in adopting a threshold value for minimal duff depths requiring raking. Carolyn Hull-Sieg was consulted for this project and is currently conducting research on raking effectiveness. Mitigation measures common to all action alternatives include raking older yellow-barked pines with duff layers greater than 12 inches. Raking costs and a lack of volunteers needed to successfully rake trees makes raking trees with lower duff layer depths prohibitively expensive.

Comment 13-1

Please see the response to Comment 8-5

Comment 13-2

Uneven-aged tree structure is an integral component of historic ponderosa pine forests in the Southwest. The Purpose and Need for Action incorporates uneven-age principles as part of the restoration and fuel reduction goals. The District and GFFP spent months developing a management proposal that attempts to manage for uneven-aged forest structures where possible, while still trying to maximize large tree retention when possible.

It is estimated that a total of approximately 1.5 million trees will be thinned under Alternatives 2 and 3 to meet canopy cover and uneven-aged management goals. Under Alternative 2, approximately 8,800 trees between 16-18 inches DBH and 750 trees between 18-20 inches DBH are proposed for thinning. Under Alternative 3, approximately 11,400 trees between 16-18 inches DBH and 1,550 trees between 18-20 inches DBH are proposed for thinning. Currently, areas proposed for "Thin from Below" and "Uneven-aged Thin" treatments have a total of approximately 256,800 trees greater than 16 inches DBH, with approximately 115,400 trees (45%) between 16-18 inches DBH. Alternatives 2 and 3 still retain the majority of large trees in the project area.

Alternative 3 includes more thinning of large trees due to full restoration treatment areas. This research proposal was supported by Grand Canyon Trust and GFFP in their scoping comments.

Comment 13-3

Alternative 4 maximizes large tree retention in the project area. In some areas, uneven-age management goals can still be met with a diameter limit. See the Vegetation section in Chapter 3 for large tree management effects and data.

Grand Canyon Trust's scoping comments do provide support for uneven-aged management and support the most intense thinning (full restoration) of all treatment types proposed. Full restoration treatment on 622 acres alone accounts for the thinning of approximately 3,400 large trees.

The District recognizes that the Trust's endorsement of the Proposed Action developed collaboratively with GFFP does not prevent them from independently offering different comments in the NEPA process. However, the collaboration criteria offered by the trust would reinitiate a process that the District and GFFP used since July 2004 to address large tree management concerns. Since there was support for the Proposed Action from GFFP, the District assumed there was some level of success in large tree management agreement. The additional criteria that the Trust submitted are a good starting point for discussions that focus on large tree prescriptions in the field, however, they came too late in the process for the District to re-initiate conversations with GFFP regarding criteria. Again, Alternative 4 address these large tree retention issues. See the response to Comment 8-7 for more detail on management options and Alternative development regarding large trees.

Forest Service models do provide sufficient information to estimate effects on vegetative growth and patterns in the project area. They provide sufficient detail to compare the effects of alternatives. While spatial modeling is difficult without stem maps of an area, the Vegetation section of Chapter 3 provides enough context and site-specific analysis to predict vegetation effects.

In a meeting with Grand Canyon Trust to discuss their clarification comments, the District Ranger agreed that estimates for total large tree numbers to be thinned would be included in the EA. These are included in the Vegetation section of Chapter 3 for all alternatives. In addition, location and site information is included to help define where in the project area large tree concerns are focused.

Comment 13-4

In pre-NEPA discussions, large tree management rationale that the District developed with GFFP was sufficient for planning direction in the EA. The Trust is correct in that there is a difference between rationale and criteria. The District appreciates the effort the Trust put forward in developing initial criteria for discussion purposes in their clarification letter. The EA does not contain prescriptions for treatment since prescriptions are written at the Site level based on site-specific existing conditions. One-size-fits-all prescriptions cannot be applied effectively in the field and can limit implementation staff from best meeting the project purpose and need for action and project objectives.

Still, the District reviewed these criteria and tried to incorporate some sideboards into the EA that further guided implementation staff to ensure accurate interpretation of the projects direction. See Appendix C for rationale and criteria for large tree management.

Comment 13-5

Competition occurs in the canopy but also occurs under ground, where roots can extend 2-3 times the crown width. Because of this, criteria that call for drip line or canopy spacing are too limiting. It also is not the intention of the District to thin every tree around yellow-barked pines or large oaks. There are too many variables on the ground that the provided criteria cannot account for.

Regarding dwarf mistletoe infection, there is only one stand within the project area identified as having a severe level of mistletoe infection. Large trees may need to be removed in these areas to prevent the spread of infection to the understory. The creation of buffers may encourage regeneration of mistletoe infection in the regeneration. This scenario would not meet the objectives for forest health.

Open grown “wolf” trees generally are not found in areas with high stand density of large trees. Focusing only on the removal of these trees would not be sufficient for the creation of openings. Criteria that the District developed for the creation of openings have been included in the large tree management rationale and criteria section of Appendix C.

Uneven-aged stand structure and canopy cover objectives overlap to some degree. Uneven-aged structures are an integral part of the projects goals and objectives. Please see the Vegetation section in Chapter 3 for a discussion on impacts to forest structure and large trees under the alternatives.

Appendix C – Healthy Forests Restoration Act Authorities for the Mountainaire HFRA Project

This analysis provides a description of how the Mountainaire HFRA Project Proposed Action meets the requirements set forth under the Healthy Forests Restoration Act of 2003 (HFRA). The HFRA was written to expedite the preparation and implementation of hazardous fuels reduction projects on federal lands. Because HFRA requirements are different than projects authorized under traditional NEPA authority, this document serves as a road map for educating the public on these differences.

Public Collaboration

The Mormon Lake Ranger District collaborated with Greater Flagstaff Forests Partnership (GFFP) on all phases of planning and project design for this project. The partnership represents a broad spectrum of community interests in the Flagstaff area including federal, state, and local agencies; academic groups; professional societies; conservation organizations; and local fire departments including Highlands Fire. The Forest Service has worked collaboratively with GFFP over the past year to jointly develop desired future conditions, possible management approaches, monitoring and mitigation measures, and the Proposed Action. The Forest Service and GFFP have also conducted numerous field trips and meetings to discuss project goals and objectives for the project area. In February 2005, the GFFP Board of Directors provided their endorsement for the Proposed Action. On April 22, 2005, the Board also provided support of this Proposed Action in their scoping comments.

During the comment analysis phase after the initial scoping period, the District also responded directly to respondents in attempt to clarify the respondent's comments. The ID team worked together with GFFP partners and Arizona Game & Fish department to integrate the wildlife research proposal proposed by the GFFP Board in their scoping comments. Alternative 3 was developed to address this collaborative development.

The District replied to one respondent attempting to clarify watershed management issues and Forest Service authorities and procedures. The District also asked for clarification from the Grand Canyon Trust—a GFFP partner and Board member—on their comments regarding large tree issues. The District Ranger and project leader met with Grand Canyon Trust to inform them of the District's response to their comment and how concerns will be addressed in the Environmental Assessment.

These responses were important steps to keep the collaborative dialog between the public and the District ongoing, and to ensure that partners stayed abreast of the planning process.

Wildland-Urban Interface and At-Risk Communities

Section 102(a) includes direction on types of lands that fit under HFRA authority. This project is consistent with the Implementation Plan[1] and includes the following:

- The wildland-urban interface areas of at risk communities (Section 102(a)(1)); and
- Federal lands not in the WUI that have threatened and endangered species habitat where the natural fire regimes are important for (or where wildfire proposes a threat to) the species or their habitat, and where fuel reduction projects will enhance their protection from catastrophic wildfire (and complies with applicable guidelines in management or recovery plans) (Section 102(a)(5)). See the Wildlife Section in Chapter 3 for more detail on current conditions of threatened species habitat and fire hazard ratings.

The Flagstaff area was listed in the January 4, 2001 Federal Register notice (66 FR 753) describing at-risk communities. The Wildland Urban Interface (WUI) for this project is defined though HFRA and the Community Wildfire Protection Plan (CWPP). The CWPP defines the interface as an area where public safety is the over-riding goal. The WUI is sufficiently large to:

- Reduce the potential of a high intensity fire from entering the community;
- Create an area whereby fire suppression efforts will be successful;
- Limit large amounts of wind-driven embers from settling on the community; and
- Protect critical infrastructure.

The project area is located completely within the Community Wildfire Protection Plan analysis area. The WUI as defined in this plan covers a majority of the project area. See www.gffp.org for a detailed map of the WUI area.

Community Wildfire Protection Plan

See Appendix D - Community Wildfire Protection Plan Direction for more information on how this project was developed to accommodate management goals and direction described in the CWPP.

Threatened and Endangered Species

The HFRA authorizes treatments on federal lands outside of the WUI that have threatened and endangered species habitat where the natural fire regimes are important for (or where wildfire proposes a threat to) the species or their habitat, and where fuel reduction projects will enhance their protection from catastrophic wildfire (and complies with applicable guidelines in management or recovery plans) (Section 102(a)(5)).

Natural fire regimes are identified as being important for threatened and endangered species and their habitat in the MSO Recovery Plan (1995). A main threat identified during the listing process

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[1] Implementation Plan for the Comprehensive Strategy for a Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment (May 2002).

for Mexican spotted owls was wildfire risk. The Upper Gila Mountain Recovery Unit, which encompasses the project area, has a high fire threat and has significant owl populations that have the potential of being seriously impacted by fire. Large crown fires can reduce or eliminate nesting, roosting, and foraging habitat. Desirable characteristics of many nest and roost sites place them at high fire risk.

This authorized hazardous fuel reduction project will provide enhanced protection from catastrophic wildland fire for threatened and endangered species and their habitat. The Proposed Action includes management actions within MSO habitat to improve nesting and roosting habitat and reduce fuels in these areas. Many of these areas, including the PAC, are within the WUI area. Prescribed fire and minimal thinning can reduce fuel loadings and create small openings to increase horizontal diversity and promote growth of shrubs, grasses, and forbs.

Coordination among fuel and fire specialists and biologists in the development of prescribed burn plans will occur to minimize impacts to birds and their habitat. See the Project Design Features section of the Proposed Action for project-specific mitigation and management practices.

The potential beneficial and adverse effects to the species in both the short-term and long-term will be described in the Environmental Assessment for the project.

Old Growth

The HFRA requires that the Forest Service fully maintain, or contribute toward, the restoration of the structure and composition of old growth stands according to the pre-fire suppression old growth characteristics of the forest type.

The Coconino Forest Plan (USDA 1986) was amended in 1996 to incorporate management direction for the northern goshawk and Mexican spotted owl. This amendment included new direction regarding the management of old growth ecosystems.

Section 102 (e)(3) provides that old growth direction in resource management plans established (or amended) on or after December 15, 1993, is sufficient to meet the requirements of Section 102 (e)(2) and will be used by agencies carrying out projects under the HFRA.

Old growth stands have been identified through district mapping and planning activities. Figure 2-2 provides locations of the 3,574 acres of land designated for old growth development in the Proposed Action.

The Proposed Action is in compliance with, or is moving in the desired direction to meet all Forest Plan standards and guidelines for old growth management. While these old growth development areas will meet old growth structural values sooner than other areas, other lands will also be managed to increase tree growth rates and ensure the development of additional old growth areas over time.

Large Tree Retention

The HFRA requires the Forest Service to carry out the project that focuses largely on small diameter trees, thinning strategic fuels breaks, and prescribed fire to modify fire behavior. The project should also maximize the retention of large trees, as appropriate for the forest type, to the extent that the trees promote fire-resilient stands (Sec. 102(f)).

Vegetation treatments in the Proposed Action are designed to focus primarily on the thinning of small diameter trees to meet the Purpose and Need for Action. The Proposed Action was designed to best balance the need for reducing fuels and restoring forest health, which includes protecting wildlife and their habitat, meadows and grasslands, and watershed function. A healthy, large tree population is an essential component of a healthy forest. To preserve the existing mature forest component, no yellow-barked pines will be thinned.

While the Forest Service is not purposely targeting the removal of any large trees, it recognizes the need to remove some large trees to manage for overall forest health in a sustained manner, not just the health of the current large tree component. Thinning smaller trees can achieve fuel reduction objectives, yet there are situations where the removal of large trees may need to occur to meet other forest structure needs and Forest Plan direction. Project goals and objectives are described in Mountainaire Project Need for Change Report (November 2004). This analysis should be reviewed in tandem with the Proposed Action to gain a better understanding of vegetative characteristics in the project area.

While the Proposed Action describes treatment methods and post-treatment forest structure values, it does not detail the management of individual trees. Trees selected for retention and removal—including large trees—will be determined by silviculturalists in the field on a site-specific basis. The Proposed Action and this document do not show the actual numbers of large trees retained or removed, but they can provide the context in which large tree removal would occur to meet resource needs. Although the criteria listed in the following sections provide an ecologically justified rationale for why trees may be removed, it is also important to focus on the large tree component that will remain in the project area after treatment.

Process and History

Early in the development of the project, the Forest Service and GFFP met to discuss large tree definitions, site specificity of large tree management, rationale for the retention and removal of large trees, and diameter caps. Subsequent large tree discussions were held within project interdisciplinary (ID) team meetings that were scheduled throughout late summer and fall. In these ID team meetings, Forest Service and GFFP members developed desired future condition statements, treatment timeframes, and possible management practices. Large tree management concerns were discussed at these meetings and during GFFP Project Team field trips. Forest Service silviculturalists provided in depth concerns about large tree management during numerous ID team meetings. Resulting dialog of large tree management was captured in the Need for Change Report that was completed in early November 2004 after review by GFFP.

The Forest Service collaboratively developed the Purpose and Need for Action and Proposed Action with GFFP. The Forest Service also provided GFFP a final Large Tree Management document that included preliminary model spreadsheets for some forested stands, a sample stand simulation displaying differences in forest structure with and without a diameter limit, fuel model assumptions, and a number of detailed maps displaying various aspects of forest structure. The spreadsheets provided much information on current stand characteristics, predicted stand structure after treatment, and the estimated number of large trees removed to meet resource needs. The following sections are adapted from this Large Tree Management document.

Large Tree Definition

While the current GFFP policy (December 2004) regarding large tree management does not specify a size threshold in describing large trees, this analysis (based on numerous discussions with GFFP) defines large trees as 16 inches diameter at breast height (DBH) or larger for ponderosa pine for this project. Although definition by diameter helps provide a visual image of large trees, tree diameter is only one way to measure the ecological value of a given tree.

Forest Stand Data

The project's vegetation and stand data are derived from stand exams performed by the Forest Service prior to project planning. A stand is a delineated area of land that contains a plant community that is generally uniform in cover type, age and size class, and is distinguishable from adjacent plant communities. There are 255 stands within the project area and they range in size from a few to a few hundred acres. Field crews collected detailed information at a number of points across stands. The number of points varied according to stand size, structural characteristics, and level of intensity designated for the project. The collected data was then extrapolated to best estimate current vegetative characteristics (trees per acre, tree size, etc.) for entire stands. This modeling of stand characteristics is derived from computer modeling programs. While this information is sufficiently accurate to provide general stand characteristics, it does not detail actual numbers or placement of trees within stands.

Because this data is averaged per stand and stem maps or verified data for individual trees do not exist, actual numbers of trees—including large trees—that would be retained or removed cannot be detailed in this analysis. Rather, estimates are based on modeling and provide a context for the relative numbers of trees to be removed depending on proposed vegetative treatments and desired post-treatment values such as canopy cover percentages. As prescriptions are implemented and trees are marked for removal, actual numbers and sizes of trees targeted for removal can be assessed.

Simulations

The Forest Service ran preliminary estimates of the number of trees removed using stand data and predicted stand conditions after treatment with the Forest Vegetation Simulator (FVS) program. The FVS program can model stand characteristics before and after treatment and into the future. This program, however, cannot model the creation of openings or estimate the numbers of large trees removed to create these openings. While the Forest Service predicts that the majority of large trees removed would occur due to the creation of openings and un-even aged forest structures, it is difficult to predict actual numbers due to the inherent variability of stand structure.

While the creation of openings would require the removal of some large trees in many stands, other resource needs could also necessitate the removal of large trees in addition to those removed for openings. These resource needs, such as managing for uneven aged forest structure or protecting yellow-barked pines are listed in further detail in the last section of this document. There is approximately 1,939 acres of forested land within the project area that contain 30 or more large trees per acre. There is a high probability that some large trees in these stands will need to be removed to meet project needs other than the creation of openings.

The Forest Service ran treatment simulations through the FVS program on all 255 stands within the project area to determine if large trees would need to be removed to meet canopy cover and uneven aged management objectives described in the Proposed Action. Of those stands, only 8

had stand structures that warranted removal of some 16 to 18-inch DBH trees to meet canopy cover values and/or un-even aged management objectives. Two stands require removal of some trees 18 to 20 inches DBH to meet these objectives. These stands could also require removal of large trees to meet other objectives such as creating openings or reducing competition to mature oaks and ponderosa pines.

For example, Stand 358:009 is proposed for a thin-from-below treatment with a 50% canopy cover target to meet wildlife, forest health, and fuels reduction objectives. Using FVS simulations, the stand would retain 45 trees per acre, a basal area of 99 ft2 per acre, and a canopy cover of approximately 50% after treatment. The program predicts that the removal of 15 trees per acre between 16-18 inches DBH and 7 trees per acre between 18-19 inches DBH is required to meet canopy cover objectives. After treatment, the stand would contain 10 trees per acre 12-18 inches DBH, 27 trees per acre 18-24 inches DBH, and 8 trees per acre greater than 24 inches DBH. If no large trees are removed and all trees up to 16 inches DBH are removed, values after treatment would still include 67 trees per acre, a basal area of 136 ft2 per acre, and a canopy cover of approximately 60 percent. In this scenario, the resulting structure would not meet canopy cover objectives.

Rationale and Criteria for Removal of Large Trees

The following sections describe situations where large trees would be removed to meet project goals and objectives. While the following criteria are listed individually, they are all components of a healthy forest. All of these situations are directly linked to the goal of forest and grassland restoration listed in the Purpose and Need for Action, as well as the Need for Change Report. Often, more than one of these conditions exists in a treatment area where removal of a large tree may satisfy a number of these criteria.

The number of large trees that could be removed varies by stand and is highly dependent upon current forest structure. For example, some stands may exhibit a forest structure where large trees are aggregated in clumps or groups. Other areas may have an evenly spaced and distributed population of large trees. The creation of openings would most likely require fewer large trees to be removed in the first scenario compared to the second.

Where possible, criteria were written to further define how forest structure would remain on the ground after treatment.

Creation of Openings and Natural Regeneration Areas

Historically, ponderosa pine forests in northern Arizona were characterized by frequent, low-intensity surface fires occurring every 2 to 12 years. The historic fire regime maintained an open canopy structure and a variable, patchy tree distribution (Moir et al 1997, Covington et al 1997). Desired future conditions for the project area include openings within forested stands that recreate a more open stand structure, increase horizontal heterogeneity and understory productivity, decrease fire hazard, and improve wildlife habitat for northern goshawk, antelope, turkey, and several edge species. Openings also provide areas where natural regeneration can occur. The Proposed Action includes the creation of new or the enhancement of existing openings within at

least 20% of the project area to meet Forest Plan direction for Vegetative Structural Stage (VSS) classes. Openings would range in size from ¼ to 4 acres[2].

Criteria for the creation of openings include the following (not in order of priority):

- Create openings in northwest-southeast directional patterns to provide fuelbreaks.
- Avoid rocky soils
- Utilize and enhance existing openings
- Utilize areas with dwarf mistletoe infection
- Utilize areas with bug kill trees
- Utilize areas that lack pre-settlement evidences
- Avoid areas with New Mexico locust populations
- Enhance spaces between oaks and yellow pines
- Avoid uninfected 14-18 inch black jacks where possible
- Emphasize VSS 3 (5-12" DBH) areas

A Sustainable, Uneven-Aged Forest Structure

A forest structure that consists solely of trees greater than 16 inches DBH would not contain sufficient age diversity. Without regeneration, stand structure would not persist over time. Even-aged forest structures are only self-sustaining through stand-replacing events, such as catastrophic crown fire, which is not desirable within the project area, or through management actions that mimic stand replacing events such as clearcutting. Additionally, certain insects favor trees in certain diameter classes (DeMars and Roettgering 2003). As a forest becomes denser, it becomes less resistant to bark beetle infestation. Insects are attracted to trees under stress from lack of resources (water, nutrients, light) due to vegetative competition. An uneven-aged structure with lower tree densities would be less susceptible to landscape-scale insect attack and mortality (USDA Forest Service 2002, Long 2003, Amman et al 2003) and promote understory diversity. Proposed vegetative treatments would create openings and clump or group trees where possible to emphasize this diverse forest structure.

Canopy Cover

Canopy cover is an important measure when determining thinning treatments since it is a measure common to numerous resource areas in determining treatment effectiveness. Proposed canopy cover values are important to meet since canopy cover acts as a surrogate measure for other objectives such as reducing fuels, reducing competition to trees, and providing adequate habitat for wildlife species.

Canopy cover values in the Proposed Action were developed to meet fuel reduction objectives and comply with Forest Plan direction for northern goshawk and Mexican spotted owls. Some large trees would be removed to meet target canopy cover values in situations where not removing them would conflict with other objectives listed in this section. For example, if a stand

[2] Seedling and saplings areas (Vegetative Structural Stage 1 and 2 classes) are currently lacking in the project area. Forest Plan direction for the northern goshawk calls for 10% distribution in each of the VSS 1 and VSS 2 classes.

is targeted for an uneven age structure after treatment, removing all trees up to 16 inches DBH may not result in the desired structure, even though the canopy cover value may be met. In this scenario, a few large trees would be thinned and some smaller diameter trees would be retained, providing more structural diversity within the stand.

Increased Vigor, Longevity, and Development of Old, Yellow Ponderosa Pine

Ponderosa pine trees begin to turn yellow at approximately 150 years of age. Due to the current dense forest structure, some yellow pines have smaller diameters than normally associated with old, yellow trees due decreased growth rates from competition among trees for light, nutrients, and water. Thinning black-barked pine trees around the drip line of yellow pines will decrease competition among trees, increase yellow pine vigor and longevity, decrease susceptibility to successful bark beetle attack, and decrease the risk of mortality due to crown fire (Stone et al 1999, Kolb et al 2001, Wallin et al 2004).

Decreased Dwarf Mistletoe Infection

Dwarf mistletoe (Arceuthobium vaginatum subsp. cryptopodum) is a parasitic plant that infects ponderosa pine. Infection is spread via pressure-released seeds and expands at a rate of 1-2 feet per year (Conklin 2000). Dwarf mistletoe (DM) is considered a tree pathogen because infection results in reduced tree growth, reduced tree vigor, branch deformations, and shortened life span of the infected host. Additionally, in comparison to uninfected trees, trees infected with DM are more susceptible to bark beetle attack and are also more flammable due to the accumulation of resin and branch deformations (Conklin 2000). Since Euro-American settlement and the advent of fire suppression, DM populations in the southwest are thought to have increased with increased forest densities (Conklin 2000). A more open, park-like forest structure would have limited the spread of DM infection.

Currently, twenty-three stands within the project area contain some level of DM infection. The severity of dwarf mistletoe infection for the Mountainaire Project area is displayed in Table 2. Dwarf mistletoe infection is rated on an individual tree basis on a scale of 0 to 6, with 0 representing no infection and 6 representing a tree that is severely infected. As the number of individual trees severely infected with DM increases, the DMR for the stand increases as well. For this project, DM infection across an entire stand was considered “severe” if the mean dwarf mistletoe rating (DMR) for the stand was 2.0 or greater. Dwarf mistletoe infection was considered “moderate” if the mean DMR for the stand was between 1.0 and 1.9. Dwarf mistletoe infection was considered “light” if the mean DMR for the stand was less than 1.0. Within the project area, two stands are severely infected, two stands are moderately infected, and nineteen stands are lightly infected with DM. Dwarf mistletoe infection ranges from 35 to 177 trees per acre in moderately to severely infected stands. Mortality ranges from 7 to 19 trees per acre in moderately to severely infected stands.

Retaining infected trees in the overstory could spread infection to smaller trees in the understory. For example, a stand may contain a 16-inch DBH black-barked pine tree infected with dwarf mistletoe and a 14-inch DBH pine tree free from infection. In this case, the larger tree would be removed and the smaller tree would be retained. If, however, the infected tree is a yellow pine or group of yellow pines, then a 1 chain (66 feet) buffer would be cut around the tree or group to prevent the spread of infection. Infected yellow pines would be retained because of their rarity in the project area and because they provide good habitat as snags or nesting areas for wildlife species.

To decrease (not eliminate) the incidence and spread of dwarf mistletoe infection within the Mountainaire Project area, a limited number of infected, overstory large trees would be removed over an estimated 2,876 acres where DM exists. Large trees would most likely be removed in those areas where dwarf mistletoe ratings are severe (352 acres). Large trees would be removed to a much lesser degree in areas of light to moderate dwarf mistletoe ratings.

Table A-2. Existing severity of dwarf mistletoe infection within the project area.

Dwarf Mistletoe Severity	Acres	Mean Dwarf Mistletoe Rating (DMR)	Trees per Acre Infected	Trees per Acre Mortality
Light 0-0.9	2311	0.3	4 - 65	0 - 4
Moderate 1.0-1.9	213	1.1	35 - 132	7
Severe 2.0+	352	2.3	111 - 177	17 - 19

Grassland and Savannah Restoration

Many grassland and ponderosa pine savannah areas are relatively open and have fewer larger trees than heavily forested stands. Most of these areas were logged previously during railroad construction and development. Many of the larger, straighter “yellow” pines in the area were cut. This left a forest structure with larger pines that were less desirable from a timber production viewpoint. These trees often exhibit twisted or bent stems, multiple tops, or low heights. Forest Service staff in the 1970s and 1980s planted many of these previously logged areas with seedlings to grow more trees for future harvest. The resulting landscape includes larger trees interspersed among overstocked “plantation” areas that hold numerous small trees.

In addition, due to fire exclusion, some grasslands have experienced encroachment of ponderosa pine for approximately 125 years. Some of these encroaching trees have reached larger diameters due to open growing conditions. Many of these trees are “wolfy” black-barked pine trees that are characterized by below average heights (less than 40-50 feet), wide spread crowns, excessive taper, and excessive limbs that extend to the ground (Smith 1986). This low canopy base and high canopy bulk density makes them prone to torching during fire events.

Grasslands identified for restoration were selected based on Terrestrial Ecosystem Survey (TES) units 53 and 55, Forest Plan Management Area 9 (Meadows) units, orthophoto quadrant maps, and field visits. TES units 53 and 55 are considered valley plains and swales that are unsuitable for timber production. These areas receive added moisture from surrounding areas and hold water seasonally. These areas also act as cold air drainages, making any regeneration more prone to frost heaving.

Areas with low historic stand densities and areas that transition from grasslands to forested stands are referred to as ponderosa pine savannahs. Selection of savannah restoration areas was based on TES units 53 and 55, Forest Plan Management Area 9 (Meadows) units, orthophoto quadrant maps, stand data, and field trip visits.

While stand boundaries are fairly accurate in delineating forest structure or topographical differences between stands, actual management boundaries that divide forested areas from

savannah or grassland areas would be identified in the field and guide management direction. For example, TES unit boundaries do not follow stand boundaries and some stands may contain only a portion of a TES unit. Because of this, stands identified for grassland and savannah restoration would not receive uniform treatment. The number of remaining trees in grassland areas and savannah areas after treatment would be based on the number of evidences of pre-settlement trees. Remaining portions of stands that have similar vegetative characteristics and forest structure values to adjacent forested stands would receive thinning treatments similar to those proposed for the adjacent stands.

When selecting trees for retention in these areas, tree markers will retain genetically desirable trees over “wolf” trees, where possible, although some “wolf” trees would be retained due to the excess number of them. Retained trees will be selected from the healthiest trees in a stand, not necessarily the closest in distance to historic evidences. Genetically desirable, large trees would most likely not be thinned in these areas.

Increased Growth, Vigor, and Longevity of Gambel Oak

Due to past harvesting of Gambel oak, both legally and illegally, large oak trees (greater than 10 inches diameter at root collar) are rare within the project area. One objective of the project is to increase the productivity and age class diversity of Gambel oak. A desired future condition is to contain more larger oaks within the project area. Thinning of ponderosa pine around clumps of Gambel oak (oak stems greater than 5 inches DRC) would reduce competition between pine and oaks for moisture, nutrients, and sunlight. Reduced competition for these resources will increase tree vigor, growth, and longevity.

Appendix D – Community Wildfire Protection Plan Direction

The development of the Community Wildfire Protection Plan (CWPP) for Flagstaff and Surrounding Communities (October 2004) was coordinated by GFFP and Ponderosa Fire Advisory Council. This plan is a collaborative planning and implementation tool that helps mitigate immediate fire hazards to communities at risk and restore fire-adapted ponderosa pine forests in the area. It provides a broad operating framework for treatment within the area.

According to the CWPP, the immediate, but not exclusive, focus is on protecting communities. Restoration efforts would be directed toward protecting and promoting development of old growth and large trees, but not at the expense of providing adequate fire protection to communities at risk.

Desired future conditions for the area as described in the CWPP includes:

> Actions and treatments will leave both the landscape and at-risk communities resistant to catastrophic fire. Ponderosa pine stands will generally range from 30-100 larger-diameter trees/acre and/or basal area of 40-80/acre, be found in groups in varying degrees of interlocking canopy, and be separated by openings of various sizes. This pattern of tree clumps and openings will be variable and provide for a diverse, rich, robust, and healthy ecosystem that supports a variety of butterflies, songbirds, mycorrhizae, carabib beetles, pollinators, grasses, flowers, shrubs, and herbaceous plants. Further, it will avoid a homogenous, plantation appearance. Thicker groupings of trees, including all sizes, are found scattered throughout the larger area.

Forest structure and composition descriptions are very similar to the desired future conditions for this project. See Chapter 1 for the Purpose and Need for this project.

Treatment Guidelines

The CWPP provides recommendations for successful outcomes instead of prescriptive options for the treatment of ponderosa pine forests. Treatment guidelines are intended to serve as a general guide for management direction and provide a framework within which specific prescriptions can be developed. Modification of the guidelines based upon site-specific conditions and needs is required and encouraged by the plan.

The Proposed Action and associated project design features closely follow CWPP treatment guidelines for tree selection, cutting techniques, slash treatment, pile burning, broadcast burning, and maintenance treatments.

Implementation and Treatment Types

Site specific planning occurred in the development of the Proposed Action with GFFP partners to determine appropriate treatment types and forest structure values. Wildfire hazard ratings for the area are based on tree crown height, fuel levels, canopy cover, fuel type, number of trees per acre, and slope characteristics. This site-specific analysis using current ground data guided the development of the Proposed Action treatments, which may vary from ForestERA models and treatment recommendations found in the Implementation and Monitoring Section of the CWPP.

Proposed Treatments

Treatment actions in the Proposed Action were designed to reduce fire hazard ratings to low or moderate where possible as well as meet other resource area direction. The District used agency fuel models to determine fire hazard ratings within the project area. The ID Team and GFFP developed a Proposed Action that best met fire hazard reduction needs near communities and wildlife and forest restoration needs in other areas. In some cases, the team attempted to balance these sometimes opposing needs. Canopy cover target values are one element to measure desired conditions and treatment intensity since silviculture, wildlife, and fuel resource areas all use this measure. Proposed treatments range from relatively open park-like conditions (approximately 30% canopy closure) to denser stands (approximately 60% canopy cover), depending on resource needs. Forest structure also varies from area to area depending on resource objectives.

Community Wildfire Protection Plan Treatments

Map 3 in the CWPP depicts ForestERA predicted fire behavior patterns based on current forest conditions. The CWPP presents treatment in a "course-filter" approach that recognizes the necessity of site-specific planning to complement CWPP models. Five treatment types are proposed in the area, ranging from light intensity burning and no thinning to high intensity (heavy) thinning followed by prescribed fire. Treatments are designed to reduce predicted fire behavior from Active Crown Fire behavior to Passive Crown Fire.

Treatment Comparison

Model inputs and assumptions, and desired future conditions are different between the CWPP and the Mountainaire HFRA Project. While low and moderate fire hazard ratings in Forest Service analyses roughly correspond to Surface or Passive fire behavior categories described in the CWPP (p. 11), there is a difference in the suggested treatments to achieve these lower fire hazard ratings or fire behavior categories. According to a draft ForestERA and Forest Service comparison conducted by ForestERA, less than half of the compared acres had absolute agreement[3]. While there is some agreement between these models, full comparison still needs to be conducted. As the CWPP is a "living" document and may change with new information, future versions may better align with Forest Service models for fire hazard and other resource issues.

Forest Service fire hazard ratings serve as the fine-scale analysis tool which the CWPP allows for. The CWPP analysis area also is missing some communities and private property parcels in its maps. The Proposed Action accounts for these deficiencies. In some areas, the Proposed Action includes thinning that is heavier than what the CWPP calls for. In other areas, heavier thinning that the CWPP recommends is not needed. A majority of the acres proposed for thinning (7,922 acres) have a 40% canopy cover target value. Existing conditions in these stands average 57 (stands targeted for a thin-from-below treatment) to 60 (stands targeted for uneven age management) percent canopy cover. A majority of the treatment proposed by the CWPP in Map 11B is a Low intensity thinning and burning treatment that includes a reduction of approximately 20% in canopy cover. Some stands with only a 20% canopy cover reduction do not reduce fire

[3] An April 27, 2005 comparison document written by ForestERA researchers resulted in a 42.6% acres compared with absolute agreement, 40.4% acres with disagreement that could be related to uncertainty, and 17% acres with unexpected disagreement. This comparison document is located in the Project Record.

hazard ratings sufficiently, especially over the long term (20-40 year treatment effectiveness). Most of the stands within the project fall within the Moderate Intensity thinning treatments of the CWPP that result in a 30% decrease in canopy cover, 40% decrease in basal area, and 72% decrease in trees per acre.

Effects of Treatments

ForestERA modeled effects of treating the project area with the treatment recommendations and are included in the CWPP. Effects of the proposed action are included in Chapter 3. Full comparisons of ForestERA models with Forest Service programs would need to be made before an adequate comparison of effects can be made.

Monitoring and Assessment Plan

To best manage fuel reduction projects in an adaptable manner, the Forest Service will conduct monitoring of treatment accomplishments. Additional monitoring direction is described in the Monitoring section of the Proposed Action. Monitoring is also a key component of Alternative 3 regarding wildlife species habitat.

Funds will be allocated to accomplish Forest Plan monitoring requirements associated with this project. Monitoring results will be stored in the Project Record and shared with GFFP or other interested parties and will serve as a tool for public education and adaptive management.

A CWPP Review Team has recently been established to coordinate the tracking and monitoring of CWPP implementation. While no specific monitoring measures have been identified yet for this project, the Forest Service will work with the CWPP Review Team to look at possible monitoring activities to determine treatment effectiveness and accomplishments.

Appendix E – Best Management Practices for the Mountainaire HFRA Project

Best Management Practices (BMP's) are "a practice or a combination of practices, that is determined by a State (or designated area-wide planning agency) after problem assessment, examination of alternative practices and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals Guidelines for using Best Management Practices" (FSH 2509.22). Authority and guidance to prescribe and implement BMP's is defined in FSM 2501, 2530, FSH 2509.22 and the Forest Plan.

24.11 - Use of Terrestrial Ecosystem Survey Timber Harvest Limitation Rating

1. Objective. To identify severe and moderate erosion hazard areas and other soil limitations in order to adjust treatment measures to prevent downstream water quality degradation.

24.13 - Limiting the Operating Period of Timber Sale Activities

1. Objective. To ensure that the Purchaser conducts operations, including but not limited to erosion control work, road maintenance, and log landing drainage in a timely manner, within the time period specified in the Timber Sale Contract.

The CT6.3 "Plan of Operation" provision is required in all Timber Sale Contracts. This provision states that the Purchaser must submit a general plan of operation which will set forth planned periods for and methods of road construction, timber harvesting, completion of slash disposal, erosion control work, and other contractual requirements. Forest Service written approval of the Plan of Operation is a prerequisite to the commencement of the Purchaser's operation. Provision BT6.6 can be used to suspend operations because of wet or saturated soils in order to protect soil and water resources.

24.18 - Tractor Skidding Location and Design

1. Objective. To minimize erosion and sedimentation by designing skidding patterns to best fit the terrain. Proper skid pattern management involves such things as locating skid trails to avoid stream courses and restriction of skidders to designated trails. The Sale Administrator locates the skid trails with the timber Purchaser or by agreeing to the Purchaser's proposed locations prior to construction

24.2 - Log Landing Location

1. Objective. To locate landings so creation of unsatisfactory watershed conditions which lead to water quality degradation is avoided.

24.21 - Erosion Prevention and Control Measures During Timber Sale Operations

1. Objective. To ensure that the Purchaser's operations shall be conducted reasonably to minimize soil erosion.

Equipment shall not be operated when soil conditions are such that accelerated soil erosion will result. The kinds and intensity of control work required of the Purchaser shall be adjusted to soil and weather conditions and the need for controlling runoff. Erosion control work shall be kept current immediately preceding expected seasonal periods of precipitation or runoff.

24.3 - Slash Treatment in Sensitive Areas

1. Objective. To comply with Federal and state water quality standards by protecting sensitive areas from degradation which would result from using mechanized equipment for slash disposal.

Protected streamcourses will be designated on the sale area map. Disturbance from mechanical equipment will be minimal within 50’ on either side of the protected streamcourse.

41.3 - Obliteration of Roads

1. Objective. To reduce sediment generated from unneeded roads, roads that run in streambeds, and roads that are located in streamside management zones by closing them to vehicle use and restoring them to productivity.

Roads that are no longer necessary for public access or management purposes need to be obliterated. Roads that are allowed to exist without proper maintenance are subject to continued, uncorrected damage and can become chronic sediment sources.