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Forest
Service

Botany Report

Four-Forest Restoration Initiative

Coconino and Kaibab National Forests

Coconino County, AZ

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Introduction

The Four-Forest Restoration Initiative is a planning effort designed to restore forest resiliency and function across four National Forests in Arizona including the Coconino, Kaibab, Apache-Sitgreaves and Tonto National Forests. Due to the size of the landscape involved, at least two environmental analyses will be conducted. This is the first environmental analysis, which focuses on the Coconino and Kaibab National Forests with a project area totaling approximately 988, 764 acres.

Within the 988,764-acre project area, the Forest Service is preparing an environmental impact statement (EIS) that proposes to conduct restoration activities on approximately 600,000 acres on the Coconino NF and Kaibab NF. Of this total, approximately 361,379 acres would be treated on the Coconino NF and 233,991 acres would be treated on the Kaibab NF. Restoration actions would be focused on the Flagstaff district with fewer acres included on the Mogollon Rim and Red Rock districts of the Coconino NF. On the Kaibab NF, activities would occur on the Williams and Tusayan districts.

Objectives of this project are to

- Restore forest structure and forest health to historic condition
- Improve vegetation composition and diversity
- Restore fire regime condition class to historic ranges
- Restore ecological processes and function to riparian systems

Summary of changes to report between draft and final documents

This paragraph reflects the changes to the Botany Specialist's Report between the Draft and Final Reports

- The Region 3 sensitive species list was updated in 2012. As a result, we added one new plant species to the analysis. Arizona phlox (*Phlox amabilis*) was added to the sensitive species list for both Kaibab and Coconino National Forest. We determined that it occurred in several units on the Kaibab NF so included it in our analyses.
- We replied to comments we received during the public comment period and included our responses in Appendix F. Many of the comments were related to cheatgrass (*Bromus tectorum*). We incorporated some of the references provided by commenters into our analyses
- We clarified inconsistencies in the document based on comments and our internal edits and removed some areas that are now included in other projects. An example is the Flagstaff Watershed Protection Project that is included in another NEPA analysis.
- We added a proposal for an administrative study to address the fire effects on Arizona bugbane. This was based on comments from the USFWS on the Draft Biological Assessment
- The Kaibab National Forest Revised Plan was finalized and became effective in April 2014.Itchanges plan direction for the Kaibab portion of the analysis area. The most significant change is the removal of reference to the Garland Prairie RNA. The area will be managed as the Garland Prairie Management Area under the revised plan (2014).
- The Kaibab NF plan includes a new category of plants incorporated into the plan. The several rare and narrow endemic plant species that are neither threatened,

endangered or Region 3 sensitive were included in the plan. Management effects to these species will be managed by desired conditions and guidelines presented in the KNF revised plan (2014). The main effect to this analysis is determining the locations of these species incorporating the desired conditions and guidelines during implementation.

- The Coconino NF draft plan (2013) has similar direction for rare and narrow endemic plants. We have included the Coconino NF in the analysis of rare and endemic plant species, assuming that this analysis will be needed for certain areas on the forest at the time of implementation.
- We included some additional survey locations that were determined in recent surveys that were accomplished since the release of the Draft Report.
- In response to comments from the Center for Biological Diversity and the Arizona Forest Health Council, we adjusted some of the mechanical treatments in Alternatives C and E. About 40,000 acres of ponderosa pine will be mechanically treated to retain larger trees and will be treated at the lowest range of the proposed treatment. As a result, these areas will not be fully restored and treated areas may appear differently than surrounding restoration units. The basal area and canopy will be higher than originally proposed. This is a small portion of the analysis area and is not a significant change to the initial analysis for botanical resources. Overall, the acreages of treatment would not change.
- In response to comments from the Center for Biological Diversity and the Arizona Forest Health Council, we adjusted some of the savanna treatments in Alternatives C and E. More trees will be retained on about 3,300 acres of savanna treatments to address concerns voiced by these groups. As a result, the areas will not be fully restored on the initial entry. This is a small portion of the analysis area and is not a significant change to the initial analysis for botanical resources.

Purpose and Need

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

- moving vegetation structure and diversity towards desired conditions by creating a mosaic of interspaces and tree groups of varying sizes and shapes

- moving towards a forest structure with all age and size classes represented as identified in the 1996 forest plan amendment for northern goshawk and Mexican spotted owl habitat

- managing for old age (pre-settlement) trees such that old forest structure is sustained over time across the landscape by moving towards forest plan old growth standards of 20 percent at a forest Ecosystem Management Area scale

- improving forest health by reducing the potential for stand density-related mortality and by reducing the level of dwarf mistletoe infection

- moving towards desired conditions for vegetation diversity and composition by maintaining and promoting Gambel oak, aspen, grasslands, and pine-sage

- moving towards the desired condition of having a resilient forest by reducing the potential for undesirable fire behavior and its effects
- moving towards the desired condition of maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support wide-spread crown fire
- moving toward desired conditions in riparian ecosystems by having springs and seeps function at, or near, potential
- moving towards desired conditions for degraded ephemeral channels by restoring channel function
- moving towards restoring select roads to their natural condition by restoring soil function and understory species

Proposed Action

The Coconino and Kaibab National Forests propose to conduct approximately 587,923 acres of restoration activities over approximately 10 years or until objectives are met. Approximately 20,000 to 30,000 acres of vegetation would be treated annually and up to 40,000 acres would be prescribed burned annually across the Forests. For details of these actions, see the Final Proposed Action (alternative B, as described in the DEIS (2012).

On average, 40 – 60,000 acres of prescribed fire would be implemented annually across the Forests (within the treatment area). Up to two prescribed fires [1] would be conducted on all acres proposed for burning over the 10-year period.

Laws and Regulations

Below is a partial list of federal and state laws, executive orders, and Forest direction pertaining to project-specific planning and environmental analysis for this project as they relate to TES plants and noxious or invasive weeds.

- Coconino National Forest Land and Resource Management Plan, 1987 (as amended). See table 1 below for details.
- Kaibab National Forest Land and Resource Management Plan, 2014. . See table 2 below for details.
- Endangered Species Act, 1973 (as amended). This legislation applies to the management and regulation of Threatened and Endangered Species. This legislation was considered but dismissed because no Threatened or Endangered Plant Species occur within the analysis area.

[1] A single prescribed fire may include burning piles and a follow-up broadcast burn. Prescribed fire would be implemented as indicated by monitoring data to augment wildfire acres, with the expectation that desired conditions would require a fire return interval of about 10 years.

- Resource Planning Act (RPA), 1974 (as amended). This act directs the National Forest Service to inventory, protect and address the effects to natural resources.

- Multiple-Use Sustained-Yield Act of 1960. This act designates multiple uses with equal standing in the National Forests. These include recreation, range, timber, watershed, wildlife and fish. It introduces the principles of multiple use and sustained yield on the National Forests.

- National Environmental Policy Act, 1969. This act requires all federal agencies to analyze the effects of management actions and prepare Environmental Assessments or Environmental Impact Statements to address these impacts (depending on the complexity of the project).

- National Forest Management Act, 1976 (as amended); 36 CFR 219. The NFMA Act originated as an amendment to the Resources Planning Act (1974) to address legal challenges. It provided direction requiring an interdisciplinary and systematic approach to resource management and provided for public input on preparing and revising forest plans.

- Forest Service Manual, FSM 2370 (Special Recreation Designations), Part 2672 (Areas Designated Administratively) (RNAs and Botanical Areas) and Forest Service Manual, FSM 2372, 2372. 01, 2372. 02 and 2372. 05. These manuals provide Forest Service direction for designating, preserving and managing special areas such as Botanical Areas on National Forests. They were considered when addressing Research Natural Areas and Botanical Areas in the analysis area.

- Forest Service Manual, FSM 2620, 2630, 2670, 2672. These manual directives address the management of Region 3 sensitive species.

- Executive Order 13112 of 1999, regarding noxious or invasive weed control. This executive order is one of the founding directives of the noxious or invasive weed control on National Forest system lands.

- Forest Service Manuals 2900 and 2150 and Regional Supplement No. 2100-98-1, regarding noxious weed control.
- Noxious Weeds Strategic Plan Working Guidelines– Coconino, Kaibab, and Prescott National Forests (1998). These working guidelines were developed by the three forests to manage noxious or invasive weeds. Noxious weed invasions were recognized as an emerging issue and growing problem.
- Arizona State regulations R3-4-244, R3-4-245 require that the landowner must have an active management program to prevent further spread of weeds and reduce numbers of existing populations.
- Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab and Prescott National Forests within Coconino, Gila, Mojave and Yavapai Counties, Arizona (USDA Forest Service, 2005), incorporated into the Coconino National Forest and Kaibab National Forest Plans..
- Forest Service Manual 2070 (Amendment2000-2008-1) Native Plant Policy

Coconino and Kaibab National Forests Land Management Plan Direction

Table 1. Summary of the Coconino and National Forest Plan for the Four Forest Restoration Initiative area

Coconino National Forest Plan (1987) plus amendments		
MANAGEMENT AREAS (MA)	**DESCRIPTION**	**MANAGEMENT EMPHASIS**
FLEA Area-wide Goals, Objectives, Standards and Guidelines New page 206-76	The impacts of non-native plant and animal species are controlled and the introduction and maintenance of undesirable non-natives is discouraged	Noxious or invasive weeds
FLEA Area-wide Goals, Objectives, Standards and Guidelines New page 206-72	Threatened, endangered, sensitive, and management indicator species are maintained or recovering in the majority of the habitat.	TES Plants
FLEA Area-wide Goals, Objectives, Standards and Guidelines **Forestry** **Goals and Objectives** New page 206-75	Grass, forbs, and shrubs on the forest floor contribute to biological diversity of the ponderosa pine forest.	Healthy plant community
FLEA Area-wide Goals, Objectives, Standards and Guidelines New page 206-75	Incorporate measures to control non-native and invasive plants into project design.	Noxious or invasive weeds
MA 35- Lake Mary New page 206-98	Maintain or enhance rare plant populations where they occur. Examples are Flagstaff pennyroyal, Flagstaff Penstemon, and Arizona leather flower.	TES Plants
Chapter 4 management direction replacement page 23	Improve habitat for listed threatened, endangered, or sensitive species of plants and animals and other species as they become threatened or endangered. Work toward recovery and delisting **threatened and endangered** species.	TES Plants
Forest-wide direction Replacement Page 23	Identify and protect areas that contain threatened, endangered, and sensitive species of plants and animals.	TES Plants
Forest-wide standards and guideline new page 65- 12	Protect occupied *Cimicifuga arizonica* habitat. Restrict ground-disturbing activities within the habitat and provide shade needed for perpetuation of the species. Fence and/or relocate trails where necessary to protect occupied habitat.	TES Plants
Forest-wide standards and guideline page 64-1	Evaluate potential resource impacts on T&E and sensitive species habitat by projects and	TES Plants

Coconino National Forest Plan (1987) plus amendments		
MANAGEMENT AREAS (MA)	**DESCRIPTION**	**MANAGEMENT EMPHASIS**
	activities through a biological assessment (FSM 2670) and conduct appropriate consultation (FSM 2670) when necessary. Provide appropriate protection or enhancement.	
Forest-wide standards and guideline replacement page 65	*Hedeoma diffusum* and *Senecio franciscanus* are managed by the direction presented in the management plans prepared for each species. *Hedeoma diffusum* is covered by the *Hedeoma diffusum* Management Plan and *Senecio franciscanus* by the San Francisco Peaks Alpine Tundra Management Plan, which are both adopted by the Forest Plan.	TES Plants
Forest-wide standards and guidelines replacement page 69	**Incorporate measures to control invasive weeds into project planning, implementation, and monitoring.** Use the Appendix B "Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures in the Final **Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds on the Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona** (2005) for specific mitigation measures. Deviance from Appendix B does not trigger the need for a Forest Plan Amendment; however, Required Protection Measures from Section 7 consultation (Endangered Species Act) must be followed. If because of environmental analysis, Best Management Practices or Mitigation Measures are modified, document the reason(s) in a NEPA decision.	Noxious or invasive weeds
Coconino National Forest Plan amendment 11 new page 65-11	Within the ranges of the Kaibab pincushion cactus, *Pediocactus paradinei*, and the Arizona leather flower, *Clematis hirsutissima arizonica*, management activities needed for the conservation of these two species that may conflict with northern goshawk standards and guidelines would be exempt from the conflicting northern goshawk standards and guidelines until conservation strategies or recovery plans (if listed) are developed for the two species.	TES Plants

Table 2. Summary of Kaibab National Forest Plan for the Four Forest Restoration Initiative area

Kaibab National Forest Plan (2014)		
FORESTWIDE	**DESCRIPTION**	**MANAGEMENT EMPHASIS**
Threatened, endangered and sensitive species (Page 51)	The primary needs for threatened, endangered, and sensitive species (TES) are addressed through law, regulation, and policy (e.g., recovery plans and conservation agreements). As a result, this plan provides the framework for implementing the recommendations from these higher-level laws, regulations, policies, plans, and agreements for TES, with limited needed additional direction	**Desired condition** Threatened, endangered, and sensitive species have quality habitat, stable or increasing populations, and are at low risk for extirpation **Guidelines** Project activities and special uses should be designed and implemented to maintain refugia and critical life cycle needs of Forest Service Sensitive Species.
Rare and narrow endemic species (Page 52)	A species is considered a rare and narrow endemic if it has extremely limited distribution and/or habitat in northern Arizona. Due to limited distributions and potential susceptibility to perturbations, some species may require specific management considerations.	Desired conditions Habitat and refugia are present for narrow endemics or species with restricted distributions and/or declining populations. Location and conditions of rare and narrow endemic species are known. Guidelines: Project design should incorporate measures to protect and provide for rare and narrow endemic species where they are likely to occur.

Nonnative Invasive Species	Some nonnative species have invasive tendencies and threaten native species, ecosystem function, and the quantity and quality of forest goods and services (e.g. noxious weeds).	Desired Conditions Invasive species are contained and/or controlled so that they do not disrupt the structure or function of ecosystems or impact native wildlife. Visitor experiences are not adversely impacted by the presence of invasive species. Guidelines All ground-disturbing projects should assess the risk of noxious weed invasion and incorporate measures to minimize the potential for the spread of noxious and invasive species. New populations should be detected early, monitored, and treated as soon as possible. Treatment approaches should use integrated pest management (IPM) practices to treat noxious and nonnative invasive species. IPM includes manual, biological, mechanical, and herbicide/pesticide treatments. Use of pesticides, herbicides, and biocontrol agents should minimize impacts on non-target flora and fauna. impacts on non-target flora and fauna.

MANAGEMENT AREAS (MA)	DESCRIPTION	MANAGEMENT EMPHASIS
Garland Prairie MA	The Garland Prairie Management Area is an approximately 340-acre area on the Williams Ranger District that was identified as a potential research natural area (RNA) in the original forest plan but was never designated. Garland Prairie is typical of the high elevation grassland ecotone dominated by Arizona fescue (Festuca arizonica) and mountain muhly (Muhlenbergia montana). When Garland Prairie was originally recommended as RNA, there was a need for montane grassland type representation. This is no longer true, and as a result, it does not meet the criteria identified in the Region 3 RNA process. This area was retained as a management area because of its value as a reference area for research and management purposes.	Desired conditions The area serves as a reference for the study of ecologic changes and as a control to other similar habitats being manipulated for research or management purposes. Lightning fires are able to burn naturally within the area.

Units of Measure

The following are analysis questions and the indicators used to evaluate environmental consequences specific to Region 3 Forest Service sensitive plant species and noxious and invasive weeds. These analysis questions will be tracked throughout the effects analysis in order to address whether, or to what degree, the project meets the purpose and need and complies with law, regulation, policy and the forest plan direction. Specific analysis questions also respond to public concerns and issues brought up during scoping. A quantitative and/or qualitative indicator has been developed for each analysis question.

Analysis questions to be answered

- How would proposed treatments affect Region 3 Forest Service sensitive plant species? This analysis question also responds to a concern raised by the public on impacts to Bebb's willow. The indicators used to evaluate environmental consequences are: (1) a qualitative evaluation of whether populations are maintained or increased per FSM 270. 5(19), (2) a qualitative evaluation of whether potential habitat is maintained or enhanced, (3) an evaluation of whether impacts to sensitive plants and their habitats are effectively minimized, and, (4) an evaluation on habitat and species resiliency to natural disturbances including fire and climate change.

- A unit of measure for Region 3 Sensitive Species is to maintain or increase the populations within the project area. Additionally, potential habitat for these Region 3 Sensitive Species should be maintained or enhanced.

- How would proposed treatments affect rare and endemic plant species, specifically within those units on the Kaibab and Coconino NFs? The indicators used to evaluate environmental consequences are: (1) a qualitative evaluation of whether populations are known and protected during implementation per the Kaibab NF Plan (2014). This issue would be addressed during implementation because the effects to these species from management actions has already been addressed NEPA analysis the Final Environmental Impact Statement for the Kaibab National Forest Land and Resource

Management Plan (2014) and will be addressed in the final Coconino NF revised plan.

- How would project activities affect the presence of noxious or invasive weeds? This analysis issue also responds to concerns raised by the public on the potential for project activities to increase cheatgrass and spotted knapweed occurrences. Indicators used to evaluate environmental consequences are: (1) qualitative evaluation of compliance with the Forest Plans per the direction in the "Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds for Coconino, Kaibab and Prescott National Forests", (2) qualitative evaluation on whether noxious weeds and non-native invasive would have the potential to increase with mitigation, best management practices, and design features applied, (3) qualitative evaluation of the conflict between noxious or invasive weeds and the Region 3 Sensitive Plants,

- The management actions untaken in this project are complementary and enhance the control objectives for each noxious or invasive weed species as identified in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds for Coconino, Kaibab and Prescott National Forests and complies with the Coconino NF Plan, which incorporates the FEIS by amendment.

- Appropriate treatments to mitigate the effects of management actions on noxious or invasive weeds are incorporated into the project design and implementation.

- Appropriate Best Management Practices as outlined in Appendix B of the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (FEIS). are incorporated into the project design and implementation – unit of measure is compliance and effectiveness of BMPs as outlined in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds for Coconino, Kaibab and Prescott National Forests (2005).

There are no measures for Threatened and Endangered plants, because none occurs within the analysis boundary.

Alternatives

Alternative A (No Action)

The Council on Environmental Quality (CEQ) regulations (40 CFR 1502. 14d) requires that a "No Action" alternative be analyzed. This alternative represents the existing condition against which the other alternatives are compared.

Under the No Action alternative current management activities would continue. Management actions proposed in the proposed alternative would not occur and the purpose and need would not be met. Any movement towards desired conditions within the project area would have to occur in other planned projects.

- Vegetation structure and diversity not move toward the desired conditions. No mosaic of interspaces or tree groups would be created. Forest structure would not move toward a condition that represent all age and size classes and would not achieve the need to move toward conditions identified in the 1996 forest plan amendment for northern goshawk and Mexican spotted owl habitat.

- No progress would be made to manage for old age trees (pre-settlement) such that old forest structure is sustained over time across the landscape. There would be no shift toward old growth standards of 20 percent at a forest EMA scale.
- The risk of stand density related mortality and levels of mistletoe would not be reduced.
- The desired conditions for increasing vegetation diversity and composition by maintaining and promoting Gambel oak, aspen, grasslands and pine-sage would not be met.
- The potential for undesirable fire behavior and its effects would not be reduced and would likely increase over time. A more resilient forest condition would not be achieved.
- The desired condition of maintaining the mosaic of tree groups and interspaces with frequent, low-severity fire by having a forest structure that does not support widespread crown fire would not be met.
- Desired conditions in riparian ecosystems by having springs and seeps function at, or near, potential would not be met.
- There would be no restoration for degraded ephemeral channels and channel function would not be improved.
- Select roads would not be restored to their natural condition by restoring soil function and understory species.

Alternative B (Proposed Action)

The Coconino and Kaibab NFs propose to conduct approximately 583,330 acres of restoration activities over approximately 10 years or until objectives are met. On average, 45,000 acres of vegetation would be mechanically treated annually. On average, 40,000 to 60,000 acres of prescribed fire would be implemented annually across the Forests (within the treatment area). Up to two prescribed fires would be conducted on all acres proposed for treatment over the 10-year period. Restoration actions would:

- Mechanically cut trees on approximately 384,966 acres. This includes mechanically treating up to 16-inch dbh. within 18 MSO PACs.
- Apply prescribed fire on approximately 384,966 acres where mechanical treatment occurs and use low severity prescribed fire within 70 MSO PACs (excluding core areas).
- Utilize prescribed fire only on approximately 198,364 acres.
- Construct approximately 520 miles of temporary roads for haul access and decommission when treatments are complete (no new permanent roads would be constructed).
- Reconstruct up to 40 miles of existing, open roads for resource and safety concerns (no new permanent roads would be constructed). Of these miles, approximately 30

miles would be improved to allow for haul (primarily widening corners to improve turn radiuses) and about 10 miles of road would be relocated out of stream bottoms. Relocated roads would include rehabilitation of the moved road segment.

- Decommission 726 miles of existing system and unauthorized roads on the Coconino NF.
- Decommission 134 miles of unauthorized roads on the Kaibab NF.
- Restore 74 springs and construct up to 4 miles of protective fencing.
- Restore 39 miles of ephemeral channels.
- Construct up to 82 miles of protective (aspen) fencing.
- Allocate/manage as old growth 40 percent of the ponderosa pine type and 77 percent of the pinyon-juniper woodland on the Coconino NF.
- Manage and develop uneven-aged stands with a representation of old growth components across most of the project area on the Kaibab NF

No forest plan amendments would be needed on the Kaibab NF. The proposed actions are consistent with forest plan objectives, desired conditions, and standards and guidelines (see forest plan consistency section). Three nonsignificant forest plan amendments (see appendix B) would be required on the Coconino NF to implement alternative B:

Amendment 1 would add language to allow mechanical treatments up to 16-inch dbh. to improve habitat structure (nesting and roosting habitat) in 18 MSO PACs The amendment would remove language that limits PAC treatments in the recovery unit to 10 percent increments and language that requires the selection of an equal number of untreated PACs as controls. The amendment would remove language referencing monitoring (pre and post treatment, population, and habitat monitoring). Replacement language would defer final project design and monitoring to the FWS biological opinion specific to MSO for the project. The amendment, which is specific to restricted habitat in pine-oak, would add definitions of target and threshold habitat.

Amendment 2 would add the desired percentage of interspace within uneven-aged stands to facilitate restoration in goshawk habitat (excluding nest areas), add the interspace distance between tree groups, add language clarifying where canopy cover is and is not measured, allow 28,952 acres to be managed for an open reference condition, and add a definition to the forest plan glossary for the terms interspaces, open reference condition, and stands.

Amendment 3 would remove the cultural resource standard that requires achieving a "no effect" determination and would add the words "or no adverse effect" to the remaining standard. In effect, management would strive to achieve a "no effect" or "no adverse effect" determination.

Alternative C

The Coconino and Kaibab NFs would conduct restoration activities on approximately 586,110 acres over a period of 10 years or until objectives are met. On average, 45,000 acres of vegetation would be mechanically treated annually. On average, 40,000 to 60,000 acres of prescribed fire would be implemented annually across the Forests (within the treatment area). Up to two prescribed fires[1] would be conducted on all acres proposed for treatment over the 10-year period. Restoration activities would:

[1] A single prescribed fire may include burning piles and a follow-up broadcast burn.

- Mechanically cut trees on approximately 431,049 acres. This includes: (1) mechanically treating up to 17.9-inch dbh. within 18 Mexican spotted owl protected activity centers.
- Apply prescribed fire on approximately 431,049 acres where mechanical treatment occurs; this includes using low-severity prescribed fire within 70 Mexican spotted owl protected activity areas (including 54 core areas).
- Utilize prescribed fire only on approximately 155,061 acres.
- Construct approximately 520 miles of temporary roads for haul access and decommission when treatments are complete (no new permanent roads would be constructed).
- Reconstruct up to 40 miles of existing, open roads for resource and safety concerns (no new permanent roads would be constructed). Of these miles, approximately 30 miles would be improved to allow for haul (primarily widening corners to improve turn radiuses) and about 10 miles of road would be relocated out of stream bottoms. Relocated roads would include rehabilitation of the moved road segment.
- Decommission 726 miles of existing system and unauthorized roads on the Coconino NF.
- Decommission 134 miles of unauthorized roads on the Kaibab NF.
- Restore 74 springs and construct up to 4 miles of protective fencing.
- Restore 39 miles of ephemeral channels.
- Construct up to 82 miles of protective (aspen) fencing.
- Construct up to 12 flumes and 12 weather stations and associated instrumentation (up to three total acres of soil disturbance) to support the paired watershed study.
- Allocate/manage as old growth 40 percent of the ponderosa pine type and 77 percent of the pinyon-juniper woodland on the Coconino NF.
- Manage and develop uneven-aged stands with a representation of old growth components across most of the project area on the Kaibab NF

No forest plan amendments would be needed on the Kaibab NF. The proposed actions are consistent with forest plan objectives, desired conditions, and standards and guidelines. Three nonsignificant forest plan amendments (see appendix B) would be required on the Coconino NF to implement alternative C:

Amendment 1 would allow mechanical treatments up to 17.9-inch dbh. to improve habitat structure (nesting and roosting habitat) in 18 MSO PACs. These PACs would be managed for a minimum basal area of 110. It would allow low-intensity prescribed fire within 54 MSO PAC core areas. The amendment would remove language that limits PAC treatments in the recovery unit to 10 percent increments and language that requires the selection of an equal number of untreated PACs as controls. The amendment would remove language referencing monitoring (pre- and post-treatment, population, and habitat). Replacement language would defer final project design and monitoring to the FWS biological opinion specific to MSO for the project.

Prescribed fire would be implemented as indicated by monitoring data to augment wildfire acres, with the expectation that desired conditions would require a fire return interval of about 10 years.

The amendment, which is specific to restricted habitat in pine-oak, would add definitions of target and threshold habitat. It would allow 6,299 acres of restricted target and threshold habitat to be managed for a minimum range of 110 to 150 basal area.

Amendment 2 would add the desired percentage of interspace within uneven-aged stands to facilitate restoration in goshawk habitat (excluding nest areas), add the interspace distance between tree groups, add language clarifying where canopy cover is and is not measured, allow 28,653 acres to be managed for an open reference condition, and add a definition to the forest plan glossary for the terms interspaces, open reference condition, and stands.

An exception to this amendment applies to about 39,860 acres of goshawk habitat. In response to feedback and comments received on treating less aggressively and leaving more large trees, canopy cover will be measured at the stand level on about 39,860 acres of goshawk habitat where there is a preponderance of VSS 4, 5 and 6.

Amendment 3 would remove the cultural resource standard that requires achieving a “no effect” determination and would add the words “or no adverse effect” to the remaining standard. In effect, management would strive to achieve a “no effect” or “no adverse effect” determination.

Alternative D

Alternative D responds to Issue 2 (prescribed fire emissions) by 69 percent (when compared to alternative B, proposed action). This equates to removing fire on about 404, 889 acres. A select number of MSO PACs would be mechanically treated but would not be treated with prescribed fire. All other components of the alternative are the same as described in alternative B.

The Coconino and Kaibab NFs would conduct restoration activities on approximately 563,407 acres over a period of 10 years or until objectives are met. On average, 45,000 acres of vegetation would be mechanically treated annually. On average, 40,000 acres of prescribed fire would be implemented annually across the Forests (within the treatment area). Two prescribed fires would occur over the 10-year treatment period. Restoration activities would:

- Mechanically cut trees on approximately 384,966 acres. This includes: (1) mechanically treating up to 16-inch dbh. within 18 MSO PACs, and, (2) disposing of slash through various methods including chipping, shredding, mastication, and removal of biomass off-site
- Utilize prescribed fire only on approximately 178,441 acres.
- Construct 520 miles of temporary roads for haul access and decommission when treatments are complete (no new permanent roads would be constructed).
- Reconstruct up to 40 miles of existing, open roads for resource and safety concerns (no new permanent roads would be constructed). Of these miles, approximately 30 miles would be improved to allow for haul (primarily widening corners to improve turn radiuses) and about 10 miles of road would be relocated out of stream bottoms. Relocated roads would include rehabilitation of the moved road segment.
- Decommission 726 miles of existing system and unauthorized roads on the Coconino NF.
- Decommission 134 miles of unauthorized roads on the Kaibab NF.
- Restore 74 springs and construct up to 4 miles of protective fencing.

- Restore 39 miles of ephemeral channels.
- Construct up to 82 miles of protective (aspen) fencing.
- Allocate/manage as old growth 40 percent of the ponderosa pine type and 77 percent of the pinyon-juniper woodland on the Coconino NF.
- Manage and develop uneven-aged stands with a representation of old growth components across most of the project area on the Kaibab NF

No forest plan amendments would be needed on the Kaibab NF. The proposed actions are consistent with forest plan objectives, desired conditions, and standards and guidelines. Three nonsignificant forest plan amendments (see appendix B) would be required on the Coconino NF to implement alternative D:

Amendment 1 would add language to allow mechanical treatments up to 16-inch dbh. to improve habitat structure (nesting and roosting habitat) in 18 MSO PACs. These PACs would be managed for a minimum basal area of 110. The amendment would remove language that limits PAC treatments in the recovery unit to 10 percent increments and language that requires the selection of an equal number of untreated PACs as controls. The amendment would remove language referencing monitoring (pre- and post-treatment, population, and habitat). Replacement language would defer final project design and monitoring to the FWS biological opinion specific to MSO for the project.

The amendment, which is specific to restricted habitat in pine-oak, would add definitions of target and threshold habitat.

Amendment 2 would add the desired percentage of interspace within uneven-aged stands to facilitate restoration in goshawk habitat (excluding nest areas), add the interspace distance between tree groups, add language clarifying where canopy cover is and is not measured, allow 28,952 acres to be managed for an open reference condition, and add a definition to the forest plan glossary for the terms interspaces, open reference condition, and stands.

Amendment 3 would remove the cultural resource standard that requires achieving a “no effect” determination and would add the words “or no adverse effect” to the remaining standard. In effect, management would strive to achieve a “no effect” or “no adverse effect” determination.

Alternative E

In alternative E, eighteen MSO PACs would be mechanically treated to 9-inch dbh. No prescribed fire would be utilized within MSO PAC core areas. No acres would be managed for an open reference condition[2]. No treatments would occur within the Garland Prairie management area. MSO population and habitat monitoring would follow current forest plan direction and the FWS biological opinion. The paired watershed study and small mammal research would occur. Key components of the stakeholder-created large tree retention strategy are incorporated into the alternative’s implementation plan.

[2] Open Reference Condition is defined as forested ponderosa pine areas with mollic integrade soils to be managed as a relatively open forest with trees typically aggregated in small groups within a grass/forb/shrub matrix.

The Coconino and Kaibab NFs would conduct restoration activities on approximately 581,020 acres over a period of 10 years or until objectives are met. On average, 45,000 acres of vegetation would be mechanically treated annually. On average, 40,000 acres of prescribed fire would be implemented annually across the Forests (within the treatment area). Two prescribed fires would occur over the 10-year treatment period.

Restoration activities would:

- Mechanically cut trees on approximately 403,218 acres. This includes: (1) mechanically treating up to 9-inch dbh. within 18 MSO PACs, and, (2) disposing of slash through various methods including chipping, shredding, mastication, and removal of biomass off-site.
- Apply prescribed fire on approximately 403,218 acres where mechanical treatment occurs.
- Utilize prescribed fire only on approximately 177,801 acres.
- Construct 520 miles of temporary roads for haul access and decommission when treatments are complete (no new permanent roads would be constructed).
- Reconstruct up to 40 miles of existing, open roads for resource and safety concerns (no new permanent roads would be constructed). Of these miles, approximately 30 miles would be improved to allow for haul (primarily widening corners to improve turn radiuses) and about 10 miles of road would be relocated out of stream bottoms. Relocated roads would include rehabilitation of the moved road segment.
- Decommission 726 miles of existing system and unauthorized roads on the Coconino NF.
- Decommission 134 miles of unauthorized roads on the Kaibab NF.
- Restore 74 springs and construct up to 4 miles of protective fencing.
- Restore 39 miles of ephemeral channels.
- Construct up to 82 miles of protective (aspen) fencing.
- Construct up to 12 flumes and 12 weather stations and associated instrumentation (up to 3 total acres of soil disturbance) to support the paired watershed study.
- Allocate/manage as old growth 40 percent of the ponderosa pine type and 77 percent of the pinyon-juniper woodland on the Coconino NF.
- Manage and develop uneven-aged stands with a representation of old growth components across most of the project area on the Kaibab NF.

Note: Measuring canopy cover at the stand level on about 39,860 acres of goshawk habitat where there is a preponderance of VSS 4, 5 and 6 represents no change to the current Coconino NF forest plan.

Comparison of Alternatives

Table 3 focuses on effects related to the purpose and need for the project. See chapter 3 (FEIS) for detailed discussion of the effects and the specialists' reports for the complete analysis.

Table 3. Comparison of Alternatives

Proposed Activity	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C (Preferred)	Alternative D	Alternative E
Vegetation Mechanical Treatment (acres)	0	384,966	431,049	384,966	403,218
Prescribed Fire (acres)*	0	583,330	586,110	178,441	581,020
MSO PAC Habitat Treatments	N/A	Mechanically treat up to 16-inch d.b.h. in 18 PACs (excluding core areas). Utilize prescribed fire in 70 MSO PACs (excluding core areas).	Mechanically treat up to 17.9-inch d.b.h. in 18 PACs and manage these PACs for a minimum of 110 BA. Utilize prescribed fire in 54 MSO PACs (including core areas). Utilize prescribed fire in 16 MSO PACs (excluding core areas).	Mechanically treat up to 16-inch d.b.h. in 18 PACs (excluding core areas).	Mechanically treat up to 9-inch d.b.h. in 18 PACs (excluding core areas). Utilize prescribed fire in 70 MSO PACs (excluding core areas).
Springs Restored (number)	0	74	Same as alternative B		
Springs Protective Fence Construction (miles)	0	Up to 4	Same as alternative B		
Aspen Protective Fencing (miles)		Up to 82	Same as alternative B		
Ephemeral Stream Restoration (miles)	0	39	Same as alternative B		
Temporary Road Construction and Decommission (miles)	0	520	Same as alternative B		
Road Reconstruction/ Improvement (miles)	N/A	Up to 30	Same as alternative B		

Proposed Activity	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C (Preferred)	Alternative D	Alternative E
Road Relocation (miles)	N/A	Up to 10	Same as alternative B		
Existing Road Decommission (miles)	N/A	726	Same as alternative B		
Unauthorized Route Decommission (miles)	N/A	134	Same as alternative B		

*On those acres proposed for prescribed fire, two fires would be conducted over the 10- year period.

Mitigation Measures and Design Features

The following mitigation measures and design features (Table 4) have been included for alternatives B, C and D to reduce or eliminate the impacts to Region 3 sensitive plant species and to diminish the effects of management actions on noxious or invasive weeds. There are no mitigation measures and design features for threatened or endangered plants in this section because none exist in the analysis area. Forest plan guidance for the Coconino and Kaibab NFs is shown in Table 1and Table 2 above.

Table 4. Mitigation Measures Required for All Action Alternatives

#	Mitigation	Why
1	Follow Forest Plan Guidance for activities in special areas.	Helps preserve special features and intent of designation.
2	Determine potential occurrences and habitat of Region 3 sensitive plants in potential activity areas when planning for implementation. Identify potential species and **survey the area to be treated before implementation**.	Identifies and helps plan mitigation needed for Region 3 sensitive plants that may be affected by management activities. Complies with FSM direction 2670.
3	Mitigate negative effects from management actions on Region 3 sensitive plants during design and implementation.	Complies with FSM direction, minimizes impacts to Region 3 sensitive plants.
4	Prohibit slash pile construction within populations of Region 3 sensitive plants	Mitigates effects of disturbance and burning
5	Do not permit mineral pits in populations of Region 3 sensitive plants	Mitigates loss of plants and reduces disturbance in habitats.
6	Construct slash piles at least 10 to 20 feet away from known populations of Region 3 sensitive plants.	Mitigates effects of disturbance and burning.
7	Prohibit temporary road construction or reconstruction within populations of Region 3 sensitive plants	Eliminates direct loss of plants
8	Prohibit construction, reconstruction or log landings in identified populations of Region 3 sensitive plants	Mitigates effects of disturbance Follows Guidance of *Hedeoma diffusum* management plan
9	Follow the guidance of the **Arizona Bugbane Conservation Assessment and Strategy, Coconino and Kaibab National Forests (1995)** when planning activities near Arizona bugbane populations. **An example of mitigation for this species includes preservation of shade and cool microsites for existing populations**. This may require special attention in upland areas near canyon edges.	Mitigates effects to Arizona bugbane Follows guidance of Conservation Assessment and Strategy and complies with Conservation Agreement with USFWS, Complies with FSM direction
10	Manage fire severity in all entries in or near Arizona bugbane populations to minimize tree mortality.	Preserves the shady, mesic environment and overstory needed for Arizona bugbane
11	Follow the guidance of the Management Plan for Hedeoma diffusum (Flagstaff pennyroyal) when working in suitable habitat for this species. Examples	Mitigates effects to Flagstaff pennyroyal Complies with Coconino National Forest Plan.

#	Mitigation	Why
	of mitigations include restrictions on distance for building temporary roads near existing populations.	
12	Deferrals and groups may include Region 3 sensitive plant groups where practical, using areas not occupied by the plants as interspaces.	The intent of this design feature is to provide protection and shade needed by the sensitive plants while allowing for the least impact on clump/group/ interspace design and layout during implementation and helps mitigate impacts to Region sensitive plants.
13	Survey springs and channels slated for restoration for Region 3 sensitive plants before implementation of restoration projects and identify locations. Inform the Forest Botanist if new locations are found and mitigate effects to plants and populations. Mitigations would include avoiding plants, altering designs or including plants in enclosures.	Protects populations and habitat of Region 3 sensitive plants specifically Bebb's willow, Blumer's dock and Arizona sneezeweed.
14	Review watershed BMPs for project area and incorporate mitigations for Arizona sneezeweed into BMPs	Watershed BMPs often serve as good mitigations for Arizona sneezeweed since it grows in ephemeral stream courses, springs, ponds, stock tanks and meadows.
15	Survey springs and channels slated for restoration for Bebb's willow within the analysis area before implementation of restoration projects and identify locations. Inform the Forest Botanist if new locations are found and mitigate effects to plants and populations. Such mitigations may include avoiding plants, altering designs or including plants in enclosures.	Protects populations and habitat of Bebb's willow
16	Review various sites such as spring restoration for opportunites to introduce and restore Bebb's willow to supplement existing locations on the forest and introduce young plants into areas where plants are decadent and dying Bebb's' willow stands would be enhanced by using cuttings, planting locally cultivated plants, and fencing existing or newly planted willows. Manual grubbing of grasses may be used to increase the likelihood of planting success. Fire lines would be placed around Bebb's willows and dead branches within the clumps would be removed before prescribed burning adjacent areas to reduce the risk of fire impacting willows	Aids in restoring Bebb's willow which is a Region 3 Sensitive species for the Coconino NF and a rare species on the landscape for both forests.
17	Manage prescribed burns to promote native species and to hinder weed species germination.	Promotes healthy native plant communities and reduces the risk of noxious or invasive weed invasions.
18	Survey treatment area and evaluate weeds present before implementation. Avoid or remove sources of weed seed and propagules to prevent new weed	Reduces noxious or invasive weed infestations.

#	Mitigation	Why
	infestations and the spread of existing weeds	
19	Follow the guidance in Appendix B of the Noxious Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (FEIS).	Provides guidance and mitigation for noxious or invasive weeds on both forests and complies with Coconino NF Forest Plan.
20	Place slash piles on previously used locations such as old piling sites, old log deck sites, or other disturbed sites to avoid severe disturbance to additional locations where possible.	Reduces loss of native seed bank, limits extent of severe disturbances and reduces severely disturbed sites that are more prone to invasion by noxious or invasive weeds.
21	Treat weed infestations within treatment units before implementing treatments.	Forest Plan Direction
22	Monitor slash pile sites after burning and control noxious or invasive weeds.	Controls weeds, reduces risk of invasion and reduces risk to native species by reducing weed competition.
23	Prevent spread of potential and existing noxious or invasive weeds by vehicles used in management activities by washing vehicles and equipment prior to entering the project area and when moving from one area to another.	Mitigates effects of management actions on existing and potential noxious or invasive weed infestations Forest Plan Direction Is complementary to Timber Sale Contract Clause CT WO-C/CT 6. 36 Is complementary to Watershed Best Management Practices
24	Incorporate the Best Management Practices for noxious or invasive weeds as listed in Appendix B of the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds into all management actions. See Appendix F of this report.	Required by the Forest Plans of the Coconino and Kaibab
25	Manage prescribed fires as an aid to control of existing weed infestations and to prevent the spread of existing weeds.	Mitigates effects of management actions on existing and potential noxious or invasive weed infestations Forest Plan Direction
26	Incorporate weed prevention and control into project layout, design, alternative evaluation and project decisions.	Addresses noxious or invasive weeds during project planning and implementation Required by the Forest Plan
27	Review Timber Sale contract clauses for vehicle cleaning and incorporate appropriate clauses.	Complementary to vehicle cleaning clause above.
28	Monitor the effects of treatment on Region 3 sensitive plants after treatments are completed.	Provides opportunities to obtain knowledge on local species that are often poorly understood. Allows for adaptive management in future treatments.

#	Mitigation	Why
29	Timing of prescribed fire and herbicide application in areas with leafy spurge will be determined by the District Fuels Specialist and District Weeds Coordinator at the time of implementation. The most successful herbicide treatments for populations of leafy spurge on the Coconino National Forest have been in the fall. However, the logistics of treating plants with herbicide in the fall after burning may be difficult. The above ground portions of the plants will be absent and resources would have been drawn into the underground storage structures of the plants. A spring herbicide treatment following a fall burn may be necessary to address help facilitate control but this issue will be addressed on a site specific basis.	Allows prescribed fire to occur in our near existing populations of leafy spurge while providing for control of it. Allows on the ground, site-specific assessment and coordination of the prescribed fire and control of leafy spurge on a site-specific basis.
30	Fire should be excluded from leafy spurge areas where biological control insects for leafy spurge are active during the summer months generally from mid-May to August, except if monitoring and surveys fail to detect the presence of the biological control insects. Prescribed fire may be implemented during that time if the insects are absent from the site and there are no other resource concerns. Monitoring prior to implementation will be needed to confirm the presence/absence of the insects	Protects the financial investment and potential control provided by the biological control insects that have been released in the past and may be released in the future while allowing prescribed fire to be implemented in the affected areas.
31	Incorporate surveys for rare and endemic plants into surveys for Region 3 sensitive plants and/or noxious or invasive weeds prior to implementation. Survey needs will be dependent on known or potential occurrences in the treatment areas.	Addresses the desired conditions for rare or endemic species in the Kiabab NF Plan (2014) and the Coconino NF plan (in revision).
32	Apply mitigations 2 through 8 and 12 through 15 as needed to address the effects to rare and endemic plant species.	Addresses management effects to rare and endemic species as well as to Region 3 sensitive plants.
33	Consult the Rare Plant Guidebook) in preparation) (if avaialable) at the time of implemenation.	Guidebook is designed to provide identification aids, potential habitat information and potential risks to species for analysis and implementation.

Methodology for Analysis

Sources for this analysis include survey records and data. These include:

- Threatened, endangered and Region 3 sensitive plant and noxious or invasive weed data on file in NRM TESP/Invasives database, which is the national database of record for these data.
- Various surveys, documents and files on file at the Coconino and Kaibab National Forests
- The current forest plans for Coconino and Kaibab National Forests (1987, 1988)
- GIS data layers for the Coconino and Kaibab NFs
- GIS data developed specifically for this project by Mark Nigrelli, GIS Specialist.

- SEINet on-line herbaria
- Arizona Game and Fish Heritage data and abstracts.

These data were used to identify and assess the effects to Region 3 sensitive plants and noxious or invasive weeds within the project area for the alternatives in this project.

Disclaimer: Data is typically reported to the nearest acre, mile, or percentage. Most values have been rounded from their actual decimal values. Totals were calculated before any values were rounded in order to give the most accurate sum. Any apparent inconsistency between the total values reported in a table and a sum resulting from adding up individual values in a table typically accounts for a discrepancy of about 1% in the case of rounding percentages or miles, and <2 acres in the case of acres.

In an attempt to avoid confusion over these kinds of inconsistencies, minor adjustments to the numbers in the EIS document were made to allow for numbers in tables to add up correctly as displayed. As a result, some numbers may not be the same in the EIS document as compared to this report. The numbers in this report are the most accurate and any differences do not alter any determination of effects.

Affected Environment and Environmental Consequences

This section details the affected environment and environmental consequences for the threatened, endangered and Region 3 sensitive plants and noxious or invasive weeds within the project area. It establishes the baseline against which the decision maker and the public can compare the effects of all action alternatives.

This section also describes the direct, indirect, and cumulative effects of implementing each alternative on threatened, endangered and Region 3 Sensitive plants and noxious or invasive weeds in the project area. It presents the scientific and analytical basis for the comparison of the alternatives presented in Alternatives section. NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502. 16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Introduction

The following sections discuss the management effects of the alternatives on botanical resources including Region 3 Sensitive plant species and noxious or invasive weeds. These topics are separated into sections below. For the sake of completeness, federally listed plant species are mentioned in a section below. There are only two federally listed plants on the Coconino and Kaibab NFs, the Arizona cliffrose (*Purshia subintegra*) and San Francisco Peaks ragwort (*Packera fransciana*) on the Coconino NF neither of which occur within the areas to be treated. Kaibab NF has no federally listed plant species.

Assumptions

The environmental effects disclosed in this document are based on the following assumptions:

- All relevant laws, regulations, manual guidance and Forest Service policy relating to management of the resources discussed within are followed during analysis and implementation.
- Management will follow the guidance of the Coconino (1987) and Kaibab National Forest (2014) Plans. This report was prepared using the guidance of the plans. Review may be needed later as updated and revised plans become available.
- Silviculture and prescribed burning treatments will be implemented as written and addressed in the Silviculture and Fire Specialist's Reports and not substantially modified without review of the effects of such actions.
- Management actions for activities related to roads and transportation as well as spring and channel restoration will be implemented as addressed in their respective reports and not substantially modified without review of the effects of such actions.
- Prescribed fires will be of lower severity and intensity in any given area compared to large-scale wildfires in the same area so the amount of disturbance from prescribed burning is less than compared to wildfires.
- Fire effects to individual species vary depending on several factors including life cycle, time of burning and several biotic and abiotic factors (see Pyke et al, 2010). As a result, the responses of the plant species discussed in this report may vary in any given area or time. The effects of fire on these species will be mitigated through the burning prescription.
- Areas to be treated will be surveyed for Region 3 sensitive plants before and after treatments are implemented. These factors should be considered when identifying survey needs
    - Target special features and microhabitat needed by the species of interest. This is generally only a small portion of the area, and is estimated to be 5% or less of any given area.
    - Survey and mitigation will be based on the likelihood of any of the species addressed in this document occurring within the treatment area. Not all areas contain suitable habitat for a given species.
    - The amount of disturbance predicted to occur during treatment. For example, surveys may not be needed in areas scheduled for prescribed burning if the treatments are scheduled to be of low intensity.
- Areas to be treated will be surveyed for noxious or invasive weeds before and after treatments are implemented. These factors should be considered when identifying survey needs
    - Likelihood of any of the species addressed in this document occurring within the treatment area
    - Amount of disturbance. For example, surveys may not be needed in areas scheduled for prescribed burning if the treatments are scheduled to be of low intensity.
- The mitigations and Best Management Practices addressed in this document are included in analysis and project implementation. See table 4 above for these features.
- The acreage of potential disturbance in this project is much larger than generally analyzed in similar projects, necessitating more noxious or invasive weed treatments to control invasive species. This will lead to increases in personnel and budget to accomplish this need.

Garland Prairie Management Area)

Garland Prairie MA was originally designated as a Research Natural Area (RNA) in the Kaibab National Forest Plan (1988), but the establishment record for it was never completed. Approval of a new RNA is specifically delegated to the Regional Forester with the concurrence of the appropriate Research Station Director (FSM 4063. 04b). However, prior to approval the area must go through a complex process defined in Chapter 4060 of the FSM. For the Garland Prairie RNA, the designation by the Regional Forester and the Rocky Mountain Research Station Director was never completed. Therefore, it was never formally established. According to the Kaibab NF plan (1988), the area contained 300 acres. The boundary for this area in GIS data layers provided by the forest contained 371 acres. In the current Kaibab National Forest Plan (2014), the area is defined as a Management Area. Factors such as ponderosa pine invasions and the presence of noxious or invasive weeds have rendered the area unsuitable for use as a Research Natural Area. The current plan manages the area using desired conditions

The analysis question to be answered is; "How would proposed treatments affect the Garland Prairie MA and features for which it was considered?"

Existing condition for Garland Prairie MA

In the 1988 Forest Plan, the area was selected as RNA to represent a high elevation grassland ecotone. It currently contains a mixture of grasslands and ponderosa pine forest. Soils in the area are moderately deep, fine textured and well developed. Designation of the RNA was never completed and the current conditions within the former RNA have rendered it unsuitable for its former proposed designation. The area is treated as a management area (MA) in the current KNF Plan (2014). Figure 1 below shows the former location of the now defunct RNA.

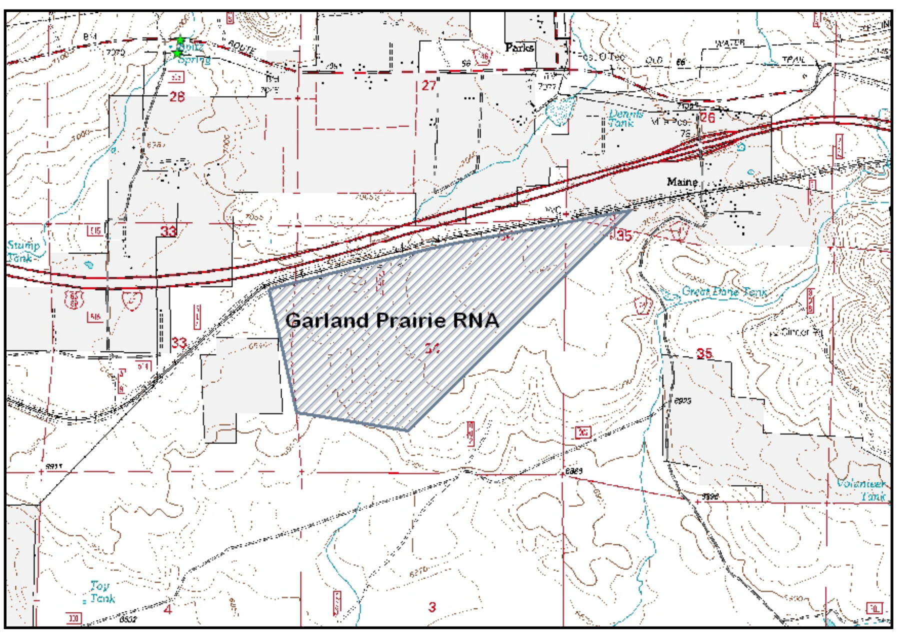

Figure 1. Garland Prairie RNA, Kaibab NF

Desired condition for Garland Prairie MA

Desired conditions for the Garland Prairie Management Area in the current plan (2014) are

- The area serves as a reference for the study of ecologic changes and as a control to other similar habitats being manipulated for research or management purposes.
- Lightning fires are able to burn naturally within the area.

Alternatives A, B, D and E

These alternatives are lumped together because there is no treatment within the boundary of the MA in any of them. The effects of Alternatives B, D and E are the same as no action (alternative A).

Direct and Indirect Effects

There are no treatments proposed for the areas within the MA in these alternatives so there would be no direct effects from management actions in this area. No tree cutting or prescribed fire would occur in this area. Indirect actions include continued departure from fire cycles and continuation of missed fire intervals. No mechanical harvesting would occur. Trees that invaded the grassland areas would not be removed leaving the grassland area invaded by woody plants, which occurred in part due to the lack of fire. This will result in continued departure from the grassland ecotone for which the area was considered. Natural processes such as fire would not be reintroduced as part of the management actions of this project except for natural ignitions, leaving the area more prone to uncharacteristic wildfire. The MA is near private property and structures and there is a risk of wildfire entering the area from adjacent private land. With no treatment, the area would not be protected from human caused wildfires such as those that might arise on private lands and enter the adjacent MA. Similarly, uncharacteristic wildfire originating in the MA would increase the risk of damage to adjacent private property.

No treatment in the MA may help serve as a baseline for measuring long-term changes. No prescribed fire would occur and no trees would be removed, leaving the MA as an example of past management practices of fire exclusion and silviculturally untreated areas.

Climate change

Climate change is expected to be a source of widespread disturbances. Higher temperatures would occur and precipitation cycles would be modified from current patterns over large areas. The warmer climate conditions would affect ecosystems by altering biotic and abiotic factors and increase the extent and severity of disturbances (Bradley et al, 2010; Hellmann et al, 2008; Middleton, 2006). Larger and more frequent fires are expected (Marlon et al, 2009). Increasing severity and extent of disturbances including wildfires and drought would affect the integrity of all habitat types including grasslands. Many authors believe that warming resulting from climate change would bring increased severity and frequency of drought. Increased frequency of summer droughts would affect successional development of grasslands. Morecroft et al (2004) found that drought led to a higher portion of forbs in the grassland ecosystem they studied, accompanied by increases in deep-rooted species and ruderal (weedy) species. In an analysis of past drought cycles, Clark et al (2002) found that past drought cycles had affected grasslands in various ways beginning in the early Holocene. One result of extended periods of drought on grasslands was the reduction of fire in prolonged drought due to the absence of fuel. Given this scenario, climate change may affect the ability to restore what we now consider natural fire cycles and shift the cycle to something more similar to past arid periods in grassland areas. Drought may also result in higher mortality in forested areas, including those that were historically grasslands, returning the areas to habitats that are more open.

Cumulative Effects

This analysis encompasses management actions in area of the MA boundary covered by the Frenchy Analysis and begins in 2003. The analysis encompasses management actions authorized and implemented in the Frenchy EA (2003). This discussion tiers to the cumulative effects document prepared for Four Forest Restoration Initiative on file.

In 2005, the Kaibab National Forest mechanically treated 500 acres in the Government Prairie Area, removing encroaching ponderosa pine and juniper trees from grassland areas. 47 acres were lopped, piled and burned. The objective of these actions was to improve wildlife habitat in the area. Special considerations were given to trails in the area including the Overland Trail, Sycamore Rim Trail and TH I-40 to preserve the scenic values.

The Garland Prairie MA is in an active grazing allotment. Cattle grazing occurs in the area as would as grazing by wild herbivores. Dispersed recreation such as hiking occurs there as well. Management on adjacent private lands as well as nearby roads and railroad influences the area. There is no known active research in the MA.

Ongoing and future foreseeable actions

Future foreseeable actions include new management direction for this area in the recently approved Kaibab National Forest Plan (2014). Under the new plan, the area would be managed using the desired conditions in the current plan, which is using the area as a reference site for treatments of similar areas and introduction of fire through natural ignitions.

Alternative C

Alternative C proposes treatments within the boundary of the Garland Prairie Management Area. Forest Service specialists on the Kaibab NF recommended these treatments. The goals are to remove tree encroachment from the grassland area and start the area on a trajectory toward restoring natural processes. This alternative would include mechanical treatments and prescribed burning to accomplish these goals. The treatments are outlined below in Table 5. See the Silviculture report for full disclosure of the treatment types. Prescribed burning would be allowed in the area as well.

Table 5. Treatments in Garland Prairie RNA in Alternative C

Location	Site	Treatment
2275	9	Grassland Restoration
2275	11	Grassland Restoration
2275	13	Grassland Restoration
2275	15	Grassland Restoration
2275	16	Grassland Restoration
2275	14	Savanna
2275	12	Uneven age (UEA) 40

Direct and Indirect Effects

The treatments proposed in Alternative C would remove the encroaching trees and allow for prescribed fire in the area. This would conflict with the desired conditions in the current plan (short term) but would move the area toward the desired conditions identified in the current plan.

Direct effects from management actions in this alternative include disturbance from the management activities associated with the removal of trees including cutting, skidding, slash piling, prescribed burning and activities associated with transportation such as road activities.

Climate Change

The discussion for Alternatives A, B, D and E above apply to this alternative as well.

Cumulative Effects

The cumulative effects of Alternative C are similar to those for Alternatives A, B and D except the actions in Alternative C would bring the area closer to restoring the area. It continues and builds on the management actions taken in 2005 to remove woody encroachment and restore most of the area to a grassland environment.

Ongoing and future foreseeable actions

The recently approved land management plan for the Kaibab National Forest (2014) removes this area for consideration as a Research Natural Area. Under the new plan, the area would be managed using the guidance for the Garland Prairie Management Area. The analysis for cumulative effects in the Botany Specialists Report for the Kaibab Forest plan Revision FEIS (2014) defined the timeframe for the cumulative effects analysis as 25 years prior and 25 years into the future. The only mention of the Garland Prairie RNA was that it is unsuitable as a Research Natural Area. As a result, the area is designated as a management area (MA) for future management. The desired conditions for the MA is to maintain it as a reference area and to allow lightning caused fires to play a natural role in the area.

Comment Analysis

No public comments were submitted that were relevant to the Garland Prairie MA or the analysis of it in this document.

Federally Listed Threatened or Endangered Plants

This report excludes all Threatened and Endangered Species but plants as fisheries and terrestrial species are addressed in other Specialists' Reports for this project (see Chapter 3 of the DEIS or the project record). The project area **does not include** any locations or potential habitat for Threatened or Endangered plant species. There are only two Threatened or Endangered plant species on the Coconino and Kaibab National Forests. These are San Francisco Peaks ragwort [*Packera franciscana* (*Senecio fransciscanus*)], a threatened species known only from the tundra of the San Francisco Peaks (CNF) and Arizona cliffrose (*Purshia subintegra*), an endangered species known only from the Cottonwood area (CNF) of the Verde Valley where it occurs in desert communities. Neither of these species occurs within the analysis area boundary and is not directly or indirectly by the management actions in Four Forest Restoration Initiative.

Region 3 Sensitive Plants

Desired future conditions for Region 3 Sensitive plants with habitat or locations within the planning area include:

- **Maintain or increase** the populations within the planning area. Additionally, suitable habitat for sensitive plant species should be **maintained or enhanced**.
- **Follow Forest Plan Direction** for Coconino and Kaibab National Forests at it applies to Region 3 sensitive plant species.

The indicators used to evaluate environmental consequences are:

- A qualitative evaluation of whether populations are maintained or increased per FSM 270. 5(19)
- A qualitative evaluation of whether potential habitat is maintained or enhanced
- An evaluation of whether impacts to sensitive plants and their habitats are effectively minimized
- An evaluation on habitat and species resiliency to natural disturbances including fire and climate change.

This analysis is based on the following **assumptions.** See additional assumptions above.

- The mitigation measures and design features identified in this document will be incorporated into project design and implementation
- Surveys will be conducted in treatment areas before implementation
- All treatments will occur as analyzed in the various specialists reports
- Fire effects to individual species vary depending on several factors including life cycle, time of burning and several biotic and abiotic factors (see Pyke et al, 2010). As a result, the responses of the plant species discussed in this report may vary in any given area or time. The effect of fire on these species will be mitigated through the burning prescription.

Alternative A No Action

This discussion addresses the no action alternative for Arizona bugbane, Rusby milkvetch, Arizona leather flower, cliff fleabane, Flagstaff pennyroyal, Arizona sneezeweed, Sunset Crater beardtongue, Flagstaff beardtongue, Blumer's dock and Bebb's willow. This discussion groups all of these species together because the effects of no action are the same. All of these species differ in location and habitat needs from each other. These topics are discussed below in each species section

Direct and Indirect Effects common to these species

Alternative A is the no action alternative. Under this alternative, none of the management actions including tree removal, burning, spring restoration, channel restoration, aspen restoration or actions related to road reconstruction, or decommissioning would occur. There would be no direct effects from management actions to these Region 3 sensitive species.

If the no action alternative were selected, none of the management actions would occur. There would be no tree cutting and no prescribed burning. As a result, tree density and canopy would not be reduced and stands would remain overstocked. Laughlin et al (2011) stated that conditions associated with dense ponderosa pine stands result in physiologically stressful environments for understory plants. Stressors include increased shading, deep litter horizons, low soil moisture, low nutrient availability and contribute to a decline in species richness within the plant community. These factors affect all understory species including Region 3 sensitive plants. There would continue to be a reduction or loss of understory vegetation and therefore, a loss of understory services (see Understory Report).

With no treatment, fire hazard would continue to increase therefore increasing the risk of severe wildfire in many parts of the project area (see Vegetation and Fire Reports for more information). Factors that contribute to fire hazard ratings that would be reduced through management actions such as canopy cover, trees per acre and dead and down fuel loading would not be reduced. The risk of wildfire transitioning to crown fires would increase in many areas of the project area resulting in the increased risk of severe wildfire and degradation of potential habitat. Severe wildfires often result in short and long-term effects (Pyke et al, 2010) which include removal of tree canopy, loss of the understory plant community and alteration of soil structure and nutrients. Fire affects plant communities in several ways including, removal of vegetation and litter, alteration of soil characteristics and redistribution or modification of nutrients (Raison, 1979). Severe wildfires often result in deaths of all plants including Region 3 sensitive plants, loss of seed banks (Korb et al. 2004) and volatilization, alteration or removal of nutrients (Kaye and Hart, 1998; Ballard, 2000; Choromanska and DeLuca, 2002). These changes could adversely affect the habitat and populations of Region 3 sensitive plants by damaging soil, killing existing plants and by reducing or destroying the seed bank. Fire size may also increase, leading to large-scale crown fires, which in turn may cause a permanent loss in understory diversity (Covington, 2000). Primary fire effects such as deaths of individual plants or groups may recover in a matter of a few years. However, secondary effects such as permanent changes in biotic and abiotic factors can result in permanent changes in the post fire plant community (see Pyke et al, 2010)

With no action, dead and down fuels would continue to increase, which in turn could negatively affect the vigor of Region 3 sensitive plants by increasing the amount of shade and litter (see Vegetation Report). Goodwin (1983) observed decreases in plant vigor and population density for Flagstaff pennyroyal in areas of heavy litter accumulation.

Noxious or invasive weeds such as Dalmatian toadflax (Crawford et al, 2001; Collins et al, 2007, Dodge et al, 2008) and cheatgrass (McGlone et al, 2009; Pyke et al, 2010) more easily invade areas of severe wildfires than unburned areas. Therefore, if a severe wildfire occurred in the habitat of Region 3 sensitive plants, noxious or invasive weeds would also increase and contribute to the degradation of the habitat and loss of individuals and groups of Region 3 sensitive plants Examples of this is the Hochderffer Fire (1996) (See Crawford, et al, 2001), and the Schultz Fire (2010) and higher levels of Dalmatian toadflax infestations. . Dodge et al (2008) studied Dalmatian toadflax in the Leroux Fire, a wildland fire that occurred in 2001. The authors studied the effects of fire severity on toadflax density. The period of study was from 2002 through 2004. The authors found higher levels of toadflax infestations in severely and moderately burned areas as compared to lightly burned or unburned areas within the fire perimeter. These increases persisted through the study but these increases were not statistically significant.

In the no action alternative, there would be no road reconstruction or decommissioning so there would be no direct or indirect risks such as deaths of individual plants and no risk of introduction of noxious or invasive weeds from management activities associated with road activities.

No spring or channel restoration would occur. There would be no improvements to upland watershed conditions in areas near Arizona bugbane habitat. Opportunities to improve habitat for such species as Bebb’s willow and Blumer’s dock would not occur and areas that might have historically provided habitat for these species and would remain degraded and unsuitable for these and other plant species that require mesic conditions for their survival.

With no action, there would be no restoration of structure and function in the treatment areas, resulting in continued departure from the desired conditions for all resources in this project, including Region 3 sensitive plant species.

Cumulative Effects

The boundary of this analysis is the project area. The time limit is from the year 2000 to present. This date was selected to coincide with the cumulative effects analysis by P. Cote.

Past management actions within the project area have defined the existing conditions and set the stage for the current departure from reference condition and need for change. Past activities such as fire exclusion and heavy grazing have resulted in a shift in environmental conditions. Conditions in many western forests, including the ponderosa pine forests in northern Arizona have changed from an ecosystem regulated by frequent, low intensity ground fire to a system with fire exclusion and stand-replacing fire regimes. These changes have resulted in decreased understory vegetation and alteration of the hydrological systems (see Understory, Silviculture and Watershed Reports). Other changes include shifts to more frequent occurrences of fire intolerant species, increases in litter, (Abella et al, 2007), declines in species density and shrub cover (Bakker and Moore, 2007), changes in species composition and functional groups including shifts toward more shade tolerant understory species under denser tree canopies (Laughlin, et al, 2011).

If the “no action” alternative is selected management actions such as fuels reduction projects, prescribed fire, spring and channel restoration will be limited to those analyzed and implemented by the individual Ranger Districts on the Coconino and Kaibab NFs (see table 7 of the cumulative effects document). The effects of the no action would be continued survey, analysis and mitigation for Region 3 sensitive plant species on the Coconino and Kaibab NFs based on project level analyses. Opportunities for cooperation with external partners for such items as survey and monitoring would not occur.

Ongoing, future and foreseeable actions

The boundaries of this discussion are the project area boundary and timeline is 10 years into the future. Future foreseeable actions include those management actions for all projects within the Four Forest Restoration Initiative boundary have or will be analyzed under NEPA including fuels reduction and restoration projects, springs restoration, road construction, reconstruction and obliteration, range allotment analysis and recreation planning. Some of the projects that will be implemented were analyzed using the guidance of the 1987 and 1988 forest plans that did not focus on restoration. As a result, the guidance would not follow the recent emphasis on restoration including more open stand conditions and re-introduction of natural fire. Another foreseeable action would be the continued project analysis on a project-by-project basis, which would result in patchy and inconsistent restoration effects across the area that is covered, by the Four Forest Restoration Initiative analysis. Species that might have benefitted from restoration efforts will continue to be affected by increasing tree density and departure from the natural fire cycle in those areas not covered by individual project analysis.

Alternatives B, C, D and E

The analysis of all action alternatives are combined in this discussion. The effects of management actions on these species are similar for all alternatives. On the ground conditions for various areas may differ by alternative. For example, the areas subjected to fire will be more limited in alternative D than in other alternatives.

Arizona Bugbane [(Actaea (Cimicifuga) arizonica)]

Note: The Arizona Bugbane Conservation Assessment and Strategy for Coconino and Kaibab National Forests (1995) and the Arizona Bugbane Conservation Agreement (1998) are expired but is considered legally binding by both the US Forest Service and the US Fish and Wildlife Service. The Assessment containing the following statement justifies the analysis as a proposed species;

“prepare **Biological Assessments and Evaluations (BAEs)** to determine the effects of planned projects within existing populations and potential habits of Arizona bugbane. “We consulted with the U.S. Fish and Wildlife Service and have included Arizona bugbane in our Biological Assessment for the project. Arizona bugbane is currently considered a region 3 sensitive species for the purpose of “findings” in BAEs

Arizona bugbane is an endemic species known only from northern and central Arizona that was first collected on the slopes of Bill Williams Mountain on the Kaibab National Forest in 1883. In 1993, a petition for listing Arizona bugbane as a Threatened or Endangered species was published in the Federal Register (58 Federal Register 51144; September 30 1993) and the species was assigned Category 1 Status, indicating there was enough information to support listing under the Act. The US Fish and Wildlife Service and Arizona Rare Plant Recovery Team determined that the implementation of a Conservation Strategy by the Forest Service with a Memorandum of Understanding (MOU) was sufficient to preclude the listing of Arizona Bugbane. As a result, the forests prepared the Arizona Bugbane Conservation Assessment and Strategy for Coconino and Kaibab National Forests in 1995. This document was accepted and approved by the District Rangers and Forest Supervisors for Coconino and Kaibab National Forests. The Conservation Strategy included a monitoring schedule for known populations. The Strategy is under revision with estimated completion by September 30, 2014.

Arizona bugbane requires deep shade from forest or riparian overstory. Arizona bugbane occurs in mesic habitats, typically along the bottoms and lower slopes of steep, narrow canyons, where the dense overstory often includes a combination of coniferous and deciduous tree species. Important overstory species include Douglas fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), big tooth maple (*Acer saccharum* ssp. *grandidentatum*), Arizona alder (*Alnus oblongifolia*) and red osier dogwood (*Cornus stolonifera*). This special combination of environmental features that contribute to Arizona bugbane habitat also supports a high diversity of other species of plants and animals (USFWS, 1998). It is confined to various tributaries of Oak Creek Canyon, and West Clear Creek on the Coconino National Forest and the slopes of Bill Williams Mountain on the Kaibab National Forest, and in Workman Creek and Cold Springs Canyon in the Sierra Ancha Mountains (Tonto National Forest), (Arizona Game and Fish Department, 2012).

Existing condition for Arizona bugbane

Arizona bugbane was an indicator species on the Kaibab National Forest (1988). A special area has been set aside for it on Bill Williams Mountain. The Arizona Bugbane Botanical Area is comprised of 490 acres on the northwest slope of Bill Williams Mountain. Management direction in the Kaibab National Forest Plan for this species includes managing hiking to maintain ecological integrity in the area, exclusion of grazing in the area, managing fire suppression in the area to prevent damage to the population, trail maintenance and mineral withdrawal.

The **Arizona Bugbane (*Cimicifuga arizonica*) Conservation Assessment and Strategy, Coconino and Kaibab National Forests** (1995) are a legally binding document prepared by US Forest Service to prevent listing of Arizona bugbane by the U. S. Fish and Wildlife Service. The species was a Category 1 Candidate for listing as Threatened or Endangered but listing was mitigated through the preparation of the strategy and a Conservation Agreement with US Fish and Wildlife Service. The strategy contains direction on several management concerns including degradation of the integrity of the ecosystem, which focuses on preservation of the shaded habitat needed for the species, grazing impacts, recreation impacts, mining, pesticide use and natural threats including certain plant diseases. Mining and pesticide use have generally not been threats.

The Conservation Assessment and Strategy is currently under revision and will be completed sometime in 2014.

Arizona bugbane occupies mesic canyons in the Oak Creek Canyon, West Fork of Oak Creek and its tributaries and West Clear Creek. The habitat in these areas is general mixed conifer forest with deciduous understory such as maple and box elder. Oak Creek Canyon, West Fork of Oak Creek and its tributaries are in or near the analysis area boundary. In 2014, approximately 117 acres containing Arizona bugbane (West Fork of Oak Creek) were affected by the Slide Fire. Most of the populations experienced low to moderate severity fire. Only a minor portion was affected by high severity.

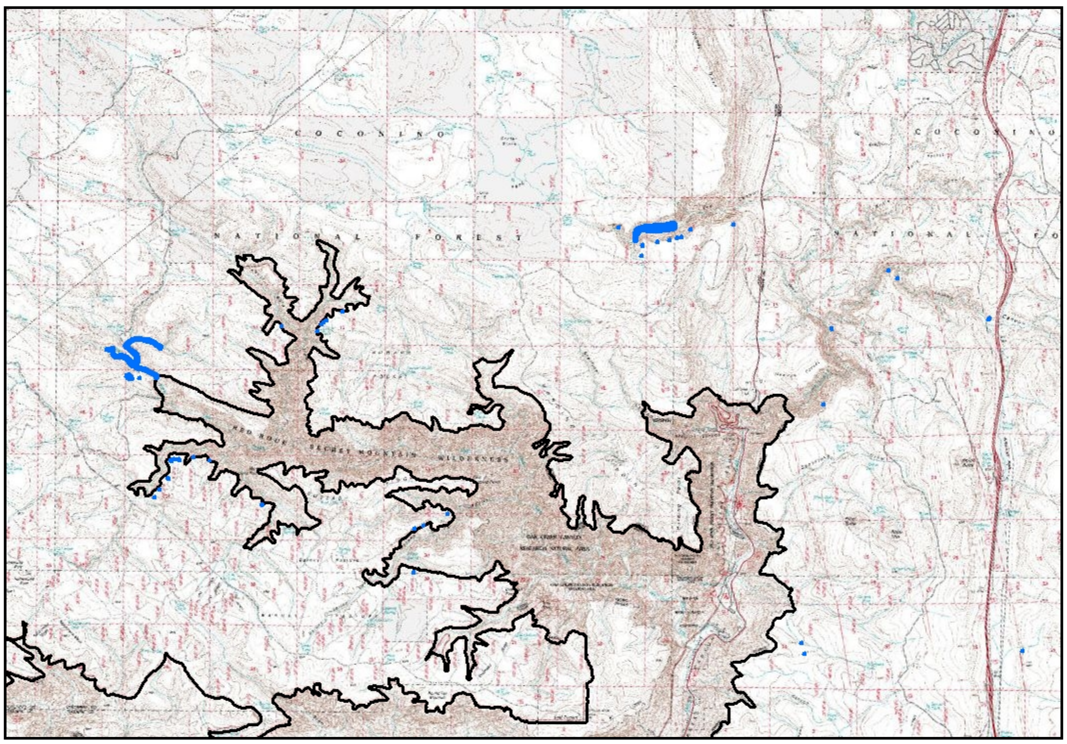

Figure 2. Map showing the occurrences of Arizona bugbane in or near the project area. The blue areas indicate the occurrences of Arizona bugbane

Table 6. Locations and treatments of Arizona bugbane by alternative

Restoration subunit	Date Collected	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
3-4	9/16/2004	368	1	Not PIPO or Filtered	Burn Only - Core Area	Not PIPO or Filtered	Burn Only - Core Area
3-4	8/5/1994	368	13	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
3-4	8/9/1995	382	4	MSO Restricted	MSO Restricted	MSO Restricted	MSO Restricted
3-5	9/12/2012	167	30	Not PIPO or Filtered	Burn Only - Core Area	Not PIPO or Filtered	Burn Only - Core Area
3-5	9/12/2012	167	33	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
3-5	9/12/2012	167	34	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
3-5	9/12/2012	176	3	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
3-5	9/1/1980	176	7	Burn Only	Burn Only	Burn Only	Burn Only
3-5	9/12/2012	176	10	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
3-5	8/15/1996	177	20	MSO Restricted	MSO Restricted	MSO Restricted	MSO Restricted

Table 6 shows the treatments by alternative for areas containing Arizona bugbane. For further information on these treatments, refer to the Vegetation and Fire reports.

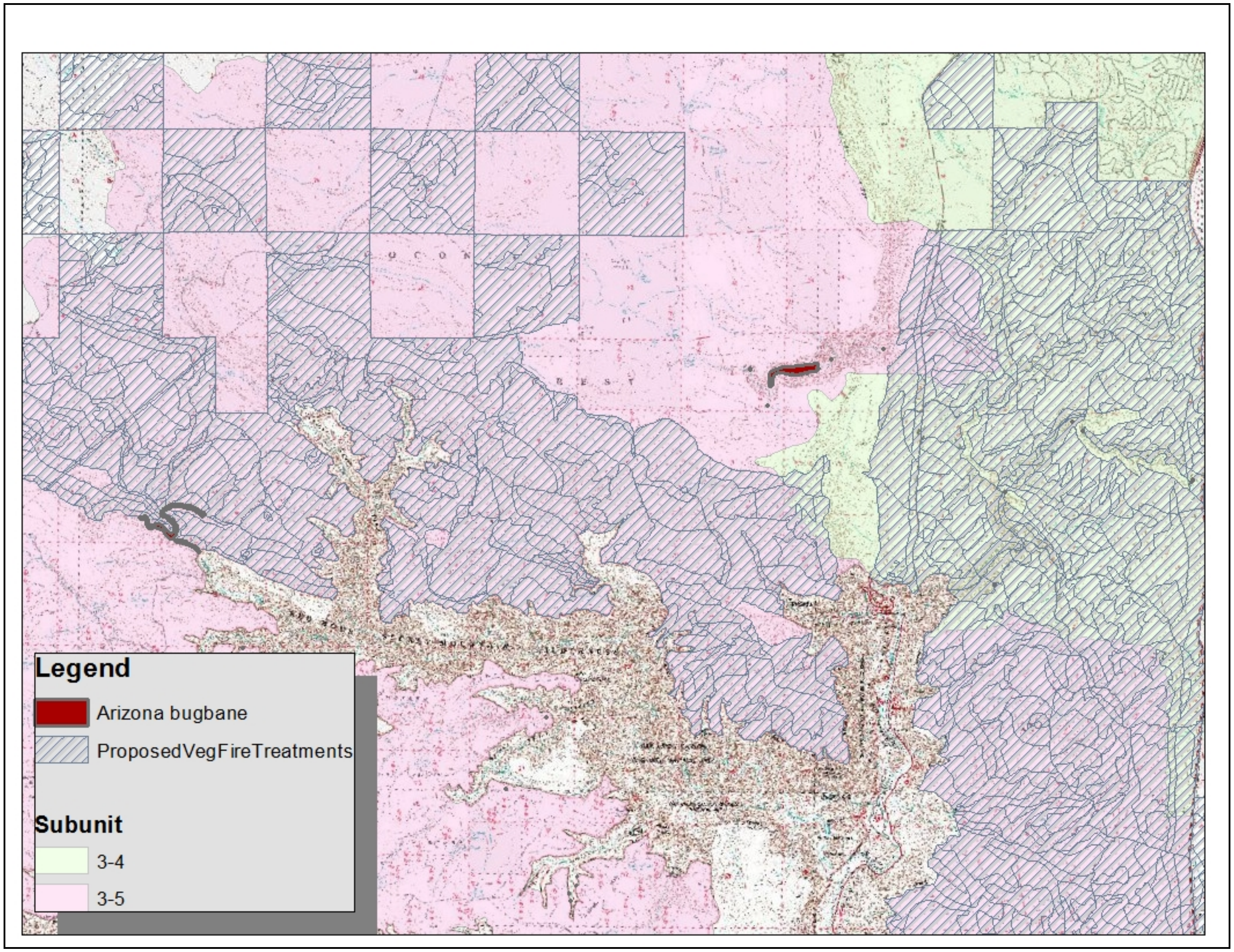

Figure 3. Arizona bugbane in the West Fork of Oak Creek and Fry Canyon Areas

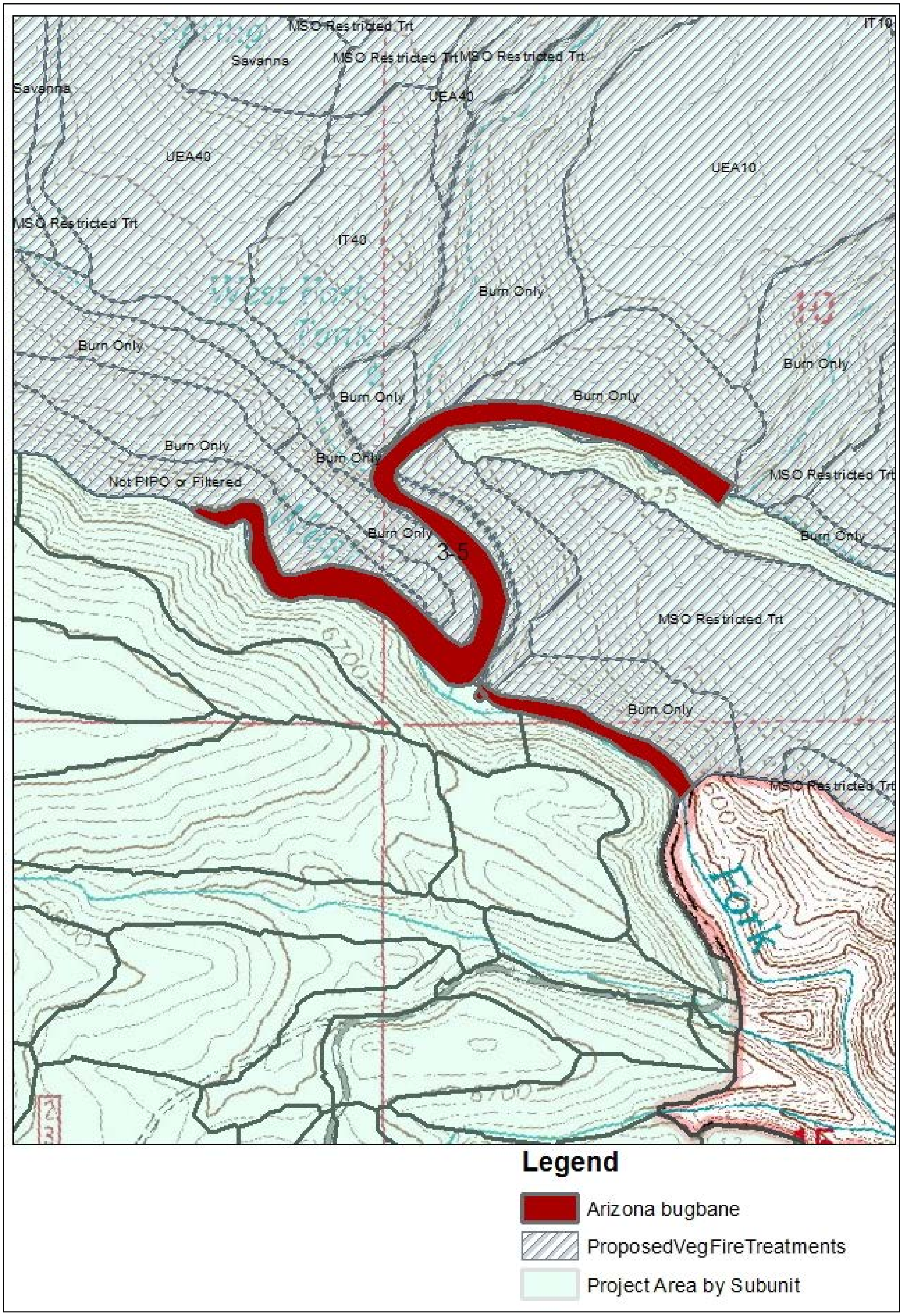

Figure 4. Closer view of Arizona bugbane in the West Fork area (area is in subunit 3.5)

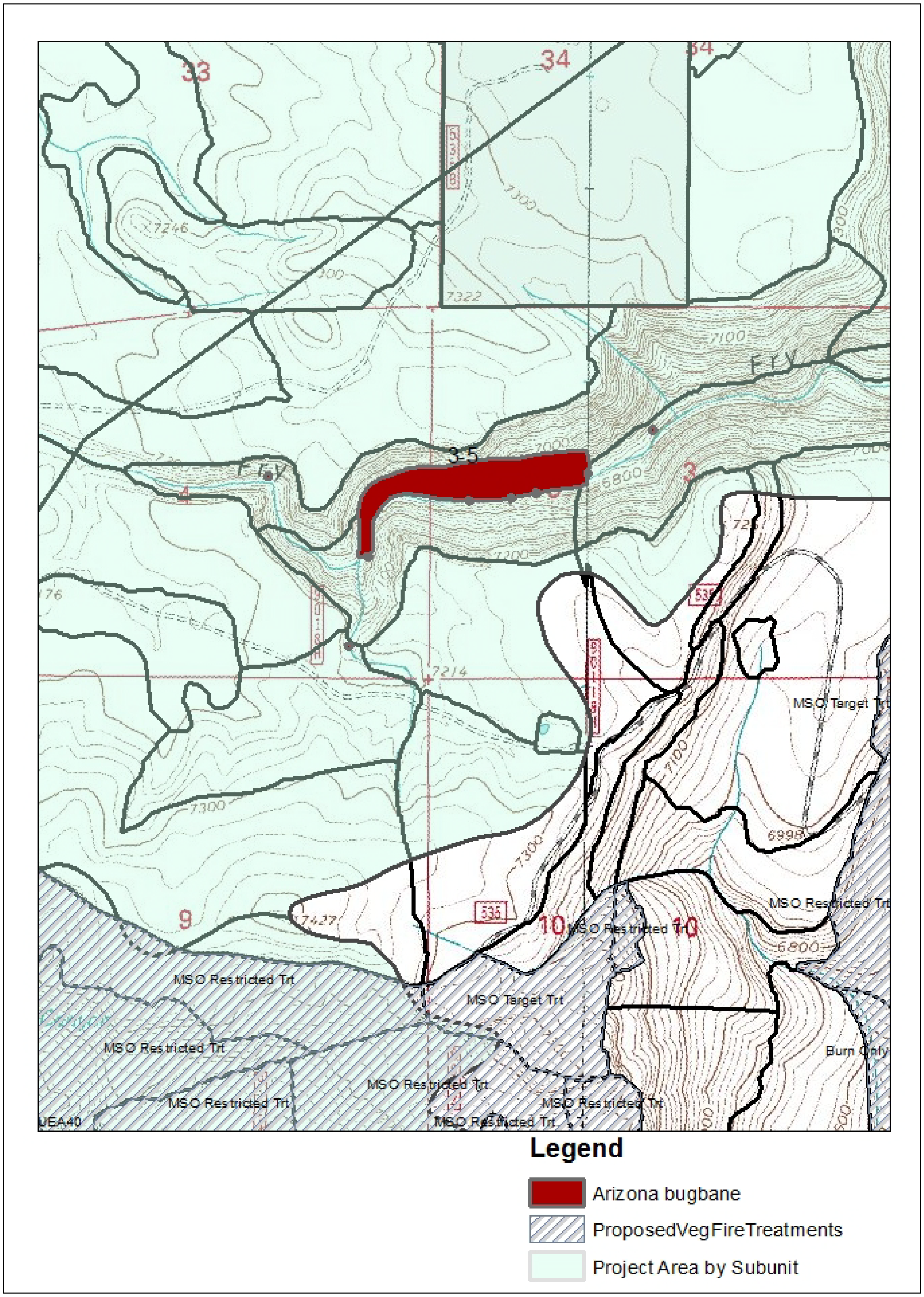

Figure 5. Arizona bugbane in Fry Canyon (area is in subunit 3.5)

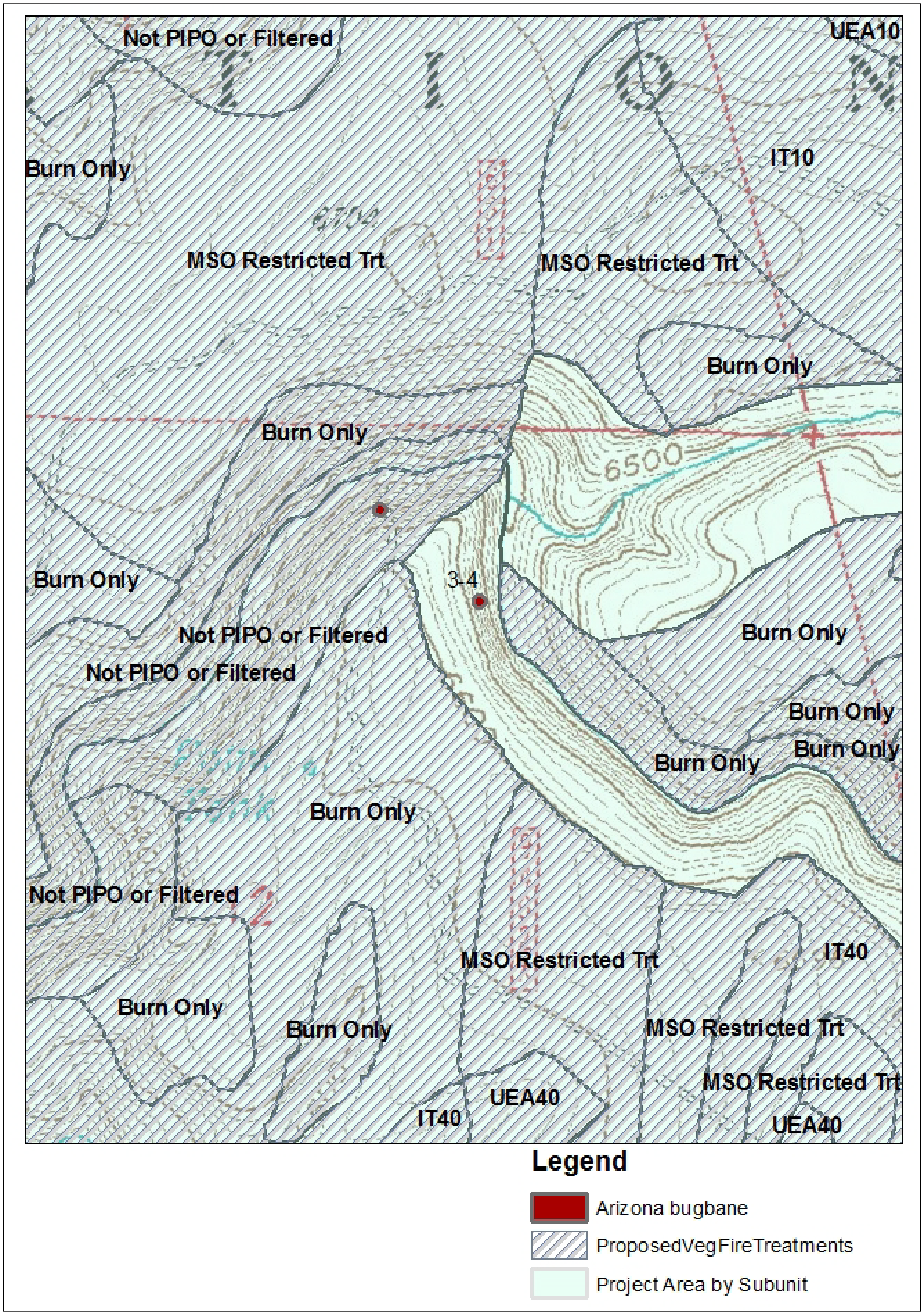

Figure 6. Arizona bugbane near James and Kelly Canyons (area is in subunit 3.4)

Desired future conditions for Arizona bugbane

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to this species from management actions are effects to the shady, mesic microclimate needed for its survival and reproduction. Upland treatments should not compromise the shady moist canyon ecotone needed for Arizona bugbane. See mitigation measures 9 and 10 for preservation of this habitat.

Alternatives B, C D and E

The alternatives for treatment in areas containing this species vary by alternative (see table 6 above).

Direct and Indirect Effects

Direct and indirect effects from fire may include loss of plants or the loss of shade from alteration of ponderosa pine stands on upland habitats. These effects would be **mitigated** to protect the shady environment needed by Arizona bugbane.

Management actions such as tree cutting and road activities would not occur in the habitat of Arizona bugbane. Care should be taken to assure actions such as tree harvesting near populations do not compromise the habitat, especially in areas near known populations. Potential effects include loss of shade from reduction of tree canopies near the canyon edges and changes to the moist microclimate near populations.

Prescribed burning may occur in or near some populations of Arizona bugbane. The areas containing Arizona bugbane that will be subjected to burning treatments vary by alternative. Alternative C contains the most areas while Alternative D contains the fewest (see Table 6). Short-term effects of burning include deaths of individual plants. Long-term effects include the loss of shade from tree mortality. This will be mitigated by burning at intensities in all entries low enough to limit mortality to trees. The current knowledge of fire effects on Arizona bugbane are based largely on observations on a local wildfire, the Fry Fire in 2003. The fire covered 180 acres of upland and canyon habitats in Fry Canyon and was of mixed severity. The initial effects of the fire to Arizona bugbane were loss the above ground portions of individual plants. On a visit in 2004, Arizona bugbane plants were growing along the fire line near the canyon bottom. A variety of plant sizes and ages were present, ranging from adults with mature fruits to seedlings. An adult plant with fruits and blackened soil at the base is shown in figure 5. The Arizona bugbane populations were monitored again in 2005 and 2010, and no adverse effects from the fire were noted. No published data for fire effects to Arizona bugbane were found. A related species *Actaea rubra* has been studied in the Northwestern U. S (Crane, 1990). In that species, the tops of plants are removed by fire and then plants regenerate from thick underground caudices, but seedlings did not appear for several years post-fire. To address the effects of fire on Arizona bugbane, we are proposing an administrative study (see Appendix G). This study will focus on occurrences of Arizona bugbane in the Upper West Fork drainage with the objective of obtaining local knowledge on the fire effects of this species.

Many populations of Arizona bugbane are within suitable habitat for Mexican spotted owl (MSO) and these areas would be subject to the restrictions for MSO, including seasonal restrictions during the summer months, which coincide with the growing season of the plants. The mitigations for MSO may indirectly benefit Arizona bugbane (see Wildlife report).

Figure 7. Arizona bugbane on Fry Fire in 2004

Activities associated with roads and transportation in this project would be limited to the area of West Fork where Forest Road 231 crosses the drainage. Forest Road 231 is one of the major forest roads accessing the southern portions of the Flagstaff Ranger District and the project area. No hauling is proposed in the immediate area of Arizona bugbane populations. Indirect effects from road use would be limited to dust from road maintenance but these will be minimal and insignificant.

An indirect effect of management actions within the potential habitat of Arizona bugbane includes an increased risk of invasion from noxious or invasive weeds. These effects would be mitigated by incorporating the Best Management Practices. Incorporation of the Best Management Practices would mitigate the effects of increased disturbance from management activities, and help to control the spread and introduction of weeds within the habitat of Arizona bugbane. Currently, there are no recorded infestations within the populations of Arizona bugbane in Table 6 above.

No locations of Arizona bugbane occur within sites for spring or channel restoration were found, so there would be no direct effects to the species. Indirect effects include introduction of noxious or invasive weeds but these effects would be mitigated by following the Best Management Practices for noxious or invasive weeds. Spring and channel restoration may indirectly benefit Arizona bugbane by improving the upland watershed condition for some areas where Arizona bugbane exists in canyons (CNF). The known location for Arizona bugbane in the project area for Kaibab National Forest is on Bill Williams Mountain, which is being considered in a separate analysis.

Cumulative Effects

The boundary of this discussion is the range of Arizona bugbane within the Coconino and Kaibab National Forests. The time limit for this analysis begins in 1993, when monitoring for Arizona bugbane began on the Coconino and Kaibab National Forests. The following past actions have affected the abundance and Arizona bugbane and have established baseline current condition for Arizona bugbane. Some impacts observed include grazing, recreation, wildfire and natural disturbances such as flooding, drought, tornados and mortality in overstory trees. Grazing impacts were addressed in the Conservation Strategy (1995) and include fencing and monitoring in certain populations. This has led to a reduction in these conflicts. Signs of domestic and wild grazers have been observed in the populations at Upper West Fork. Cow dung has been observed on the canyon floor near known populations. No herbivory that can be directly attributed to cattle has been observed recently but cattle may trample plants or crush them while walking or “loafing” in the shade.

Herbivory and trampling from elk have been observed during visits to several populations in the Upper West Fork area. This was especially apparent during drought years (1996 and 2002) when animals were seeking food, water and shelter in canyons

A wildfire, the Rattle Fire (1972) occurred in the uplands near populations in a tributary of West Fork, reducing the amount of shade produced by vegetation above the canyon. Prior to the fire, timber had been harvested in the area in approximately 1970. After the fire occurred, trees damaged or killed by the fire were harvested in a salvage sale. The fire area was seeded with various grasses and ponderosa pine seedlings have been planted in the fire area on at least two different occasions (Bataineh et al, 2006). The overall result in the fire and associated management actions was a more open stand condition than previously existed, leading to a more open xeric environment, making upper portions of the drainage unsuitable for Arizona bugbane.

The Fry Fire in 2003 burned into Fry Canyon. The source of the fire was a lightning strike on August 9, 2003 near the south edge of Fry Canyon. The fire burned approximately 180 acres of ponderosa pine and mixed conifer forest in upland areas and canyons slopes. Activities during the suppression effort included but were not limited to fire line construction and felling of trees in the canyon. Additionally, some backfires were set in the upland areas to reduce fire spread and intensity. We visited the fire area in 2004 and again in 2005. On these subsequent visits, we observed Arizona bugbane growing along the fire line (see Figure 9). Many were growing vigorously and had produced fruits. In 2010 during a scheduled monitoring visit, we noted an area where the tree canopy had died because of the fire. There were numerous healthy bugbane plants on the site.

The Taylor Fire (2009) reached into areas near the populations in West Fork. There were no direct impacts such as loss of shade to the populations. There was some minor degradation of the habitat through siltation resulting from erosion from the fire site, but it was minor and insignificant.

The Woody Ridge Project, analyzed in 2004 authorized approximately 8,000 acres of timber harvest and around 11,000 acres of prescribed burning. Teacup Timber Sale is part of the Woody Ridge Restoration Analysis. It is immediately adjacent to the south slope of Fry Canyon. Timber sale administrators mitigated the effects of harvest on Arizona bugbane by locating populations and avoiding them during implementation.

In October 2010, a series of tornados struck certain areas in the Coconino National Forest, including an area in upper West Fork. As a result, overstory trees were damaged or destroyed. Impacts of the tornado to Arizona bugbane are unknown at this time but likely resulted in a more open environment in some areas. Some of the area affected by the tornadoes is the same stands in table 6 above in the Upper West Fork area. The Flagstaff District analyzed certain areas of the tornado path including the area near Upper West Fork. The justification for this analysis was the increased risk of bark beetle infestations that are presently occurring. Harvesting in or near Arizona bugbane areas on this project was limited to areas without steep slopes.

The Slide Fire began on May 20, 2014 and burned over 20,000 acres. It burned through several known locations of Arizona bugbane in the West Fork of Oak Creek and its associated tributaries. We have not been able to observe the effects to the plants and habitat due to safety concerns but data from fire severity and vegetation analyses indicate that most of the canyon itself burned at low to moderate severity. The effects of factors such as erosion, flooding and landslides in the future are not known. On a field visit on July 2, 2014, we observed Arizona bugbane plants sprouting in the edge of the fire in a low to moderate severity of the fire. More monitoring will be needed to determine the effects on Arizona bugbane. For more information on the Slide Fire, see the Fire and Wildlife Reports.

Other natural events have affected the habitat and distribution of Arizona bugbane in some areas. Some populations in lower West Fork were lost to flooding in 1993 (Arizona Game and Fish Department, 2012). Drought and insect outbreaks have resulted in the loss of some of the conifer trees on at least one site in West Fork. This resulted in the loss of shade and change in character on a permanent monitoring site. On this site, deciduous trees such as New Mexico locust and box elder, combined with shade from the canyon walls seem to be providing enough shade for the plants to persist. There has also been some mortality in the overstory trees on Bill Williams Mountain including aspen trees on that site. A landslide in at least one population (West Clear Creek) resulted in a large rock slabs sliding down onto a population of plants resulting in mortality of some plants on a permanent monitoring transect.

Ongoing and future foreseeable actions

These management actions are ongoing within the habitat of Arizona bugbane. Some items in the cumulative effects document also apply.

Grazing by livestock and wildlife still occurs in or near some populations. Cattle grazing is a management action that can be addressed and mitigated by Forest Service actions, while wildlife grazing is not under the control of forest. Monitoring to assess the conditions of allotment fences to assure cattle are excluded in some areas near the Fernow Draw and West Fork of Oak Creek areas is a required condition of the Conservation.

Recreation impacts include hiking and trampling by humans. These impacts were addressed in the strategy and in Amendment 12 of the Coconino NF Forest Plan. Hikers trample plants and degrade habitat by leaving established trails and establishing social trails within suitable habitat. This issue was addressed by confining the trails leading from Lower West Fork to a single trail prism. Occasional off-trail incursions into populations still occur in areas such as in Lower West Fork. Trail maintenance is necessary to keep the trail confined to the prism but mitigates the effects of trampling to non-significant levels.

The Bill Williams Restoration Project is an ongoing analysis encompassing Bill Williams Mountain and the Arizona Bugbane Botanical Area. This is a related action with treatments such as burning proposed in or near the Botanical Area. Many treatments with in project are similar to activities in the proposed action. A decision on the project is pending.

The Turkey/Barney Project is adjacent to the project area. The projects share a common boundary at the West Fork of Oak Creek. There are multiple occurrences of Arizona bugbane in the Turkey Barney project area but most are in canyon bottoms or wilderness and will not be affected by management actions. Two occurrences of Arizona bugbane in the Turkey/Barney area may be affected by treatments proposed in the project.

Activities such as vehicle travel on established roads and road maintenance occur in some areas near the populations but do not directly affect plants.

Climate change is addressed in the section below.

It is my determination that

Four Forest Restoration Initiative may impact individuals of Arizona bugbane (*Cimicifuga arizonica*) but is not likely to result in a trend toward federal listing or loss of viability.

Rusby Milkvetch (Astragalus rusbyi)

Rusby milkvetch is a narrow endemic found on basaltic soils northwest and west of Flagstaff, Arizona. The range is limited to areas on the Coconino National Forest around the San Francisco Peaks and on the adjacent Kaibab National Forest. Habitats for this plant include aspen groves, mixed conifer, ponderosa pine/Arizona fescue, and ponderosa pine/gambel oak sites in dry or temporarily moist basaltic soils.

Rusby milkvetch was first collected and described from Mt. Humphrey in 1884. Recent interest in Rusby milkvetch is due in part to its addition to the US Forest Service Region 3 sensitive species list in 1999 and its occurrence in past restoration projects and proposed fuels reduction projects

Existing condition for Rusby milkvetch

There are numerous occurrences of Rusby milkvetch in the Hart Prairie (2010) and Wing Mountain (2012) projects on the Coconino National Forest. Occurrences have also been recorded on the Kaibab National Forest in Frenchy Project Area (2003) and on the adjacent Camp Navajo (Springer, 2009). Coconino Rural Environmental Corps (CREC) (2011) detected numerous locations of this plant in the A-1 Mountain area. Figure 8 below and Table 7 show the occurrences of Rusby milkvetch in the project area. Data are derived from NRIS TESP/Invasives database. Several areas such as the Frenchy (2003) and Pomeroy areas (2012) did not include surveys for this species but the areas were previously analyzed and will be included as shelf stock. There are multiple occurrences of Rusby milkvetch in many of the areas to be treated but this table has been condensed for the sake of brevity.

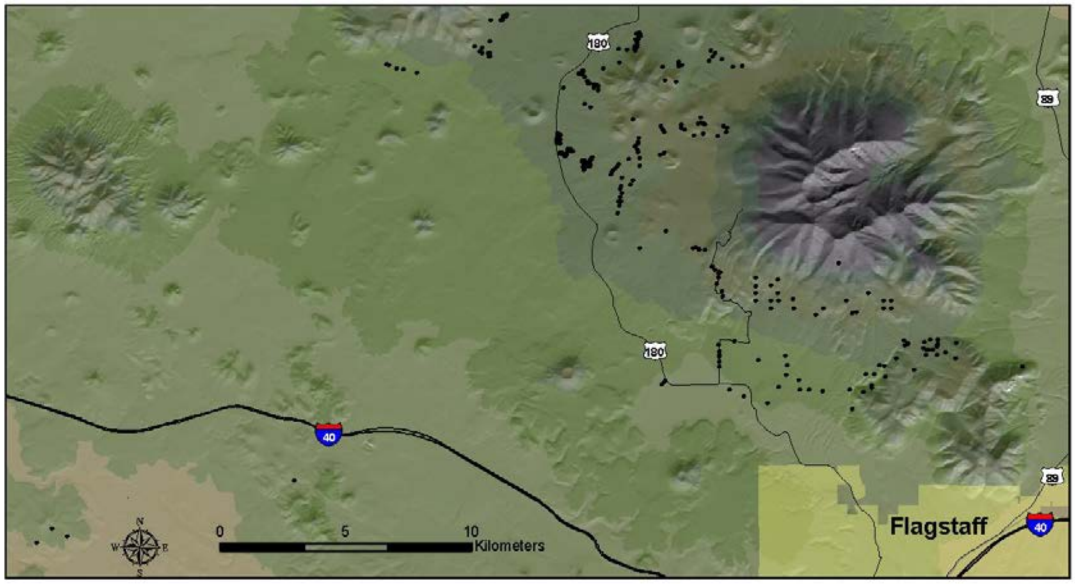

Figure 8. Occurrences of Rusby milkvetch on Coconino and Kaibab NFs courtesy of Judy Springer (2009)

This figure does not include data from 2011 with numerous collections around A-1 and Wing Mountains.

Table 7 below shows the treatment units containing Rusby milkvetch.

Table 7. Treatment units containing Rusby milkvetch. Data are derived from NRIS TESP/Invasives

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	3	UEA25	UEA25	UEA25	UEA25
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	15	PFA - UEA10	PFA - UEA10	PFA - UEA10	PFA - UEA10
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	33	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	34	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	35	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	50	Burn Only	Burn Only	Burn Only	Burn Only
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	76	3	IT10	IT10	IT10	IT10
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	83	1	IT25	IT25	IT25	IT25
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	83	5	UEA10	UEA10	UEA10	UEA10
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	83	16	PFA - IT25	PFA - IT25	PFA - IT25	PFA - IT25
Astragalus rusbyi	Rusby's milkvetch	8/3/2011	90	3	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	4	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	6	IT40	IT40	IT40	IT40
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	7	WUI55	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	8	WUI55	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/3/2011	90	10	UEA40	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	12	IT40	IT40	IT40	IT40
Astragalus rusbyi	Rusby's milkvetch	8/2/2011	90	13	SI40	SI40	SI40	SI40
Astragalus rusbyi	Rusby's milkvetch	8/3/2011	90	14	UEA40	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/2/2011	90	15	Savanna	Savanna	Savanna	Savanna
Astragalus rusbyi	Rusby's milkvetch	8/2/2011	90	16	Burn Only	Burn Only	Burn Only	Burn Only
Astragalus rusbyi	Rusby's milkvetch	8/3/2011	90	17	SI10	SI10	SI10	SI10

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Astragalus rusbyi	Rusby's milkvetch	8/10/2011	91	11	Burn Only	Burn Only	Burn Only	Burn Only
Astragalus rusbyi	Rusby's milkvetch	8/11/2011	92	2	UEA40	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/11/2011	92	3	Savanna	Savanna	Savanna	Savanna
Astragalus rusbyi	Rusby's milkvetch	8/11/2011	92	5	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Astragalus rusbyi	Rusby's milkvetch	8/11/2011	92	7	UEA25	UEA25	UEA25	UEA25
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	93	1	Burn Only	Burn Only	Burn Only	Burn Only
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	93	2	IT25	IT25	IT25	IT25
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	95	1	UEA40	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	95	6	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Astragalus rusbyi	Rusby's milkvetch	8/4/2011	95	7	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	95	15	WUI55	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	95	16	WUI55	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/4/2011	95	17	WUI55	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	96	11	IT25	IT25	IT25	IT25
Astragalus rusbyi	Rusby's milkvetch	8/17/2005	277	3	UEA40	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/17/2005	277	9	PFA - UEA25	PFA - UEA25	PFA - UEA25	PFA - UEA25
Astragalus rusbyi	Rusby's milkvetch	8/17/2005	277	15	PFA - UEA10	PFA - UEA10	PFA - UEA10	PFA - UEA10
Astragalus rusbyi	Rusby's milkvetch	7/29/2004	277	35	IT10	IT10	IT10	IT10
Astragalus rusbyi	Rusby's milkvetch	7/29/2004	279	20	Burn Only	Burn Only	No Treatment	Burn Only

Desired future conditions for Rusby milkvetch

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to Rusby milkvetch from management actions is direct losses of individuals from management actions. Incorporate mitigations and design features 2 through 8 and 21 above to mitigate these effects to non-significant levels.

Alternatives B, C, D and E

This analysis addresses all action alternatives. Treatments in any specific unit containing Rusby milkvetch may vary by alternative (see table 7 above) but the general effects of management actions are the same for all alternatives.

Direct and Indirect Effects

Direct effects from the action alternatives would include loss of individual plants or population groups through management actions. Factors contributing to these effects would include disturbance from management actions such as activities associated with tree removal, prescribed burning, road reconstruction, maintenance and decommissioning, temporary road construction and decommissioning and spring and channel restoration.

Activities associated with tree removal and prescribed burning may cause some immediate losses of individuals and groups but would beneficial in the long term by reducing competition from overstocked forests, increasing the amount of available sunlight and by increasing available nutrients. In a long-term ponderosa pine ecological restoration study in the Fort Valley Experimental Forest, Rusby milkvetch was an indicator species of tree thinning and prescribed burning, showing a positive response to treatments after five years (Laughlin et al, 2008). Some individuals may be lost during prescribed burning, especially in areas where only isolated individuals occur or in areas where plants were not detected during surveys. Prescribed burning may have beneficial direct and indirect effects on all understory vegetation including Rusby milkvetch. Burning is a disturbance that can release nutrients, reduce plant competition, and increase the amount of available sunlight light.

Most prescribed fires are low severity (see Fire Report). In some cases, fire severity may be higher in limited areas depending on variables such as management goals, weather, fuel conditions and topography. In these areas, there would be limited negative direct effects through deaths scattered individuals or groups of Rusby milkvetch if they occur at that particular location. Limited loss of small groups of plants in these cases would not significantly contribute to the overall decline of populations of this species within the project area or over the range of Rusby milkvetch. The indirect effects of higher fire severity in these areas would be similar to those for slash pile burning.

One of the associated activities with several treatments includes piling of slash from management activities. Slash piles may have negative direct and indirect effects on all understory vegetation including Rusby milkvetch. Slash pile construction could be a possible direct negative effect if the pile is placed in or near existing populations of Rusby milkvetch. These effects would be mitigated by avoiding placing slash piles directly on existing plants and by constructing piles at least 10 to 20 feet away from existing populations. Pile burning would create locally severely burned areas at pile sites, which is a negative indirect effect. Consequences include, but are not limited to, the reduction or loss of the seed bank on these sites (Korb, 2001) death or reduction of soil organisms on the pile sites (Raison, 1979; Ballard, 2000; Korb et al., 2004) and development of hydrophobic soil (Kaye and Hart, 1998; Ballard, 2000). Slash pile sites are more prone to invasion from noxious or invasive weeds than surrounding areas and contribute to the persistence and spread of noxious or invasive weeds in treated areas. 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. Additionally, pile sites would be monitored after burning occurs to identify and treat infestations (see item 21 in mitigation measures and design features)

An indirect effect of management actions within the potential habitat of Rusby milkvetch includes an increased risk of invasion from noxious or invasive weeds. These effects would be mitigated by incorporating the Best Management Practices described in Appendix B of *Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab and Prescott National Forests* (2005). Incorporation of the Best Management Practices would mitigate the effects of increased disturbance from management activities, and help to control the spread and introduction of weeds within the habitat of Rusby milkvetch. See Appendix B for noxious for invasive weed locations.

Direct and indirect effects of temporary road construction, road maintenance, road reconstruction or decommissioning include destruction of individual plants, localized disturbance of suitable habitat and the potential introduction of noxious or invasive weeds. These effects would be mitigated by surveying the areas where activities would occur as well as nearby areas that may be disturbed and by avoiding existing plant populations.

Two channels and one spring (Chimney Spring) that are proposed for restoration activities are within the potential habitat of Rusby milkvetch and several locations of the plant are nearby. The spring area and channels would be surveyed for Rusby milkvetch before implementation of restoration activities. Mitigations an design features mentioned above would be incorporated into the activities. The effects of management activities such as fence building and other activities associated with spring restoration are similar to those for road activities.

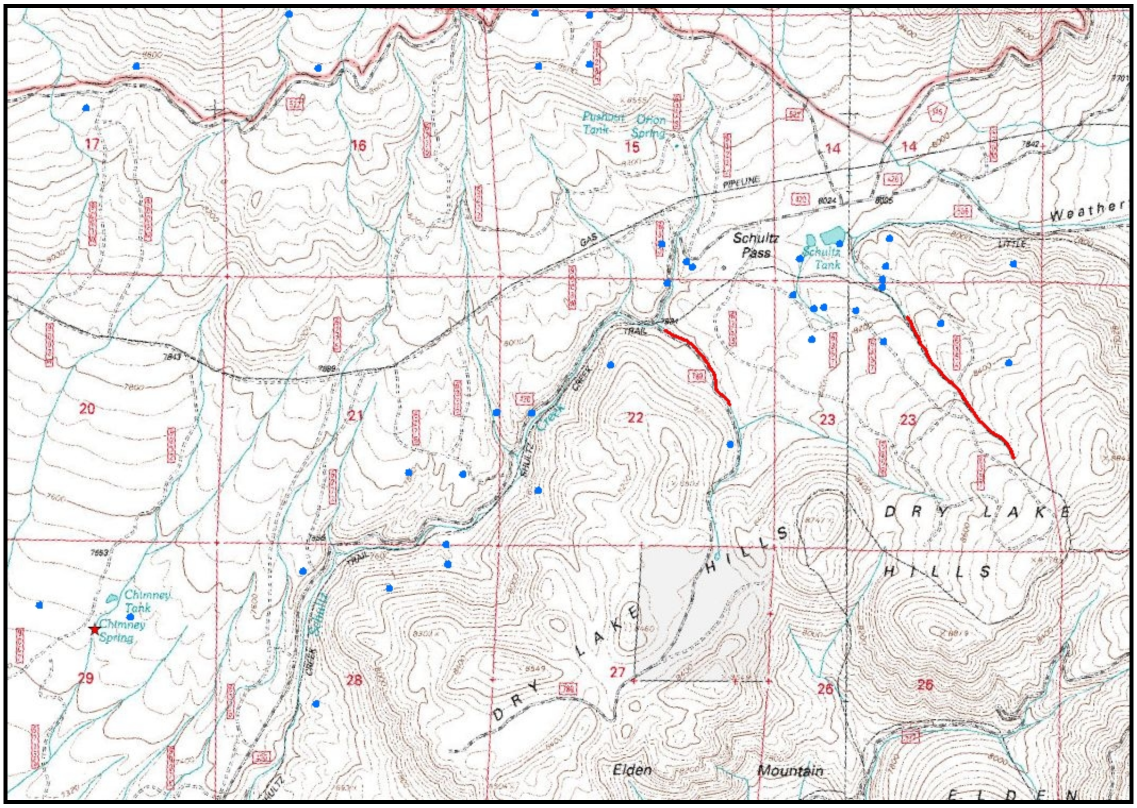

Figure 9. Spring and channel restoration in areas near Rusby milkvetch

Figure 9 Sites include Chimney Spring and two channels shown in red.

Cumulative Effects

The time limit for this discussion includes past actions since Rusby milkvetch was added to the Regional Forester’s list in 1999. Many past actions such as grazing, fire suppression, wildfires, timber activities and recreation have occurred within the range of Rusby milkvetch and have contributed to the current existing condition. The boundary for this discussion includes the range of Rusby milkvetch an endemic species, which is confined to the volcanic fields of the San Francisco Peaks and covers approximately 1, 152,000 acres (Priest et al, 2001). Only a portion of this area, the ponderosa pine forest is suitable habitat for the species.

The project area contains all or portions of several large wildfires. Only large wildfires since 1999 when this species was added to the sensitive species list are considered in this discussion. These include Pumpkin (2000), Pipe (2000), Leroux (2001), Hart (2002), Wedding (2005), Wing (2007), Schultz (2007) and the Schultz (2010) fires. Cumulatively, this represents less that 5 percent of the available habitat for Rusby milkvetch. Severe wildfires often result in deaths of all plants including Region 3 sensitive plant species (Pyke et al, 2010), loss of seed banks (Korb et al. , 2004) and volatilization or removal of nutrients (Kaye and Hart, 1998; Ballard, 2000; Choromanska and DeLuca, 2002). These effects generally have short and long-term effects on the plant community. Long term (secondary fire effects) can result in long-term changes to the plant community of an area (Pyke et al, 2010).

The Fort Valley Project (2000) contained numerous occurrences of Rusby milkvetch but effects to the species were not mitigated in the project design and implementation. The Frenchy Vegetation/Fuels Management Project (2003) contains locations of Rusby milkvetch, but the species was not addressed in the Biological Assessment and Evaluation for the project. Areas within the Frenchy area that are scheduled for harvest in the Four Forest Restoration Initiative shelf stock were surveyed for Rusby milkvetch in 20120 and locations were documented.

Ongoing and future foreseeable actions

These management actions are ongoing within the habitat of Rusby milkvetch. Some items in the cumulative effects document (Appendix F of FEIS) also apply.

The Coconino and Kaibab National Forests implemented the Travel Management Rule in 2012. The cumulative effects to this and other species are the reduction in the numbers of motorized routes and the elimination of cross-country travel. Negative effects from motorized vehicles such as crushing of plants, damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious or invasive weeds into the habitats and/or populations have been reduced. These reductions would be from the elimination of most cross-country travel and through the reduction of road density. These actions, combined with such actions as road decommissioning in this project would reduce the impacts of vehicle traffic in the habitat of Rusby milkvetch.

Project implementation will continue in previously analyzed projects containing Rusby milkvetch. These include the Hart Prairie Fuels Reduction and Forest Health Project (2010), Wing Mountain Fuels Reduction and Forest Health Restoration (2012), Frenchy (2003) and Pomeroy (2003). A non-motorized trail system, the Mount Elden, Dry Lake Hills project is a foreseeable action that will occur in the habitat of Rusby milkvetch. The project includes new trail construction and inclusion of user created trails into the official forest system. Some of these trails would affect Rusby milkvetch through impacts to individuals, but the project may also mitigate the effects to the species, especially in areas of user created trails. The Flagstaff Watershed Protection Project is currently under analysis. The areal extent of the project is similar to that of the Mount Elden Dry Lake Hills trail project. Numerous locations of Rusby milkvetch were documented in the project area during pre-implementation surveys in 2013.

Other actions such as grazing and wildfires will continue to occur in the range of Rusby milkvetch and continue to affect it. None of these actions will lead to a trend toward federal listing. Refer to the cumulative effects document on file for further discussion on these and other actions in the project area.

Climate change is considered in the section below.

It is my determination that

Four Forest Restoration Initiative may impact individuals of Rusby milkvetch *Astragalus rusbyi* **but is not likely to result in a trend toward federal listing or loss of viability**.

Arizona leather flower (Clematis hirsutissima var. hirsutissima)

Arizona leather flower is a perennial herb with pinnately compound leaves with finely divided, pubescent leaflets. The leaves have petioles and join the stems at right angles. The flowers are solitary, purple and bell shaped. After blooming, the plant produces plumose achenes. Individual plants are from 8 to 12 inches tall. Habitat includes rocky hillsides with slopes from 12% to 40%, with aspects generally from 320º to 40º.). It generally grows on limestone soil. However, a few groups have been found on basalt soils in the Fort Valley area and near Woods Canyon.

The inclusion of Arizona leather flower on the Region 3 sensitive plant list has an unusual history. The plant was formerly included on the Region 3 Sensitive Species List as *Clematis hirsutissima* var. *arizonica*, but was removed 1999 when taxonomists determined that the variety was not a valid taxon. Arizona leather flower was added back to the Region 3 sensitive species list as variety *hirsutissima* in 2007 that includes locally occurring plants formerly designated as var. *arizonica*. During its absence from the sensitive species list, some but not all projects containing locations and habitat of the plant were addressed and mitigated.

Existing condition for Arizona leather flower

This taxon is addressed in the Coconino NF Plan (1987) on page 65-7 and in the Kaibab NF Plan (1988) on page 28 where it states that management activities needed for the conservation of Arizona leather flower may conflict with Northern Goshawk Standards and Guidelines. In these cases, management that benefits Arizona leather flower would be exempt from the Goshawk Standards and Guidelines. In such instances, measures needed for the Arizona leather flower would take precedence over Goshawk Standards and Guidelines.

Populations of Arizona leather flower occur near Lower Lake Mary, in Skunk Canyon and in Fay Canyon. Arizona leather flower also occurs on the Tusayan Ranger District of the Kaibab National Forest, near Ten X Tank (KNF). Other populations occur on Harold Ranch Road in east Flagstaff (private land), in Mountainaire (private land), Fort Valley and near Hoe Tank on the Mogollon Rim Ranger District, which is outside the current project area but within ponderosa pine habitat.

Juvenile plants benefit from high amounts of leaf litter. The litter provides a source of humidity around seedlings. However, heavy accumulation of litter can be detrimental to seedling survival and vegetative reproduction in adults. Intermediate amounts (approximately 50%) of light and shade were the most beneficial conditions for Arizona leather flower. Higher levels of light increased photosynthesis in adult plants, but resulted in lower reproductive success, and increased risk of desiccation. Low levels of light resulted in decreased photosynthesis, fewer stems per plant and lower seed production (Maschinski et al, 1997). Table 8 below shows the occurrences of Arizona leather flower in treatment areas within the project.

Table 8. Treatment units containing Arizona leather flower. Data are derived from NRIS TESP/Invasives

Scientific name	Common name	Date	Location	Site	Alt. B	Alt. C	Alt. D	Alt E
Clematis hirsutissima	Arizona leather flower	6/13/1990	120	17	SI40	SI40	SI40	SI40
Clematis hirsutissima	Arizona leather flower	12/1/1988	120	18	IT25	IT25	IT25	IT25
Clematis hirsutissima	Arizona leather flower	6/1/1992	120	19	UEA40	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leather flower	12/1/1988	120	20	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	6/13/1990	120	22	UEA25	UEA25	UEA25	UEA25
Clematis hirsutissima	Arizona leather flower	6/14/2000	317	1	UEA10	UEA10	UEA10	UEA10
Clematis hirsutissima	Arizona leather flower	9/27/1983	341	1	UEA40	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leather flower	12/1/1988	341	3	SI40	SI40	SI40	SI40
Clematis hirsutissima	Arizona leather flower	4/10/1989	341	4	Savanna	Savanna	Savanna	UEA40
Clematis hirsutissima	Arizona leather flower	12/1/1988	341	5	UEA40	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leather flower	4/12/1989	341	6	UEA40	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leather flower	4/10/1989	341	8	Savanna	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leather flower	4/10/1989	341	9	UEA40	UEA40	UEA40	UEA40
Clematis	Arizona leather flower	4/10/1989	341	10	UEA25	UEA25	UEA25	UEA25

Scientific name	Common name	Date	Location	Site	Alt. B	Alt. C	Alt. D	Alt E
hirsutissima								
Clematis hirsutissima	Arizona leather flower	12/1/1988	341	11	UEA40	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leather flower	4/10/1989	341	14	UEA40	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leather flower	4/10/1989	341	15	UEA40	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leather flower	8/14/1985	341	16	WUI55	WUI55	WUI55	WUI55
Clematis hirsutissima	Arizona leather flower	12/1/1988	341	17	SI25	SI25	SI25	SI25
Clematis hirsutissima	Arizona leather flower	4/10/1989	341	20	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	6/4/1988	341	24	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	12/1/1988	341	26	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	4/10/1989	341	27	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	12/1/1988	341	28	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	12/1/1988	341	29	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	12/1/1988	341	31	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	12/1/1988	341	37	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	12/1/1988	349	4	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alt. B	Alt. C	Alt. D	Alt E
Clematis hirsutissima	Arizona leather flower	4/10/1989	349	5	UEA40	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leather flower	12/1/1988	349	7	UEA40	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leather flower	4/10/1989	349	8	UEA25	UEA25	UEA25	UEA25
Clematis hirsutissima	Arizona leather flower	4/10/1989	349	9	Savanna	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leather flower	12/1/1988	349	10	Savanna	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leather flower	6/17/2010	349	11	UEA25	UEA25	UEA25	UEA25
Clematis hirsutissima	Arizona leather flower	4/10/1989	349	13	Savanna	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leather flower	4/10/1989	349	15	Savanna	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leather flower	4/10/1989	349	16	SI40	SI40	SI40	SI40
Clematis hirsutissima	Arizona leather flower	12/1/1988	349	17	Savanna	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leather flower	12/1/1988	349	20	UEA25	UEA25	UEA25	UEA25
Clematis hirsutissima	Arizona leather flower	4/10/1989	349	22	Savanna	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leather flower	4/10/1989	349	23	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Clematis hirsutissima	Arizona leather flower	6/17/2010	349	28	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical

Scientific name	Common name	Date	Location	Site	Alt. B	Alt. C	Alt. D	Alt E
Clematis hirsutissima	Arizona leather flower	12/15/2011	4060	14	Burn Only	Burn Only	Burn Only	Burn Only
Clematis hirsutissima	Arizona leather flower	12/15/2011	4088	13	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40

Desired future condition for Arizona leather flower

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to Arizona leather flower from management actions is direct losses of individuals from management actions. Incorporate mitigations and design features 2 through 8, 17 and 21above to mitigate these effects to non-significant levels.

Alternatives B, C, D and E

This analysis addresses all action alternatives. Treatments in any specific unit containing Arizona leather flower may vary by alternative but the general effects of management actions are the same for all alternatives.

Direct and Indirect Effects

Direct and indirect effects to Arizona leather flower are similar to those for Rusby milkvetch and include death or destruction of populations or individuals through management activities. These direct effects are mitigated by following mitigations and design features 2 through 8, 17 and 21 above to mitigate these effects to non-significant levels.

Actions such as thinning that could increase the amount of sunlight could increase photosynthesis for some populations. Changes in the amount of sunlight available for Arizona leather flower could have positive or negative effects depending on the amount of change produced by management actions. High levels of light may lead to increased vegetative growth, but lower reproduction and seedling survival (Maschinski et al, 1997). These effects will be mitigated by retaining shade around Arizona leather flower populations. Surveys to locate plants will be necessary, as will such measures as avoidance containing Arizona leather flower (see mitigation measure and design features12 and 17).

Burning could reduce the amount of litter present in populations of Arizona leather flower. The presence of litter is important for Arizona leather flower. Deep litter may negatively affect the plants but removal of all litter from the site would have adverse effects on juvenile plants, which need some litter to retain moisture around them. These effects would be mitigated by burning under conditions that would reduce the litter layer without removing it entirely (see mitigation measures and design features #17).

Short-term effects of burning include mortality of individual plants. Long-term effects include the loss of shade from tree mortality or reduction in the amount of litter that would be detrimental to juvenile plants. This would be mitigated by managing burning at intensities in all entries low enough to limit mortality to trees and preserve a light layer of litter. The knowledge of fire effects on Arizona leather flower are based largely on observations on a local prescribed fire within the Bald Mesa Project on the Mogollon Rim Ranger District of the Coconino NF (2005) where mitigations such as raking and not igniting directly within the plant groups were used. These mitigations were sufficient to preserve adult plants and conserve the habitat needed for juvenile plants. No data were found in published research specifically related to the effects of fire on Arizona leather flower. Plants in the genus *Clematis* regenerate through underground rhizomes as well as through seeds, including Arizona leather flower (Pringle 1997). The insulating properties of soil would protect Arizona leather flower plants and would allow them to survive low intensity fire through protection of below ground structures (Pyke et al, 2010). Higher severity fires with long residence time would lead to lethal temperatures in underground structures, causing mortality to individuals and populations.

An indirect effect of management actions within the potential habitat of Arizona leather flower includes an increased risk of invasion from noxious or invasive weeds. These effects would be mitigated by incorporating the Best Management Practices described in Appendix B of *Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab and Prescott National Forests* (2005). Incorporation of the Best Management Practices would mitigate the effects of increased disturbance from management activities, and help to control the spread and introduction of weeds within the habitat of Rusby milkvetch.

Direct and indirect effects of temporary road construction, road maintenance, road reconstruction or decommissioning include destruction of individual plants, localized disturbance of suitable habitat and the potential introduction of noxious or invasive weeds. These effects would be mitigated by surveying the areas where activities would occur as well as nearby areas that may be disturbed and avoiding existing plant populations

There are no spring or channel restorations proposed for the areas containing Arizona leather flower on the Kaibab NF. There are two areas on the Coconino NF where channel restoration is proposed that are near or contain Arizona leather flower (see Figures 8 and 9). These are the Skunk Canyon area and drainages near Lower Lake Mary. Direct effects of activities associated with channel restoration include losses of individual plants or groups. Indirect effects include the alteration of habitat, which would be more long term. These effects will be mitigated by following the mitigation measures for sensitive plants mentioned above.

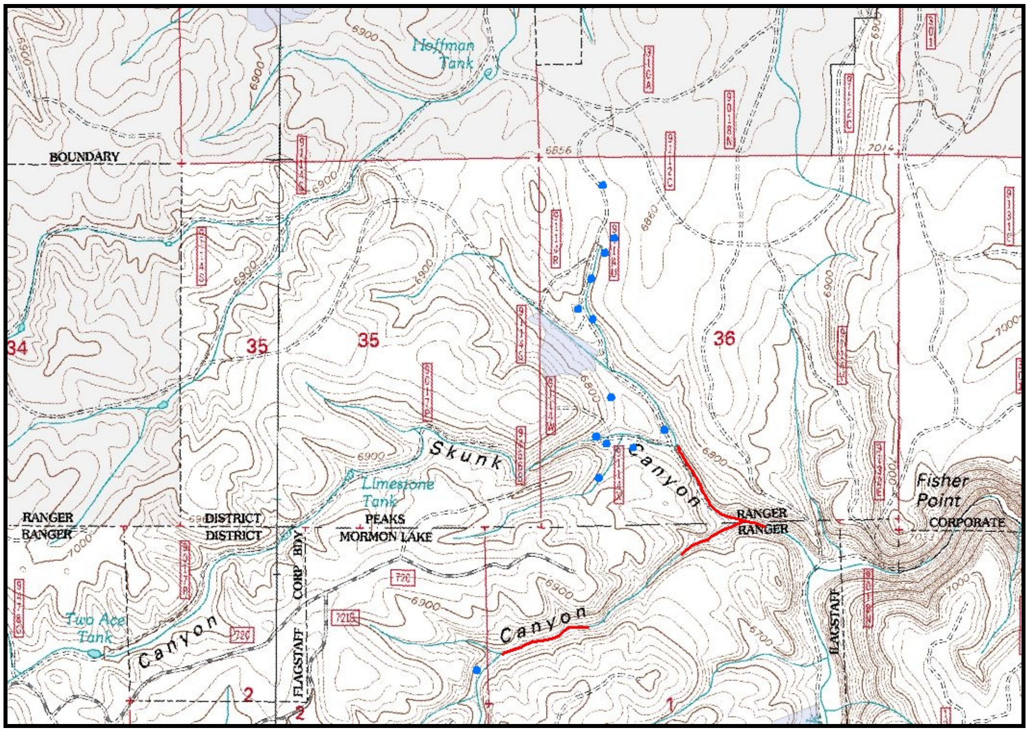

Figure 10. Locations of Arizona leather flower and channel restorations in the Skunk Canyon area

Red lines represent the channels to be restored and blue dots are plant locations.

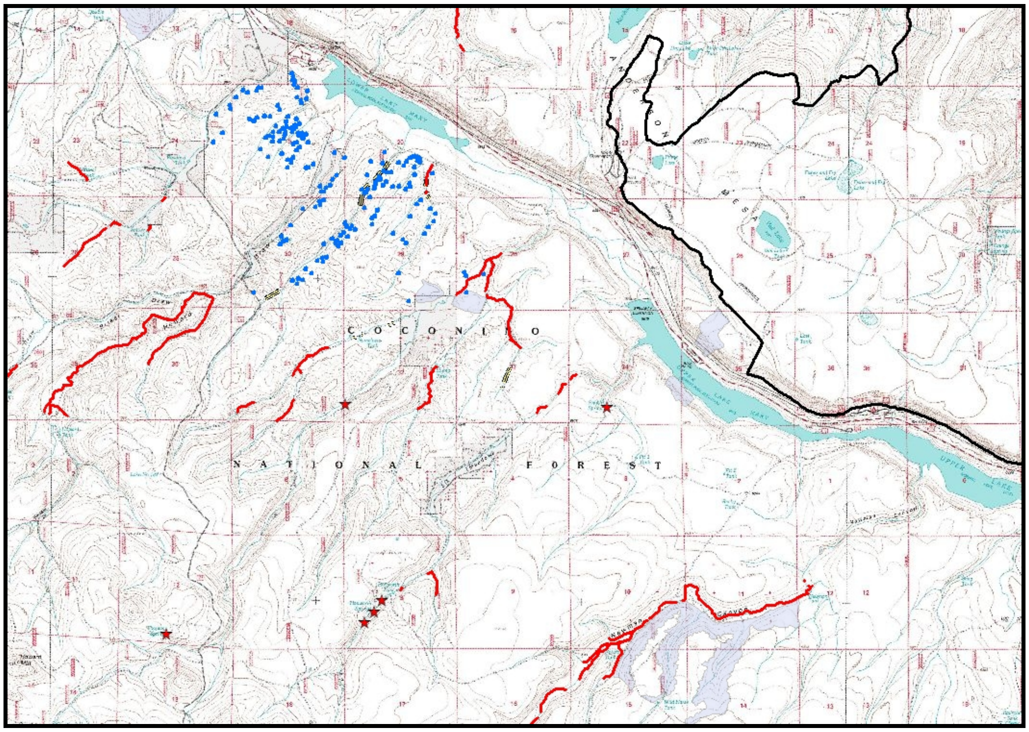

Figure 11. Locations of Arizona leather flower and channel restorations in the Lower Lake Mary area

Red lines represent the channels scheduled for restoration and blue dots are plant locations.

Cumulative Effects

The time limit for this discussion includes past actions since Arizona leather flower was added to the Regional Forester’s list in 2007. This date was chosen because it was when the species returned to the Region 3 sensitive species list after being absent from it for nearly 10 years. The boundary for this is the occupied habitat within the project boundary. Many past actions such as grazing, fire suppression, wildfires, timber activities, recreation and plant collecting have occurred in the area of consideration and have contributed to the current existing condition.

Two wildfires occurred in or near the occupied habitat for Arizona leather flower. These include the X Fire on Kaibab NF (2008) which covered more than 5000 acres and the Pepe Fire on the Coconino NF (2008). The Pepe Fire was near occupied habitat for Arizona leather flower but did not contain any documented locations. The X Fire was over 5,000 acres and contained some areas of high severity. There is an ongoing analysis on the Kaibab NF to assess the effects of planting in an area of high severity within the fire. A project titled X Fire thinning was completed in 2009. This project covered 140 acres. The effects of the fire and these associated activities to Arizona leather flower are unknown. However, the two documented locations of Arizona leather flower on the Tusayan Ranger District are within the fire boundary.

Actions on non-Forest lands have affected the occurrence and distribution of Arizona leather flower in other areas. Many areas in and near Flagstaff that provided potential habitat for the plants have been altered or developed, making the habitat no longer suitable for Arizona leather flower. At least one population on private land was destroyed during a road realignment project

Additionally, because of its’ unique appearance, the Arizona leather flower is occasionally collected and removed from the Forest for use as a landscaping plant.

Ongoing and future foreseeable actions

These management actions are ongoing within the habitat of Arizona leather flower. Some items in the cumulative effects document also apply.

The Coconino and Kaibab National Forests implemented the Travel Management Rule in 2012. The cumulative effects to this and other species are the reduction in the numbers of motorized routes and the elimination of cross-country travel. Negative effects from motorized such as crushing of plants, damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious The Coconino and Kaibab National Forests implemented the Travel Management Rule in 2012. The cumulative effects to this and other species are the reduction in the numbers of motorized routes and the elimination of cross-country travel. Negative effects from motorized such as crushing of plants, damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious or invasive weeds into the habitats and/or populations have been reduced. These reductions would be from the elimination of most cross-country travel and through the reduction of road density. These actions, combined with such actions as road decommissioning in this project would reduce the impacts of vehicle traffic in the habitat of Arizona leather flower

The Arizona Trails System and Flagstaff Loop Trail are near known populations of Arizona leather flower. Other actions such as grazing and wildfires will continue to occur in the range of Rusby milkvetch and continue to affect it. None of these actions will lead to a trend toward federal listing. Refer to the cumulative effects document on file for further discussion on these and other actions in the project area.

Climate change is considered in the section below.

It is my determination that

Four Forest Restoration Initiative may impact individuals of Arizona leather flower *Clematis hirsutissima* **but is not likely to result in a trend toward federal listing or loss of viability**.

Cliff Fleabane (Erigeron saxatilis)

Cliff fleabane is an endemic species that occurs only in northern and central Arizona where it inhabits sheer canyon walls, moist north-facing slopes, steep solid rock and bedrock outcrops from 5,000 to 8,350 ft. Within the project area, cliff fleabane occurs on steep or vertical cliff faces.

Figure 12. Picture of Cliff fleabane from SEINet taken by Max Licher

Table 9. Locations of cliff fleabane in treatment areas by action alternative

Date	Location	Site	Slope> 40%	MSO PAC	Alt. B	Alt. C	Alt. D	Alt. E
08/29/2004	354	4	No	Kelly	Burn Only	Burn Only	No Treatment	Burn Only
07/29/1985	279	20	Yes		Burn Only	Burn Only	Burn Only	Burn only

Note: Plant locations were obtained from SEINet.

All alternatives

Locations for this species within treatment units are shown in Table 9 above. No silviculture treatments are proposed for any of these units. One of the locations above is on a steep slope greater than 40 percent and the others are within Mexican spotted owl PACs. Additionally, the habitat for it is steep cliffs and bedrock boulders. It is unlikely that there would be enough fuel accumulated to allow fire to enter the areas where this species grows. Therefore, the management actions proposed in this analysis are not likely to affect individuals or habitat of cliff fleabane.

Four Forest Restoration Initiative would not affect individuals of Cliff fleabane *Erigeron saxatilis*. The habitat for this species is on steep canyon walls and is not likely to be affected by management actions.

Flagstaff pennyroyal (*Hedeoma diffusum*)

Flagstaff pennyroyal is a small perennial, mat-like herb that grows on dolomitic limestone outcrops or soils in ponderosa pine forests. There are two major population areas for this species on the Coconino National Forest. The first extends roughly from Flagstaff, east to Marshall Lake and Fisher point, then south to the vicinity of Mountainaire, then to Lower Lake Mary. A second population area is near the rim of Oak Creek Canyon and its tributaries (Boucher, 1984; Phillips, 1984). Flagstaff pennyroyal occurs on the Kaibab National Forest in Tule and Jack's Canyons but these areas are in wilderness and would not be affected by management activities associated with restoration. Another population area occurs on the Prescott National Forest.

Flagstaff pennyroyal occurs in three distinctive habitats in the ponderosa pine forest: rock pavement, cliffs and limestone. Forest canopy cover ranged from zero to 86%, averaging 26 .5% (Phillips, 1984).

Figure 13. Flagstaff pennyroyal on dolomitic limestone substrate

Existing condition for Flagstaff pennyroyal

Flagstaff pennyroyal is closely associated with a specific limestone substrate, dolomitic limestone, which occurs at various areas on the two forests, mainly in the areas of Lake Mary and Marshall Mesa and the rim of Sycamore Canyon on the Kaibab National Forest.

Table 10 below shows the occurrences of Flagstaff pennyroyal in treatment units.

Table 10. Treatment Units containing Flagstaff pennyroyal. Data are derived from NRIS TESP/Invasives

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt. E
Hedeoma diffusum	Flagstaff pennyroyal	6/12/1990	119	2	WUI55	WUI55	WUI55	WUI55
Hedeoma diffusum	Flagstaff pennyroyal	9/2/1993	120	1	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	7/17/1984	120	6	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Hedeoma diffusum	Flagstaff pennyroyal	7/1/1980	120	18	IT25	IT25	IT25	IT25
Hedeoma diffusum	Flagstaff pennyroyal	6/16/1986	120	23	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	120	24	SI40	SI40	SI40	SI40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	120	25	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	7/1/1980	120	26	Burn Only	Burn Only	Burn Only	Burn Only
Hedeoma diffusum	Flagstaff pennyroyal	7/1/1980	120	27	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	7/1/1980	120	38	UEA25	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	6/12/1986	186	23	Burn Only	Burn Only	No Treatment	Burn Only
Hedeoma diffusum	Flagstaff pennyroyal	9/26/1989	314	1	Operational Burn	Operational Burn	No Treatment	Operational Burn
Hedeoma diffusum	Flagstaff pennyroyal	9/26/1989	314	3	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	4	UEA25	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	5	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	6	UEA25	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	7	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	11	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt.
Hedeoma diffusum	Flagstaff pennyroyal	9/27/1989	314	12	Savanna	Savanna	Savanna	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	13	UEA25	UEA25	UEA25	UEA 25

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt. E
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	315	2	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	315	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	315	7	UEA10	UEA10	UEA10	UEA10
Hedeoma diffusum	Flagstaff pennyroyal	10/3/1989	315	11	UEA25	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	315	19	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	317	2	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	10/5/1983	340	22	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	340	23	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/16/1983	340	26	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/16/1983	340	27	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	340	28	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/15/1993	341	1	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	341	6	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	341	7	SI40	SI40	SI40	SI40
Hedeoma diffusum	Flagstaff pennyroyal	9/2/1993	341	8	Savanna	Savanna	Savanna	Savanna
Hedeoma diffusum	Flagstaff pennyroyal	10/13/1983	341	12	WUI55	WUI55	WUI55	WUI55
Hedeoma diffusum	Flagstaff pennyroyal	9/2/1993	341	14	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/2/1993	341	15	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	10/13/1983	341	18	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/15/1983	341	22	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	10/13/1983	341	27	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Hedeoma diffusum	Flagstaff pennyroyal	10/13/1983	341	28	Operational	Grassland	Operational	Grassland

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt. E
					Burn	Mechanical	Burn	Mechanical
Hedeoma diffusum	Flagstaff pennyroyal	5/18/1983	349	1	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/27/1983	349	2	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	349	8	UEA25	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	349	10	Savanna	Savanna	Savanna	Savanna
Hedeoma diffusum	Flagstaff pennyroyal	6/17/2010	349	11	UEA25	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	7/29/1993	349	15	Savanna	Savanna	Savanna	Savanna
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	349	16	SI40	SI40	SI40	SI40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	349	17	Savanna	Savanna	Savanna	Savanna
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	349	20	UEA25	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	349	24	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/27/1983	349	25	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	5/22/1985	350	27	UEA40	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	8/9/1993	382	1	Burn Only	Burn Only	No Treatment	Burn Only

Desired future condition for Flagstaff pennyroyal

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to Flagstaff pennyroyal from management actions is direct losses of individuals from management actions. Incorporate mitigations and design features 2 through 8, 17 and 21 above to mitigate these effects to non-significant levels.

Alternatives B, C, D and E

This analysis addresses all action alternatives. Treatments in any specific unit containing Flagstaff pennyroyal may vary by alternative but the general effects of management actions are the same for all alternatives.

Direct and Indirect Effects

The direct and indirect effects of treatments by Four Forest Restoration Initiative are similar to those discussed for Rusby milkvetch. Potential direct effects would include alteration of habitat or loss of individual plants or population groups. Factors contributing to these effects would include management activities such as tree thinning, burning, temporary road construction or decommissioning, road reconstruction, and spring or channel restoration. These activities may cause mortality of individual plants. An indirect effect includes mechanical alteration of habitat through alteration of the dolomitic limestone substrate by equipment used in various management activities such as timber harvesting and road construction or maintenance. These effects would be mitigated by following the guidance of the **Management Plan for *Hedeoma diffusum* Greene Elden, Flagstaff, Mormon Lake, and Sedona Ranger Districts** (Boucher, 1984) and mitigations contained in this document.

Prescribed burning may cause direct and indirect effects but these effects would be mitigated by following mitigation #17. In a burning experiment conducted by the Coconino National Forest, no adverse effects on Flagstaff pennyroyal were detected (Crisp, 1997). Prescribed burning would have a beneficial effect for Flagstaff pennyroyal by removing heavy litter accumulation resulting from absence of fire.

Slash pile burning is a more intense and localized burning activity. These effects would be mitigated by following the mitigations above and the **Management Plan for *Hedeoma diffusum* Greene Elden, Flagstaff, Mormon Lake, and Sedona Ranger Districts** (Boucher, 1984).

Thinning of trees would have direct and indirect effects on Flagstaff pennyroyal. Goodwin (1983) concluded that light to moderate disturbance from timber harvest did not adversely affect Flagstaff pennyroyal, which tends to occur in relatively open areas with less than 30% canopy. Therefore, tree thinning would benefit Flagstaff pennyroyal by reducing tree canopy and stand density.

Direct and indirect effects of road reconstruction and temporary road construction include death of individual plants, and alteration of habitat. Road reconstruction and temporary road construction is prohibited (see Management plan) within known populations and temporary road construction should remain 100 feet or more away from known populations to reduce indirect effects such as dust accumulation. Deaths of individual plants may occur through the direct destruction of plants. These effects would be mitigated by following the guidance of the **Management Plan for *Hedeoma diffusum* Greene Elden, Flagstaff, Mormon Lake, and**

Sedona Ranger Districts (Boucher, 1984) and mitigations and design features 2 through 8, 17 and 21.

There are scattered locations of Flagstaff pennyroyal in or near spring and channel restoration sites, including Fay Canyon and in some channel segments near Lower Lake Mary. The effects of these actions would be mitigated by following the mitigations and design features 2 through 8, 17 and 21above to mitigate these effects to non-significant levels

An indirect effect of management actions within the potential habitat of Flagstaff pennyroyal includes an increased risk of invasion from noxious or invasive weeds. These effects will be mitigated by incorporating the Best Management Practices described in Appendix B of *Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab and Prescott National Forests* (2005) and by surveying and treating weeds before implementation (see mitigations and design features). Incorporation of the Best Management Practices would mitigate the effects of increased disturbance from management activities, and help to control the spread and introduction of weeds within the habitat of Rusby milkvetch. See Appendix B of this document for noxious for invasive weed locations.

Cumulative Effects

The time limit for this discussion is from 2000 to present. This date was chosen to coincide with the cumulative effects document prepared by P. Cote (2012). The area of consideration is the range of Flagstaff pennyroyal in the project area. Occurrences of Flagstaff pennyroyal on the Kaibab NF are generally not affected by management actions because they occur below the edge of Sycamore Canyon in areas that are not suitable for management actions such as tree thinning.

Flagstaff pennyroyal occurs in several recently analyzed or implemented fuels reduction projects including Kachina Village Forest Project (2003), Mountainaire HFRA Project (2006), Elk Park Fuels Reduction and Forest Health Project (2007), Eastside Fuels Reduction and Forest Health Project (2007), and Marshall Fuel Reduction and Forest Restoration Project (2012). The effects in these projects individually and cumulatively have been “may effect but not likely to adversely affect”. These projects have covered about 75% of the total acreage of the potential habitat managed by the Coconino NF. These projects did not adversely affect the abundance or distribution of Flagstaff pennyroyal and when combined with the effects of this project, will not adversely affect this species.

Management activities on non-forest lands in suitable habitat for Flagstaff pennyroyal have reduced the amount of suitable habitat within the range of Flagstaff pennyroyal. The exact amount of this reduction is unknown but is approximately 10% total historical range.

The Kelly Trails system (Coconino NF) was analyzed in 2012. It is a motorized trail system designed to provide opportunities for single track and OHV vehicles. The trail system is 73 miles long and includes existing user created trails, roads closed under Travel Management and newly constructed segments. Effects to resources, including Flagstaff pennyroyal and its habitat are mitigated by design features such as building or rerouting existing trails into areas of no concern.

The Coconino and Kaibab National Forests implemented the Travel Management Rule in 2012. The cumulative effects to this and other species are the reduction in the numbers of motorized routes and the elimination of cross-country travel. Negative effects from motorized such as crushing of plants, damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious or invasive weeds into the habitats and/or populations have been reduced. These reductions would be from the elimination of most cross-country travel and through the reduction of road density. These actions, combined with such actions as road decommissioning in this project would reduce the impacts of vehicle traffic in the habitat of Flagstaff pennyroyal.

Ongoing and future foreseeable actions

These management actions are ongoing within the habitat of Flagstaff pennyroyal. Some items in the cumulative effects document also apply.

- 831 acres of prescribed burning will occur on the Skunk project (Coconino NF)
- 20,197 acres of prescribed burning will occur on the Eastside Project (Coconino NF)

Both of these projects were analyzed in the past and effects to Flagstaff pennyroyal were mitigated to non-significant levels.

Dispersed recreation is an ongoing activity that occurs in the habitat of Flagstaff pennyroyal. Activities include hiking, horseback riding, bicycling and dispersed camping. Areas such as the Arizona trail and Loop trail systems near Flagstaff are within the habitat of Flagstaff pennyroyal, but these trails were designed to avoid most plant populations during their construction. In some instances, Flagstaff pennyroyal has been observed growing in established trails with no apparent negative effect to individual plants. Ongoing recreation includes camping. Observers have noted remnants of campfires that were built directly on top of plants, having detrimental effects. These actions are limited and not under the control of this decision.

Climate change is considered in the section below.

It is my determination that

Four Forest Restoration Initiative may impact individuals of Flagstaff pennyroyal, *Hedeoma diffusum* but is not likely to result in a trend toward federal listing or loss of viability.

Arizona sneezeweed (Helenium arizonicum)

Arizona sneezeweed is a perennial herb that grows up to 4 feet tall with several stems. Flower heads consist of yellow to orange 3-lobed ray flowers and purplish-brown globular disk flowers and bloom July through September. Hundreds of individuals may exist in a single population. This endemic species ranges from the Mormon Lake area southeastward to the White Mountains area where it grows in drainages, near springs, ponds and other wet areas.

Figure 14. Arizona sneezeweed in field with squirrel tail grass (Elymus elymoides)

Existing condition for Arizona sneezeweed

This species occurs in ephemeral drainages in the Upper Lake Mary watershed. CREC crews detected numerous groups in the Antelope Park area in 2011. There are **no known locations of Arizona sneezeweed on the Kaibab National Forest**.

Table 11 shows the treatment units containing Arizona sneezeweed.

Table 11. Treatment Units containing Arizona sneezeweed. Data are derived from NRIS TESP/Invasives

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt. E
Helenium arizonicum	Arizona sneezeweed	8/17/2011	371	21	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Helenium arizonicum	Arizona sneezeweed	8/17/2011	387	6	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Helenium arizonicum	Arizona sneezeweed	8/17/2011	387	8	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Helenium arizonicum	Arizona sneezeweed	8/15/2011	390	7	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/15/2011	390	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Helenium arizonicum	Arizona sneezeweed	8/3/2011	399	18	UEA40	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	8/3/2011	400	1	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/3/2011	400	4	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/18/2011	400	13	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/18/2011	400	14	SI40	SI40	SI40	SI40
Helenium arizonicum	Arizona sneezeweed	8/17/2011	400	24	UEA40	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	8/18/2011	400	25	UEA40	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	8/3/2011	400	27	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/15/2011	401	15	UEA40	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	7/25/2011	415	14	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Helenium arizonicum	Arizona sneezeweed	8/18/2011	416	11	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Helenium arizonicum	Arizona sneezeweed	8/16/2011	416	12	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Helenium arizonicum	Arizona sneezeweed	8/16/2011	416	14	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt. E
Helenium arizonicum	Arizona sneezeweed	8/18/2011	417	1	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Helenium arizonicum	Arizona sneezeweed	8/18/2011	417	2	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Helenium arizonicum	Arizona sneezeweed	8/16/2011	417	11	Savanna	Savanna	Savanna	Savanna
Helenium arizonicum	Arizona sneezeweed	8/19/1985	427	3	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Helenium arizonicum	Arizona sneezeweed	8/19/1985	427	19	UEA40	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	10/4/2000	496	2	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	10/4/2000	519	16	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt

Desired future condition for Arizona sneezeweed

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to Arizona sneezeweed from management actions is direct losses of individuals from management actions. Incorporate mitigations and design features 2 through 8, 17 and 21above to mitigate these effects to non-significant levels.

Alternatives B, C, D and E

This analysis addresses all action alternatives. Treatments in any specific unit containing Arizona sneezeweed may vary by alternative but the general effects of management actions are the same for all alternatives.

Direct and Indirect Effects

Direct and indirect effects to Arizona sneezeweed are similar to those for Rusby milkvetch and include loss of populations or individuals of this species through management activities. Factors contributing to these effects would include physical destruction of plants or disturbance from management activities including activities such as vegetation management, spring and channel restoration and prescribed burning. These actions will be mitigated by following the mitigations and design features above to mitigate these effects to non-significant levels.

One of the associated activities with several treatments includes piling of slash from management activities. Slash piles may have negative direct and indirect effects on all understory vegetation including Arizona sneezeweed. Slash pile construction could be a negative direct effect if the pile is placed in or near existing populations of Arizona sneezeweed. These effects will be mitigated by avoiding placing slash piles directly on existing plants and by constructing piles at least 10 to 20 feet away from existing populations. Pile burning would create locally severely burned areas at pile sites Effects include the reduction or loss of the seed bank (Korb, 2001); death or reduction of soil organisms on the pile sites (Raison, 1979; Ballard, 2000; Korb et al., 2004) and development of hydrophobic soil (Kaye and Hart, 1998; Ballard, 2000). Slash pile sites are more prone to invasion from noxious or invasive weeds than surrounding areas and may contribute to the persistence and spread of noxious or invasive weeds in treated areas. Noxious or invasive weeds may have adverse effects on all native plants including Arizona sneezeweed by competing with native species for resources and altering habitat. 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. Additionally, pile sites should be monitored after burning occurs to identify and treat infestations.

Prescribed burning may have direct and indirect effects to on all understory vegetation including Arizona sneezeweed depending on fire severity. Most prescribed burning would be of low severity with low soil heating, retention of most ground litter and little or no change in mineral soil. Prescribed burning can release nutrients, reduce plant competition, and increase the amount of available sunlight light available to all understory plants including Arizona sneezeweed. In some cases, fire severity may be higher in limited areas depending on variables such as management goals, weather, fuel conditions and topography. In these cases moderate to high fire severity may occur. In these areas, there could be negative direct effects through deaths scattered individuals or groups of Arizona sneezeweed if they occur at that particular location. Limited deaths of small groups of plants in these cases would not significantly contribute to the overall populations of these species within the project area or over the ranges of each species. The indirect effects of higher fire severity in these areas would be similar to those for slash pile burning. Measures of severity used in this discussion are the same as the unit of measure for soil and water and a complete discussion can be found in the Soil and Water Report. Some individuals may be destroyed during prescribed burning, especially in areas where only isolated individuals may occur or in areas where plants were not detected during previous surveys. However, prescribed burning may also have beneficial indirect effects such as making soil nutrients available and water more available to understory plants including Arizona sneezeweed. Mitigations would include the protective measures for watershed; locating slash piles outside of drainage areas, and not allowing construction of control lines for prescribed fires in drainage areas where Arizona sneezeweed occurs.

There are no documented occurrences of Arizona sneezeweed in any of the areas scheduled for spring and channel restoration. If no recent projects have occurred in the spring and channel areas identified for restoration, then it is likely that no surveys have been conducted. Mitigation measures and design features # 2 -8 and 21 focus on surveying these areas before implementation. Other mitigations and design features, specifically # 13, 14 and 15 would mitigate effects from spring and channel restoration to this species.

Beneficial indirect effects to Arizona sneezeweed include reduction of tree canopy and stand density. Treatments that reduce the tree canopy and lower the stand density would benefit all understory plants including Arizona sneezeweed by allowing more sunlight, increasing available nutrients and temporarily decreasing interspecies competition as well as intra species (between tree) competition (See Understory Report).

Direct and indirect effects of temporary road construction, road reconstruction, road maintenance or road decommissioning include destruction of individual plants, localized disturbance of suitable habitat and the potential introduction of noxious or invasive weeds. These effects would be mitigated by surveying the areas where activities would occur as well as nearby areas that may be disturbed and avoiding existing plant populations

An indirect effect of management actions within the potential habitat of Arizona sneezeweed includes an increased risk of invasion from noxious or invasive weeds. Several species of noxious or invasive weeds occur in potential habitat. These effects would be mitigated by incorporating the noxious or invasive weed treatments described in Appendix 1 and by incorporating the Best Management Practices described in Appendix B of the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds. Incorporation of the Best Management Practices would mitigate the effects of increased disturbance from management activities, and help to control the spread and introduction of weeds within the habitat of Flagstaff beardtongue.

Cumulative effects

The activities below have added to the cumulative effects of Four Forest Restoration Initiative. Additional items in the cumulative effects document may apply.

The time limit for this discussion is from 1999 when Arizona sneezeweed was added to the Region 3 sensitive species list to present The boundary of this discussion includes the range of Arizona sneezeweed within the project area which is roughly the area from the Mormon Lake are southward to the project boundary. This species is not known to occur on the Kaibab NF so this discussion is limited to the Coconino NF.

There have been no past fuels reduction projects in the area of consideration where Arizona sneezeweed was documented during surveys. There are no past cumulative effects from actions associated with fuels reduction projects such as tree removal, burning, road reconstruction and maintenance activities, which are also part of Four Forest Restoration Initiative.

Persistent drought in the northern Arizona area that began in 1996 and lasted for over 10 years affected the abundance and distribution of Arizona sneezeweed due to its affinity for moist soil. The extent of the effects of drought is not known and is a natural phenomenon outside of agency control. The drought compounded such effects as fire severity and impacts from grazers seeking water sources, which decreased in availability during the drought (see climate change section for additional information).

Ongoing and future foreseeable actions

Grazing within the project area includes grazing by domestic ungulates. Wild grazers such as elk also frequent the area. The effects of grazing include past and present loss of individual plants to grazing animals and alteration of habitat through animal impacts such as trampling and compaction. Alteration of habitat through diversion of water for use to water animals also affected the habitat Arizona sneezeweed. Actions of domestic ungulates can be regulated by the Forest Service, while those of wild grazers cannot.

Dispersed recreation is an ongoing activity that occurs in the habitat of Arizona sneezeweed. Activities include hiking, horseback riding, bicycling and dispersed camping.

The Kelly Trails system (2012) is a motorized trail system designed to provide opportunities for single track and OHV vehicles. The trail system is 73 miles long and includes existing user created trails, roads closed under Travel Management and newly constructed segments. Effects to resources, including Arizona sneezeweed and its habitat would be mitigated by design features such as building or rerouting trails into areas of no concern.

The Coconino and Kaibab National Forests implemented the Travel Management Rule in 2012. The cumulative effects to this and other species are the reduction in the numbers of motorized routes and the elimination of cross-country travel. Negative effects from motorized such as crushing of plants, damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious or invasive weeds into the habitats and/or populations have been reduced. These reductions would be from the elimination of most cross-country travel and through the reduction of road density. These actions, combined with such actions as road decommissioning in this project would reduce the impacts of vehicle traffic in the habitat of Arizona sneezeweed.

Upper Beaver Creek Watershed Fuels Reduction Project (2010) contains many locations of Arizona sneezeweed. Portions of the project area will used as Four Forest Restoration shelf stock. Management activities analyzed in the Upper Beaver Creek Area are similar to those for this project, including tree removal, fuels reduction and burning. Effects to Arizona sneezeweed were the same as below and were mitigated through several resources including botany, watershed, timber and fire.

It is my determination that
Four Forest Restoration Initiative may impact individuals of Arizona sneezeweed *Helenium arizonicum* but is not likely to result in a trend toward federal listing or loss of viability.

Sunset Crater beardtongue (*Penstemon clutei*)

Sunset Crater beardtongue is a perennial herb 12 to 30 inches tall with bright pink flowers. The leaves are sharply toothed with lower leaves joining to surround the stem, forming a disk around the stem (amplexicaul). The range Sunset Crater beardtongue is limited to the Sunset Crater volcanic field near Flagstaff, including the Coconino National Forest and Sunset Crater National Monument. The soil in which Sunset Crater beardtongue grows is typically a layer of cinders 2 to 5 inches deep with a layer of silty soil below, important for water retention at the root level of this species (Phillips, et. al, 1992). The habitat of Sunset Crater beardtongue is flat or gently sloping sites in open ponderosa pine forest between 6500 to 8500 feet.

Existing condition for Sunset Crater Beardtongue

There are numerous locations of Sunset Crater beardtongue in the northeast corner of the project area. Many of these are in treatment units where burning or operational burning would occur. Some units will be treated using the grassland restoration or grassland mechanical prescriptions. In those units, the effects would be similar to mechanical treatment for other species such as Rusby milkvetch.

Table 12 below shows the treatment units containing Sunset Crater beardtongue.

Table 12. Treatment Units containing Sunset Crater beardtongue

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt. E
Penstemon clutei	Sunset Crater beardtongue	10/1/2001	215	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/2/2001	215	5	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/2001	215	8	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	2/27/1995	221	2	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/25/1993	221	4	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/22/1993	221	10	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	2/27/1995	221	12	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/25/1993	221	13	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	10/12/1989	223	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/12/1989	223	2	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/12/1989	223	4	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/2/2001	223	7	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/24/1992	232	2	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	9/2/1994	232	11	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	2/1/2000	233	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/12/1989	233	5	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	235	5	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	235	6	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	5/16/1995	239	2	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt. E
Penstemon clutei	Sunset Crater beardtongue	2/1/2000	240	8	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	2/1/2000	241	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	241	3	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	241	4	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/9/1993	241	9	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	2/1/2000	241	10	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/22/1993	248	9	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	4/1/1992	249	2	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/24/1992	249	13	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	250	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/9/1993	250	7	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/9/1993	251	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	4/1/1992	251	3	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	252	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	4/1/1992	252	5	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Penstemon clutei	Sunset Crater beardtongue	4/1/1992	252	6	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	253	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	253	3	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/12/1996	253	4	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	253	5	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	6/12/1996	254	1	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt. E
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	262	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	262	10	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	262	15	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	263	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	7/1/1979	263	4	Operational Burn	Burn Only	Operational Burn	Burn Only
Penstemon clutei	Sunset Crater beardtongue	7/1/1979	263	7	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	264	8	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	265	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	265	2	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	4	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	5	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	7/1/1979	272	7	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	10	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	11	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	12	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	273	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	273	2	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	273	5	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	274	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	274	4	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	9/13/1990	274	6	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt. E
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	274	7	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	275	1	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	275	2	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	282	1	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	282	2	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	283	3	Burn Only	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	284	1	Burn Only	Burn Only	Burn Only	Burn Only

Note: Data are derived from NRIS TESP/Invasives.

Desired future condition for Sunset Crater beardtongue

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to Sunset Crater beardtongue from management actions is direct losses of individuals from management actions. Incorporate mitigations and design features 2 through 8, 17 and 21above to mitigate these effects to non-significant levels.

The analysis question to be answered for this and all Region 3 sensitive species is:

Alternatives B, C, D and E

This analysis addresses all action alternatives. Treatments in any specific unit containing Sunset Crater beardtongue may vary by alternative (see table 12) but the general effects of management actions are the same for all alternatives.

Direct and Indirect Effects

The effects of tree removal and mechanical treatments are similar to those discussed for Rusby milkvetch and would be mitigated by following the mitigations in mitigation measures and design features.

A direct effect to Sunset Crater beardtongue from management activities initiated under the Four Forest Restoration Initiative is loss of individuals or groups through burning at known sites. This loss is anticipated to be minimal because Sunset Crater beardtongue evolved in a fire dependent ecosystem and is adapted and tolerant to fire. There have been several large wildfires in the habitat of Sunset Crater beardtongue. After one such fire, the Burnt Fire in 1973, Goodwin (1979) stated that Sunset Crater beardtongue was a pioneering species in the fire area. However, in a field experiment that included burning treatments, Fule et al. (2000) found that Sunset Crater beardtongue numbers were lower on burned plots three years after treatment when compared to pre-treatment numbers. Burning occurred at two different times, one in April 1994 and one in late September 1994. Results were similar regardless of season of burn. In the study, prescribed burning in did not appear to favor increases in Sunset Crater beardtongue numbers. The study also included a trenching experiment where root competition was manipulated through digging. The researchers concluded that decreases in root competition contributed more toward increases in vigor and plant reproduction. These experiments were complicated by low sample size and decline in Sunset Crater beardtongue in the study area including control plots. Based on the available data, there may be some short term-reduction of plants in areas of burning but no long-term reduction in the number of Sunset Crater beardtongue in the area.

Individual or groups of plants may be affected by such activities as fire line construction but these effects would be mitigated by avoiding plants during implementation of prescribed burning.

There are no effects to Sunset Crater beardtongue from spring and channel restoration because none would occur in the habitat of Sunset Crater beardtongue.

There are no effects from activities associated with road reconstruction, decommissioning, maintenance, or temporary road construction because none would occur as a part of this project

An i**ndirect** effect of management actions within the potential habitat of Sunset Crater beardtongue includes an increased risk of invasion from noxious or invasive weeds. Several species of noxious or invasive weeds occur in potential habitat. These effects will be mitigated by incorporating the Best Management Practices described in Appendix B of the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds*. Incorporation of the Best Management Practices would mitigate the effects of increased disturbance from management activities, and help to control the spread and introduction of weeds within the habitat of Sunset Crater beardtongue.

Cumulative Effects

The time limit for this discussion is from 1973 when the effects of fire to Sunset Crater beardtongue were first noted by former Wildlife Biologist, Greg Goodwin to present. This discussion includes past management activities that have occurred in potential habitat of the Sunset Crater beardtongue**,** which is an endemic and occurs only in the Sunset Crater volcanic field of the Coconino National Forest and Sunset Crater National Monument. Sunset Crater beardtongue does not occur on the Kaibab National Forest.

Two fuels reduction projects, the Eastside Fuels Reduction and Forest Health Project (2006) and the Jack Smith/Schultz Fuels Reduction and Forest Health Project have been analyzed and management actions are ongoing based of those decisions. Many of the actions implemented as part of those projects will not directly affect Sunset Crater beardtongue because the projects included only small portions of the habitat and actions would be limited to prescribed burning. There have been several large wildfires in the habitat of Sunset Crater beardtongue including the Burnt Fire (1973), Wild Bill Fire (1993), Hochderffer (1996), Cinder Hills Fire (2009), and Schultz Fire (2010).

The Schultz Fire caused severe environmental damage including flooding and soil erosion, some of which extended into the habitat of Sunset Crater beardtongue. Management activities that were part of emergency actions in 2010 to mitigate the effects of flooding and erosion on private lands affected some of the potential habitat for Sunset Crater beardtongue and possibly destroyed individual plants. Channels to divert the storm runoff from private land and structures were dug in areas such as Cinder Lake. Scarification to mitigate the effects of soil deposition and increase soil percolation using machinery occurred in some areas including the area near Cinder Lake and the City Landfill. The long-term effects on habitat and native plants in general from these actions are unknown but include noxious or invasive weed invasion and continued disturbance of the habitat through maintenance of the drainage system

Favorable responses to burning because of the Schultz Fire have been observed by L. Moser and survey crews in 2011 and 2012. . Numerous occurrences of Sunset Crater beardtongue have been recorded in the areas of the Schultz Fire east of Highway 89. These observations confirm the observations by Goodwin (1979) and support the findings above stating that Sunset Crater beardtongue would benefit from burning.

In 1992, a tornado occurred in the area near Sunset Crater, within the habitat of the Sunset Crater beardtongue. The storm damaged large numbers of trees on Forest Service land and within Sunset Crater National Monument. The Forest Service conducted a salvage sale and removed storm damaged trees from its land. A monitoring project conducted by the Peaks Ranger District (Crisp, 1996) found no adverse effects from the storm or the salvage sale.

The cinder hills area that contains most of the habitat for Sunset Crater beardtongue is heavily used for recreation, especially in the Cinder Hills OHV Area, an area identified for off-highway vehicle use. Off-highway vehicles and cross-country travel are legally permitted in the area and may result in the loss of plants from crushing and compaction, and introduction on noxious or invasive weeds into the potential habitat of Sunset Crater beardtongue.

The presence and expansion of the Flagstaff City Landfill has affected the potential habitat of Sunset Crater beardtongue by altering habitat and possibly by loss of some individuals. Additionally, it is a source for potential noxious or invasive weed invasions.

Ongoing and future foreseeable actions

The Schultz Fire Sediment Reduction Project (2012) will continue to redirect floodwaters onto Forest Service lands, increasing the risk of noxious or invasive weeds and providing an ongoing source of disturbance. Management actions to mitigate the effects of flooding to private property and redirection of the floodwaters to Forest Service lands is expected to continue for an indefinite period of time.

Non-forest actions include a rapidly growing population in the Doney Park, Timberline and similar neighborhoods that are within the range of Sunset Crater beardtongue. Effects of this increasing human population include increases of human impacts to surrounding Forest Service lands and possibly a decrease suitable habitat available on lands under other ownership.

The Coconino National Forest implemented the Travel Management Rule in 2012. It would reduce impacts to many species forest-wide. However, cross-country travel in Management Area 13 of the Coconino NF Plan (1988) would remain an allowable activity in the decision. This area contains a large portion of the known range of Sunset Crater beardtongue. Motorized vehicle use in the area and therefore vehicle impacts to habitat and plants would continue. Negative effects from motorized such as crushing of plants; damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious or invasive weeds into the habitats and/or populations would continue.

Several utility corridors are present in the potential habitat of Sunset Crater beardtongue. Construction, expansion and maintenance of these corridors would result in loss of individuals along the corridor routes at known locations or in suitable habitat. The presence of these corridors provides corridors for dispersal of noxious or invasive weeds along the utility corridor and in adjacent forested areas.

Many of the actions discussed above defined the baseline of this analysis or are on-going effects. Some effects such as wildfire and prescribed burning have resulted or are anticipated to have beneficial effects to Sunset Crater beardtongue. These include positive responses to prescribed burning treatments, which are part of the Four Forest Restoration Initiative. Negative effects from all treatments would be mitigated by following the mitigation measures and design features

Climate change is considered in the section below.

It is my determination that

Four Forest Restoration Initiative may impact individuals of Sunset Crater beardtongue *Penstemon clutei* **but is not likely to result in a trend toward federal listing or loss of viability**.

Flagstaff beardtongue (*Penstemon nudiflorus*)

Flagstaff beardtongue grows in dry pine forests, pine/oak, pine/oak/ juniper and pinyon juniper forests. It occurs on dry slopes, in openings and along edges of openings and in forested areas. Documented locations for Flagstaff beardtongue include Anderson Mesa, near Lake Mary, Luke Mountain, Mormon Lake, Stoneman Lake, along the Schnebly Hill Road, along Oak Creek on the Coconino NF and in the Volunteer Canyon area, Sycamore Canyon, Bill Williams Mountain, and near the City of Williams in the Kaibab National Forest. In recent years, numerous locations have been found in proposed fuels reduction projects such as Upper Beaver Creek Watershed Fuels Reduction Project (2010)) and in the Rocky Park Fuels Reduction Project (2001). It has been observed in several locations including the Wild Steer Mesa area along Forest Road 108 near the Hat Ranch area on the Kaibab NF.

Existing condition for Flagstaff Beardtongue

There are several locations of Flagstaff beardtongue in the project area. See Table 13for documented locations and proposed treatments.

Table 13. Treatment Units containing Flagstaff beardtongue

Scientific name	Common name	Date	Location	Site	Alt B	Alt C	Alt D	Alt E
Penstemon nudiflorus	Flagstaff beardtongue	8/17/2011	386	10	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Penstemon nudiflorus	Flagstaff beardtongue	8/17/2011	387	8	Operational Burn	Grassland Mechanical	Operational Burn	Grassland Mechanical
Penstemon nudiflorus	Flagstaff beardtongue	8/17/2011	397	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Penstemon nudiflorus	Flagstaff beardtongue	7/7/1978	459	4	SI40	SI40	SI40	SI40
Penstemon nudiflorus	Flagstaff beardtongue	10/12/2000	460	15	SI25	SI25	SI25	SI25
Penstemon nudiflorus	Flagstaff beardtongue	10/12/2000	475	3	IT40	IT40	IT40	IT40
Penstemon nudiflorus	Flagstaff beardtongue	10/5/2000	512	2	UEA25	UEA25	UEA25	UEA25
Penstemon nudiflorus	Flagstaff beardtongue	10/4/2000	519	5	UEA25	UEA25	UEA25	UEA25
Penstemon nudiflorus	Flagstaff beardtongue	10/4/2000	519	7	Burn Only	Burn Only	No Treatment	Burn Only
Penstemon nudiflorus	Flagstaff beardtongue	10/5/2000	519	10	UEA25	UEA25	UEA25	UEA25
Penstemon nudiflorus	Flagstaff beardtongue	10/5/2000	521	8	SI25	SI25	SI25	SI25
Penstemon nudiflorus	Flagstaff beardtongue	10/4/2000	523	6	Prescribed Fire	Prescribed Fire	No Treatment	Prescribed Fire

Note: Data are derived from NRIS TESP/Invasives.

Desired future condition for Flagstaff beardtongue

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to Flagstaff beardtongue from management actions is direct losses of individuals from management actions. Incorporate mitigations and design features 2 through 8, 17 and 21above to mitigate these effects to non-significant levels.

Alternatives B, C, D and E

This analysis addresses all action alternatives. Treatments in any specific unit containing Flagstaff beardtongue may vary by alternative (see table 13) but the general effects of management actions are the same for all alternatives.

Direct and Indirect Effects

Direct and indirect effects to Flagstaff beardtongue are similar to those for Rusby milkvetch and include loss of groups or individuals of this species through management activities. Factors contributing to these effects would include physical destruction of plants or disturbance from management activities including activities such as vegetation management, spring and channel restoration and prescribed burning. These actions would be mitigated by following the mitigations and design features above to mitigate these effects to non-significant levels

Activities associated with tree removal and prescribed burning may cause some immediate losses of individuals and groups but would beneficial in the long term by reducing competition, increasing the amount of available sunlight and by increasing available nutrients. Some individuals may be lost during prescribed burning, especially in areas where only isolated individuals occur or in areas where plants were not detected during surveys. Beneficial indirect effects to Flagstaff beardtongue include reduction of tree canopy and stand density. Treatments that reduce the tree canopy and lower the stand density would benefit all understory plants including Flagstaff beardtongue by allowing more sunlight, increasing available nutrients and temporarily decreasing interspecies competition as well as intra species (between tree) competition (See Understory Report).

Most prescribed burning would be of low severity (see Fire Report). In some cases, fire severity may be higher in limited areas depending on variables such as management goals, weather, fuel conditions and topography. In these areas, there could be limited negative direct effects through deaths scattered individuals or groups of Flagstaff beardtongue if they occur at that particular location. Limited loss of small groups of plants in these cases would not significantly contribute to the overall decline of occurrences of this species within the project area or over the range of Flagstaff beardtongue. The indirect effects of higher fire severity in these areas would be similar to those for slash pile burning. Prescribed fire may be beneficial to Flagstaff beardtongue. Burning is a disturbance that can release nutrients, reduce plant competition, and increase the amount of available sunlight light. Observations by various people including Barbara G. Phillips, Zone Botanist for the Coconino, Kaibab and Prescott National Forests suggest that members of the genus *Penstemon* respond positively to burning. I observed several populations of Flagstaff beardtongue on the Stage Fire, a prescribed fire on the Kaibab National Forest west of Williams, AZ in 2001. The plants appeared healthy and I did not notice any adverse effects to the plants from burning.

One of the associated activities with several treatments includes piling of slash from management activities. Slash piles may have negative direct and indirect effects on all understory vegetation including Flagstaff beardtongue. Slash pile construction could be a possible direct negative effect if the pile is placed in or near existing groups of Rusby milkvetch. These effects would be mitigated by avoiding placing slash piles directly on existing plants and by constructing piles at least 10 to 20 feet away from existing groups. Pile burning would create locally severely burned areas at pile sites, which is a negative indirect effect. Consequences include, but are not limited to, the reduction or loss of the seed bank on these sites (Korb, 2001); death or reduction of soil organisms on the pile sites (Raison, 1979; Ballard, 2000; Korb et al., 2004) and development of hydrophobic soil (Kaye and Hart, 1998; Ballard, 2000). Slash pile sites are more prone to invasion from noxious or invasive weeds than surrounding areas and contribute to the persistence and spread of noxious or invasive weeds in treated areas. 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. Additionally, pile sites would be monitored after burning occurs to identify and treat infestations (see item 21 in mitigation measures and design features)

An indirect effect of management actions within the potential habitat of Flagstaff beardtongue includes an increased risk of invasion from noxious or invasive weeds by project level activities- . Several species of noxious or invasive weeds occur in potential habitat. These effects will be mitigated by incorporating the noxious or invasive weed treatments described in Appendix 1 and by incorporating the Best Management Practices described in Appendix B of the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds*. Incorporation of the Best Management Practices would mitigate the effects of increased disturbance from management activities, and help to control the spread and introduction of weeds within the habitat of Flagstaff beardtongue.

Direct and indirect effects of temporary road construction, road reconstruction and maintenance or road decommissioning include destruction of individual plants, localized disturbance of suitable habitat and the potential introduction of noxious or invasive weeds. These effects would be mitigated by surveying the areas where activities would occur as well as nearby areas that may be disturbed and avoiding existing plant groups

There are no known occurrences of Flagstaff beardtongue in areas being analyzed for spring and channel restoration so there will be no direct or indirect effects to Flagstaff beardtongue from those actions.

Cumulative Effects

The time limit for this discussion is from 1999 to present and represents the length of time that Flagstaff beardtongue has been on the Region 3 sensitive species list. The area of consideration is the project boundary. Past fuels reduction projects have occurred within the boundary of consideration and are in the habitat of Flagstaff beardtongue include the Williams High Risk Pre-Commercial Thin (2001)Rocky Park Fuels Reduction Project (2001), Mormon Lake Basin Fuel Reduction Project (2005), Munds Park Fuels Reduction (2009), Dogtown Fuels Reduction (2004), Pineaire Fuels Reduction (2004),Elk Park Fuels Reduction (2007) and Marshall (2010 These areas covered approximately 10% of the area of consideration. These projects did not adversely affect the abundance or distribution of Flagstaff beardtongue and when combined with the effects of this project, will not adversely affect this species.

There have been several large wildfires in the habitat of Flagstaff beardtongue. Severe wildfires can negatively alter the habitat for many species including Flagstaff beardtongue by destroying plants and significantly altering the habitat on a long-term basis. Within the project area, there have been several large wildfires in the boundary of consideration and in potential habitat of Flagstaff beardtongue, including Sawmill (2006), Birdie (2007), Raptor (2009), Real (2009), Weir (2010) and Bolt (2011). The total acreage of these fires is about 10, 500 acres representing less than 10% of the potential habitat.

Ongoing and future foreseeable actions

There are numerous occurrences of Flagstaff beardtongue in the Upper Beaver Creek Watershed Fuels Reduction Project (2010), Elk Park Meadows Fuels Reduction and Forest Health Project, (2007), Clint's Well Forest Restoration and the Mahan-Landmark Project (2014). These areas were addressed in prior NEPA but will be harvested as part of the Four Forest Restoration Initiative shelf stock.

Grazing within the project area includes grazing by domestic ungulates. Wild grazers such as elk also frequent the area. The cumulative effects of grazing include past and present loss of individual plants to grazing animals and alteration of habitat through animal impacts such as trampling and compaction.

Dispersed recreation is an ongoing activity that occurs in the habitat of Flagstaff beardtongue. Activities include hiking, horseback riding, bicycling and dispersed camping.

The Coconino and Kaibab National Forests implemented the Travel Management Rule in 2012. The cumulative effects to this and other species would be the reduction in the numbers of motorized routes and the elimination of cross-country travel. Negative effects from motorized such as crushing of plants, damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious or invasive weeds into the habitats and/or populations would be reduced. These reductions would be from the elimination of most cross-country travel and through the reduction of road density. These actions, combined with such actions as road decommissioning in this project would reduce the impacts of vehicle traffic in the habitat of Flagstaff beardtongue.

Several utility corridors are present in the potential habitat (no plants have been identified along corridor) of Flagstaff beardtongue. Construction, expansion and maintenance of these corridors would result in loss of individuals along the corridor routes. The presence of these corridors provides corridors for dispersal of noxious or invasive weeds along the utility corridor and in adjacent forested areas.

Climate change is considered in the section below.

It is my determination that

Four Forest Restoration Initiative may impact individuals of Flagstaff beardtongue *Penstemon nudiflorus* but is not likely to result in a trend toward federal listing or loss of viability.

Arizona phlox (Phlox amabilis)

Arizona phlox is endemic to central and northern Arizona where it grows on limestone and basalt soils associated with prickly pear, yucca, bear grass, hackberry, and pinyon pine. . Knowledge of the range of this species has expanded over the past few years. Not long ago, distribution was thought to be limited to the Verde Valley area but it has since been collected in other areas such as the northern fringes of the Coconino NF and on the Kaibab NF. Arizona phlox occurs in pinyon/juniper woodlands, ponderosa pine forests, desert communities and semi-desert grasslands communities. The population trends and history of Arizona phlox are unknown (Arizona Game and Fish Heritage Database Abstract, 2005) Existing condition for Arizona phlox

Arizona phlox was added to the Region 3 sensitive species list in 2013. Therefore, the forests have not conducted specific surveys for it in the past. The occurrences discussed in this section were derived from SEINet, an on-line database of collections and observations from several herbaria. There may be additional undetected occurrences within the project area.

Table 14. Treatment units containing Arizona phlox

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Phlox amabilis	Arizona phlox	4/10/1960	1504	79	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Phlox amabilis	Arizona phlox	5/31/1940	2272	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Phlox amabilis	Arizona phlox	5/12/2005	2219	28	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Phlox amabilis	Arizona phlox	5/26/2012	4141	7	Burn Only	Burn Only	Burn Only	Burn Only

Note: Data are derived from NRIS TESP/Invasives

Desired future condition for Arizona phlox

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to Arizona phlox from management actions is direct losses of individuals from management actions. Incorporate mitigations and design features 2 through 8, 13, 14, 15, 17 and 21 above to mitigate these effects to non-significant levels.

Alternatives B, C, D and E

This analysis addresses all action alternatives. Treatments in any specific unit containing Arizona phlox may vary by alternative but the general effects of management actions are the same for all alternatives.

Direct and Indirect Effects

Direct and indirect effects to Arizona phlox are similar to those for Rusby milkvetch and include death or destruction of groups or individuals through management activities. These direct effects are mitigated by following mitigations and design features 2 through 8, 17 and 21 above to mitigate these effects to non-significant levels.

Most of the occurrences of Arizona phlox are in treatments scheduled for burning. The effects of burning on Arizona phlox are undocumented (Baker, 2010). In a study on the short-term effects of burning in savannas, a perennial tap-rooted phlox; *Phlox pilosa* showed delayed flowering in response to early season burning (Pavlovic et al., 2011) but it is unknown if Arizona phlox would exhibit a similar response. Another perennial, tap-rooted species (*Phlox hoodii*) is an early seral species but abundance may be reduced in the early postfire community (Gucker, 2006). Based on these data, there may be some initial reductions in the abundance of Arizona phlox in the units scheduled for burning but long term negative effects are not anticipated.

Cumulative effects

There is no information about the cumulative effects of management actions on Arizona phlox in the project area since the species was added to the Region 3 sensitive species list in 2013 and the effects to it were not considered in past analyses. The effects of management activities were likely similar to those for the other Region 3 sensitive species.

Ongoing and future foreseeable actions

Grazing within the project area includes grazing by domestic ungulates. Wild grazers such as elk also frequent the area. The cumulative effects of grazing include past and present loss of individual plants to grazing animals and alteration of habitat through animal impacts such as trampling and compaction.

Dispersed recreation is an ongoing activity that occurs in the habitat of Arizona phlox. Activities include hiking, horseback riding, bicycling and dispersed camping.

The Coconino and Kaibab National Forests implemented the Travel Management Rule in 2012. The cumulative effects to this and other species would be the reduction in the numbers of motorized routes and the elimination of cross-country travel. Negative effects from motorized such as crushing of plants, damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious or invasive weeds into the habitats and/or populations would be reduced. These reductions would be from the elimination of most cross-country travel and through the reduction of road density. These actions, combined with such actions as road decommissioning in this project would reduce the impacts of vehicle traffic in the habitat of Arizona phlox.

Climate change is considered in the section below.

It is my determination that

Four Forest Restoration Initiative may impact individuals of Arizona phlox *Phlox amabilis* but is not likely to result in a trend toward federal listing or loss of viability.

Blumer's dock (Rumex orthoneurus)

Blumer's dock is a large, long-lived herbaceous perennial plant endemic to New Mexico and Arizona. Habitat for the species is mid- to high-elevation wetlands with moist, organic soil adjacent to perennial springs or streams in canyons or meadows (Arizona Game and Fish Heritage Database Abstract, 2002). Blumer's dock was proposed for federal listing in 1998, but genetic studies and surveys have shown that its' distribution was much wider than initially thought (USFWS, 1999).

Existing condition for Blumer's Dock

The known distribution of Blumer's dock in the project area is limited to a few enclosures around springs and wet areas. Known occurrences of Blumer's dock within the project area are limited to the Hart Prairie Area, where it shares the habitat with Bebb's willow. The area was analyzed in the Hart Prairie Fuels Reduction Project (2010). There may be other occurrences at other locations in the project area where suitable habitat exists. Documented threats to Blumer's dock include grazing, water diversions, mining and recreation (USFWS, 1999).

Desired future condition for Blumer's dock

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to Blumer's dock from management actions is direct losses of individuals from management actions. Incorporate mitigations and design features 2 through 8, 13, 14, 15, 17 and 21 above to mitigate these effects to non-significant levels.

Alternatives B, C, D and E.

This analysis addresses all action alternatives. Treatments in any specific unit containing Blumer's dock may vary by alternative but the general effects of management actions are the same for all alternatives.

Direct and Indirect Effects

The most important effects to Blumer's dock from this project are activities that affect springs and channels on which it is dependent for habitat. Effects from other activities including tree removal and prescribed burning are similar to those for other species (see Rusby milkvetch) but are somewhat less important to this species since it is dependent on wet areas for its survival.

Direct effects of spring and channel restoration would include deaths of individual plants or population groups during implementation. Management actions such as digging, soil disturbance and related activities associated with spring restoration may impact individual plants if they are present on the site. These risks will be mitigated by surveying and avoiding plants.

Restoration work for springs and channels would benefit the habitat and provide areas for natural generation or re-introduction. An example of this is the enclosures at the Hart Prairie Preserve (Nature Conservancy) and the adjacent Fern Mountain Botanical Area (CNF) where a robust population of Blumer's dock exists within the enclosure where it has been protected from grazing by livestock and wildlife since construction of the enclosures in 1995. These plants “appeared” after construction of the enclosures but seeds or roots for them were present in the area for many years. Plants outside the enclosures are subjected to grazing and are much reduced in size or absent.

Restoration at springs as part of this project, especially in areas where fencing may occur could result in similar results for this rare species. Currently there are no plans to reintroduce this species into enclosures within the project area but these areas would provide sites if future efforts are considered.

An indirect effect to Blumer's dock is the threat wildfires, especially in cases where severe fires result in sedimentation and channel cutting (USFWS, 1999). In these situations, habitat and plants are lost. The sum of management activities in this project that are designed to reduce the risks of uncharacteristic wildfire and restore natural fire cycles would reduce these risks to many understory plants including Blumer's dock.

Direct and indirect effects of temporary road construction, road reconstruction and maintenance or road decommissioning include destruction of individual plants, localized disturbance of suitable habitat and the potential introduction of noxious or invasive weeds. These effects would be mitigated by surveying the areas where activities would occur as well as nearby areas that may be disturbed and avoiding existing plant groups

An indirect effect of management actions within the potential habitat of Blumer's dock includes an increased risk of invasion from noxious or invasive weeds. Several species of noxious or invasive weeds occur in potential habitat. These effects will be mitigated by incorporating the noxious or invasive weed treatments described in Appendix 1 and by incorporating the Best Management Practices described in Appendix B of the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds*. Incorporation of the Best Management Practices would mitigate the effects of increased disturbance from management activities, and help to control the spread and introduction of weeds within the habitat of Blumer's dock.

Cumulative effects

The area of consideration for this discussion is the project boundary. The timeframe for this discussion is from 1991 when the nearby Tonto National Forest prepared a Management Plan for Blumer's dock to present. This discussion is based on the knowledge of locally occurring groups and references for this species. Many cumulative effects to Blumer's dock are similar to those for Bebb's willow.

Past actions that have affected the abundance and distribution of Blumer's dock on the forest include historic water diversions, grazing and recreation. The extent of these effects is unknown.

Persistent drought in the northern Arizona area that began in 1996 and lasted for over 10 years probably affected the abundance and distribution of Blumer's dock due to its affinity for wet areas. The extent of the effects of drought is unknown and is a natural phenomenon outside of agency control. The drought compounded such effects as fire severity and impacts from grazers seeking water sources that decreased in availability during the drought.

Grazing within the project area includes grazing by domestic ungulates. Wild grazers such as elk also frequent the area. The cumulative effects of grazing include past and present loss of individual plants to grazing animals and alteration of habitat through animal impacts such as trampling and compaction.

Dispersed recreation is an ongoing activity that occurs in the habitat of Blumer's dock. Activities include hiking, horseback riding, bicycling and dispersed camping.

The Coconino and Kaibab National Forests implemented the Travel Management Rule in 2012. The cumulative effects to this and other species would be the reduction in the numbers of motorized routes and the elimination of cross-country travel. Negative effects from motorized such as crushing of plants, damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious or invasive weeds into the habitats and/or populations would be reduced. These reductions would be from the elimination of most cross-country travel and through the reduction of road density. These actions, combined with such actions as road decommissioning in this project would reduce the impacts of vehicle traffic in the habitat of Blumer's dock.

Several utility corridors are present in the potential habitat of Blumer's dock. Construction, expansion and maintenance of these corridors would result in loss of individuals along the corridor routes. The presence of these corridors provides corridors for dispersal of noxious or invasive weeds along the utility corridor and in adjacent forested areas.

The U. S. Fish and Wildlife Service considered a petition for listing Blumer's dock as threatened in 1999 but decided that listing was unwarranted. Threats analyzed in that process included livestock grazing, recreation, water development, road construction and maintenance, logging, mining and wildfire as causing the loss or degradation of riparian and cienega habitats needed by Blumer's dock. These threats were stated in the petitioning analysis and were addressed in the 1999 Federal Register. Comments on these issues combined with documentation of more widespread distribution and resolution of genetic relationships to the more common *Rumex occidentalis* led to the withdrawal of the petition.

Ongoing and future foreseeable actions

Management activities that were analyzed as part of the Hart Prairie Project (2010) will continue to be initiated including several activities in or near the Hart Prairie Preserve and Fern Mountain Botanical Area. Ongoing activities include construction and/or reconstruction of several enclosures that will provide refugia for Blumer's dock.

Climate change is considered in the section below.

It is my determination that

Four Forest Restoration Initiative may impact individuals of Blumer's dock *Rumex orthoneurus* but is not likely to result in a trend toward federal listing or loss of viability.

Bebb's Willow (Salix bebbiana)

Bebb's willow (*Salix bebbiana*) is a large native shrub or a small bushy tree fifteen to twenty-five feet tall that ranges from Alaska south to British Columbia to east Newfoundland and in northeast

United States and upper mid-western United States. Bebb's willow plants can regenerate from root and basal stem sprouting. Stem and root fragments root naturally if buried in moist soil. Bebb's willow plants are dioecious: male and female flowers are borne on separate plants. Large quantities of seed may be produced but remain viable for only a few days. Bebb's willow is drought and shade intolerant. Changes in water regime such as channel changes reduce successful germination from seed (Tesky, 1992). Bebb's willow was added to the Region 3 Sensitive Species list for the Coconino National Forest in 2007, but not a sensitive species for the Kaibab National Forest. .

Existing condition for Bebb's willow

The largest population of Bebb's willow on the Coconino National Forest occurs in the Hart Prairie area, which has approximately 1300 plants. Conservation of Bebb's willow is the focus of the Fern Mountain Botanical Area and is a species of major interest on the adjacent Nature Conservancy Hart Prairie Preserve. These areas are within the project boundary but have been analyzed in a separate project. Locations elsewhere on the forests are comprised of single plants or small groups, not the unique riparian scrub community at Hart Prairie. Documented locations include the Hart Prairie area, Kehl Springs, Merritt Draw, Mormon Lake Area, Upper West Fork and Fernow Draw on the Coconino National Forest. There are Bebb's willows in two stands scheduled for treatment in the Mormon Lake area. These include location 435 site 3, which is scheduled for burning only and 454/3which is scheduled to be thinned and burned. Location 454 site 3 is the area surrounding Double Spring, which is being evaluated for spring restoration. Several groups of Bebb's willow occur in the area of Sawmill Spring in location 548 site 3, 704/6, 704/12, 531/7 and 541/13. Many of these plants are dead or decadent and some are heavily browsed Location 548 site 3 is scheduled for channel restoration and operational burning in is project. Location 704 sites 6 and 12 are scheduled for thinning and burning accompanied by operation burning. Location 531 site 7 and location 541 site 13 are in a Mexican spotted owl PAC and are scheduled for thinning and burning.

There are no documented locations of Bebb's willow within the project area on the Kaibab National Forest but Bebb's willows may be present in some areas such as around springs and channels. These areas will be surveyed before implementation and mitigation measures and design features (see mitigation #2) would be incorporated as needed.

This discussion is designed to address a public comment on the need to protect Bebb's willows during management actions. The commenters based their concerns on the need for action for this species identified in the Hart Prairie Project (2010) thought it merited consideration on a project wide basis. The need for action in Hart Prairie was based on the unique high elevation riparian community that exists there as well as the special land designations; Fern Mountain Botanical Area under the control of the Forest Service and the adjacent Hart Prairie Preserve owned and managed by the Nature Conservancy. We considered their concerns valid and considered them in this discussion.

Desired condition for Bebb's willow

The analysis question to be answered for this and all Region 3 sensitive species is:

How would proposed treatments affect Region3 Forest Service species plant species?

The most significant effect to Bebb's willow from management actions is direct losses of individuals from management actions. Incorporate mitigations and design features 2 through 8, 13, 15, 16 17 and 21 above to mitigate these effects to non-significant levels.

Alternatives B, C, D and E

This analysis addresses all action alternatives. Treatments in any specific unit containing Bebb's willow may vary by alternative but the general effects of management actions are the same for all alternatives.

Direct and indirect effects

Direct and indirect effects to Bebb's willow are similar to those for Rusby milkvetch and include loss of populations or individuals of this species through management activities. Factors contributing to these effects would include physical destruction of plants or disturbance from management activities including activities such as vegetation management, spring and channel restoration and prescribed burning. These actions would be mitigated by following the mitigations and design features above to mitigate these effects to non-significant levels

The direct effects of prescribed burning on Bebb's willow include deaths of plants but this risk would be mitigated by surveying and protecting plants during prescribed burning Fire may be beneficial to Bebb's willow by promoting sprouting and aiding in long distance dispersal of seed under some conditions (Tesky, 1992). However, new sprouts are subject to grazing and are frequently consumed by grazers. This occurred in 2001 when a prescribed fire escaped its boundary into the Bebb's willow community in Fern Mountain Botanical Area (CNF), destroying the above ground portions of about 50 plants. These plants regenerated from basal sprouts but grazers consumed the new growth resulting in death of the plants. Mitigations to prevent further occurrences of this were incorporated into the Hart Prairie Project (2010). These included placing fire lines around the Bebb's willow stands and removing dead branches within the clumps to help prevent fire from entering the Bebb's willow clumps where woody debris had accumulated. In that project, fencing will be used to protect vegetative regeneration and young seedlings from grazing. These mitigations would be used in this project as well (see mitigations 13, 15, 16 and 17.

Direct **effects** of spring and channel restoration would include deaths of individual plants or population groups during implementation. Management actions such as digging, soil disturbance and related activities associated with spring restoration may impact individual plants if they are present on the site. These risks would be mitigated by surveying and avoiding plants.

Restoration work for springs and channels would benefit the habitat and provide areas for natural generation or re-introduction of Bebb's willow. An example of this is the enclosures at the Hart Prairie Preserve (Nature Conservancy) and the adjacent Fern Mountain Botanical Area (CNF) where a robust population of Bebb's willow exists within the enclosure where it has been protected from grazing by livestock and wildlife since construction of the enclosures in 1995. Enclosures proposed in project would provide similar opportunities (see Silviculture, Wildlife and Watershed reports).

Management actions for spring and channel improvements may benefit Bebb's willow in certain areas and these areas would be surveyed for Bebb's willow presence before implementation. Spring restoration sites may also serve as potential -planting sites to increase Bebb's willow occurrences in the project area. Such sites include the stands in the Mormon Lake and Sawmill Springs areas, where opportunities exist to protect and enhance the Bebb's willow groups present on the sites. Sites such as these may be enhanced using cuttings, planting locally cultivated plants and fencing the existing or newly planted willows. Manual grubbing of grasses may be used in areas where willows are planted to increase the likelihood of success. Fencing or other protective measures are needed on sites where Bebb's willows are present to assure protection to protect existing plants and provide safe havens for naturally occurring or planted young plants.

The Sawmill Spring area has been identified as a priority area where existing plants need restoration and protection. The area contains several old plants that are decadent with no regeneration of younger plants. Over time, Bebb's willows will disappear from this area without intervention. Without fencing, enhancement or regeneration in these areas would not likely be successful. The area is in a Mexican Spotted Owl PAC and there is concern for potential owl mortality from wire fences. Alternatives to wire fencing will be used in this area. Alternatives include but are not limited to sucker rod (welded iron), pipe rail or other barriers such as wooden fences. Forest and/or District Wildlife Biologists would be consulted before constructing features in this area.

Restoration work for springs and channels that are a part of this analysis may benefit the habitat and provide areas for natural generation or re-introduction of Bebb's willow. Examples of restoration activities benefitting the species are the enclosures at the Hart Prairie Preserve (Nature Conservancy) and the adjacent Fern Mountain Botanical Area (CNF) where a cohort of Bebb's willow plants that originally began as seedlings in 1995 exists within the enclosure where it has been protected from grazing for several years.

Sedimentation and channel cutting are threats to this species. Spring and channel restoration would reduce those risks by improving degraded watershed conditions. Improperly placed or maintain roads may contribute to sedimentation and channel cutting in some areas. Activities to maintain and improve roadways that are included in the management activities for Four Forest Restoration Initiative will benefit the overall watershed condition and will therefore benefit the habitat in general.

High severity wildfires may contribute to the development of sedimentation and channel cutting. In these situations, habitat and plants are lost. Management activities to reduce the risks of uncharacteristic wildfire and restoring natural fire cycles would reduce the risk to many understory plants including Bebb's willow.

Cumulative effects

The boundary of this discussion is the **Coconino NF portion of the project area**. The timeline for this discussion begins in 1987 with the publication of the Coconino NF Plan. **Cumulative effects to Bebb's willow on the Kaibab NF were excluded from this discussion because there are no documented occurrences in the Kaibab portion of the project and Bebb's willow has no special status on the Kaibab NF.**

The Coconino NF has long recognized the rarity on the landscape for Bebb's willow. The Fern Mountain Botanical Area was established in 1987 in the Coconino National Forest Plan that contains a unique Bebb's willow community. This community is the southernmost occurrence of this habitat type, which is more common in the northern U. S. and Canada. Elsewhere in the project area, Bebb's willows are limited to single plants or groups of plants and the unique Bebb's willow community type is not present.

Conservation of Bebb's willow is the focus of the Fern Mountain Botanical Area and is a species of major interest on the adjacent Nature Conservancy Hart Prairie Preserve. The Fern Mountain Botanical Area is included in Management Area 17 of the Coconino National Forest Plan and is "a 186-acre high elevation riparian scrub community is dominated by Bebb's willow, and represents a unique riparian community". The adjoining Hart Prairie Preserve owned and managed by the Nature Conservancy contains 245 acres. Approximately 1300 Bebb's willow plants occur in the Hart Prairie area in the botanical area and the Hart Prairie Preserve. Much of the work at the Preserve focuses on conservation of the Bebb's willow community, which is a globally rare community type. The Hart Prairie Preserve was established in 1994. A local family, owners of The Homestead at Hart Prairie, learned that the site contained a globally rare Bebb's willow community and donated the site. Since then the Conservancy has taken numerous actions to benefit the Bebb's community, including reconstruction of the access road to the Preserve to improve water flow across the property, planting, fence maintenance and monitoring.

Forest botanists have collaborated with Nature Conservancy personnel to study and monitor Bebb's willow in the area since 1995. Activities included construction of two enclosures, one on Conservancy property and one on forest property to facilitate and monitor regeneration of Bebb's willow, inventory and mapping of mature trees and removal of a metal stock tank. The Conservancy has done roadway reconstruction on their property and adjacent Forest Service property to improve drainage and restore a more natural water flow to the prairie habitat. Actions included bridge reconstruction, removal of culverts and installation of French drains in the roadway leading to the Conservancy buildings on Hart Prairie Preserve property. Additionally, Peaks District conducted a project in 2001 that focused on habitat restoration in the area near the Preserve.

In 1991, the Hochderffer Area Analysis Scoping Document described the objective of the Botanical Area is to "improve the age classes, distribution and quantity of riparian plants, especially the Bebb's willow. " All actions in this area should be evaluated according to their effect on the plant community" (page. 7). Another part of the plan (page 3) describes improvement of species diversity as a goal. The actions outlined the Hochderffer Analysis were not initiated because the deciding official selected the "no action" alternative from the NEPA analysis.

In 1998, the Arizona Water Protection Fund authorized and funded the development of a plan for fencing and grazing in the Hart Prairie area, continuing an on-going restoration effort between the Nature Conservancy, Northern Arizona University and the Coconino National Forest begun in 1995.

During a prescribed burn, fire entered the Bebb's willow stand, killing the above ground portions of approximately 50 individuals. This burning, combined with grazing on basal sprouts on the affected plants resulted in mortality of these plants.

In 2007, Bebb's willow was added to the Region 3 sensitive species list for Coconino National Forest. Bebb's willow is a Region 3 sensitive species for the Coconino NF but not the Kaibab NF.

Ongoing and future foreseeable actions

Management activities that were analyzed as part of the Hart Prairie Project (2010) will continue to be initiated including several activities in or near the Hart Prairie Preserve and Fern Mountain Botanical Area. Ongoing activities include construction and/or reconstruction of several enclosures that will provide refugia for Bebb's willow. Young Bebb's willows are being planted in the enclosures, which will improve the distribution of age classes.

The Apache Maid Allotment analysis, which is a concurrent but unrelated analysis, includes the Railroad Spring area. The ID team recognized the need for action to restore the spring area, channel and Bebb's willow but did not include Bebb's willow protection and regeneration of it in their analysis.

Climate change is considered in the section below.

It is my determination that

Four Forest Restoration Initiative may affect individuals of Bebb's willow *Salix bebbiana* **but is not likely to result in a trend toward federal listing or loss of viability**.

Climate Change

Climate change could affect the distribution of vegetation in general by affecting biotic and abiotic factors and by increasing the extent and severity of disturbances (USDA Forest Service 2010). **Rare and sensitive species** may be especially vulnerable because they often need specific habitat components such as specialized soil types that are not widely available. This could negatively affect their abilities to migrate to suitable areas as environmental conditions change. Water availability may decrease in some areas while temperatures generally increase. Alpine habitats may disappear entirely as elevational vegetation shifts occur (USDA Forest Service, 2010). Future plant distributions in general may be governed by several factors including human influences, abilities of plants to disperse, and the presence of suitable habitat components including such factors as suitable soil types (McKenney et al, 2007). Large changes in ecosystem structure and species composition of plant communities are expected due to increasing temperatures and altered precipitation cycles (USDA Forest Service, 2010). Species have responded to climate change throughout their evolutionary history, but not at rates seen in recent climate change (Root et al, 2003). Phenology shifts in vegetation communities in large regions have been noted. These include shifts in the beginning, ending and length of growing seasons in temperate regions of the northern hemisphere. The results have been earlier emergence and blooming of flowering plants, extended end of season and longer growing seasons. Changes in growing season may affect climate by affecting surface radiation, temperature, hydrology and carbon cycling (Jeong et al, 2011). Trophic mismatches have been documented for several species (Parmesan, 2006) leading to disruption on symbiotic relationships and plant/animal interactions. In a review of many studies on climate change, Root et al, 2003 determined that "the balance of evidence for these studies strongly suggests that a significant impact to global warming is already discernible in animal and plant populations". Climate change coupled with other factors such as habitat loss could lead to extirpations and increased risks of extinction. Species generally respond to rapid climate change at differential rates. These differential movements may lead to loss of connectedness and loss of communities (Root et al, 2003). While the actions of this project will not mitigate widespread climate change, actions will provide more resiliency to our local vegetative communities (see Silviculture and Understory Reports), restore natural fire regimes and reduce the risk of habitat loss due to uncontrolled wildfire (see Fire Report).

Noxious or invasive weeds

Note: comments were received from Ecological Restoration Institute concerning the ranking of noxious or invasive weeds in this document as well as the inclusion of information on the fire effects on the species addressed in this analysis. We incorporated some of those comments but did not change the species ranking presented in table 15. This ranking is based used in the Final *Environmental Impact Statement* (FEIS) *for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona* (2005), which provides the foundation and guidance for noxious or invasive weed management for the forests and the project area. See comment 165-47 in Appendix F.

This analysis is based on the following **assumptions.** See additional assumptions above.

- The mitigation measures and design features will be incorporated into project design and implementation
- Surveys will be conducted in treatment areas before implementation
- Areas to be treated will be surveyed noxious or invasive weeds before treatments are implemented.
- All management activities will occur as analyzed in the various specialists reports and described in the FEIS.
- These factors should be considered when identifying survey needs
    - Likelihood of any of the species addressed in this document occurring within the treatment area
    - Amount of disturbance. For example, surveys may not be needed in areas scheduled for prescribed burning if the treatments are scheduled to be of low intensity.
- The mitigations and Best Management Practices addressed in this document are included in analysis and project implementation. See table 4 above for these features.
- The acreage of potential disturbance in this project is much larger than generally analyzed in similar projects, necessitating more noxious or invasive weed treatments to control invasive species. This will lead to increases in personnel and budget to accomplish this need.

Noxious or invasive weeds on the Coconino and Kaibab National Forests are managed using the guidance of the Final Environmental Impact Statement (FEIS) for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (2005). The FEIS establishes goals for treatment of noxious weed species on the three participating forests, provides guidance for all site-disturbing projects on the forest, allows herbicide treatment on forestlands and provides best management practices to help prevent the spread of noxious or invasive weeds. The FEIS was incorporated into the Coconino NF forest plan (and former Kaibab NF forest plan) by amendment in 2005. The revised Kaibab NF Plan (2014) addresses noxious or invasive weeds through a series of desired conditions, guidelines, objectives and management approaches (see pages 53-55 of that document). These are compatible with past direction.

The rankings in Table 15 below were taken from pages 16 and 17 of the FEIS. Twenty-five species were addressed in the FEIS. These species were prioritized using various criteria including difficulty of control, successes with control efforts elsewhere, lifecycle (perennial vs. annual), acreage on the forests and potential damage to resources. Rankings begin at number 1 with leafy spurge as the priority species for control on the forests. Within the context of the analysis, prevention means minimizing introduction of a weed species into the project area and is combined with eradication to allow for elimination of spot populations as they arise. Eradication means attempting to eliminate a species from the forests. Control means preventing seed production throughout a target patch and reducing the area covered by a species, whereas contain means to prevent the species from expanding beyond the perimeter of existing patches. The treatment and control rankings in this table are from the Noxious Weed FEIS and are based on the area-wide goals identified for the Coconino, Kaibab and Prescott NFs. Priorities may be reviewed and revised for treatment units at the time of implementation

Table 15. Noxious or invasive weeds within the treatment units of Four Forest Restoration Initiative

Species*	Common Name	Species Rank	Objective	Known to occur in treatment areas (Y/N)
Euphorbia esula	leafy spurge	1	Eradicate	Y
Centaurea solstitialis	yellow starthistle	2	Eradicate	N
Centaurea melitensis	Malta starthistle	3	Eradicate	N*
Alhagi maurorum Syn. Alhaghi pseudoalhagi	camelthorn	4	Contain/Control	Y
Acroptilon repens	Russian knapweed	5	Contain/Control	Y
Cardaria draba	whitetop	6	Eradicate	Y
Salvia aethiopis	Mediterranean sage	7	Eradicate	Y
Carduus nutans	musk thistle	8	Eradicate	Y
Centaurea diffusa	diffuse knapweed	9	Contain/Control	Y
Centaurea stoebe ssp. micranthos *Syn. Centaurea maculosa, Centaurea biebersteinii*	spotted knapweed	10	Eradicate	Y
Onopordum acanthium	Scotch thistle	11	Eradicate/Control	Y
Elaeagnus angustifolia	Russian olive	12	Contain/Control	N*
Tamarix spp.	salt cedar	13	Contain/Control	Y
Rubus procerus *Syn. R. armeniacus or R. discolor*	Himalayan blackberry	14	Contain/Control	N*
Cynoglossum officinale	houndstongue	15	Eradicate	N
Arundo donax	giant reed	16	Contain/Control	N*
Potentilla recta	sulfur cinquefoil	17	Prevent/ Eradicate	N*

Species*	Common Name	Species Rank	Objective	Known to occur in treatment areas (Y/N)
Linaria dalmatica	Dalmatian toadflax	18	Contain/Control	Y
Ailanthus altissima	tree of Heaven	19	Contain/Control	N*
Cirsium vulgare	bull thistle	20	Contain/Control	Y
Ulmus pumila	Siberian elm	21	Contain/Control	N*
Bromus tectorum	cheatgrass	22	Contain/Control specific populations	Y
Avena fatua	wild oats	23	Contain/Control	N*
Dipsacus fullonum	common teasel	24	Eradicate	N*
Chrysanthemum leucanthemum Syn Leucanthemum vulgare	oxeye daisy	Unassigned	Prevent/Eradicate	N
Cirsium arvense	Canada thistle	Unassigned	Prevent/Eradicate	N*
Halogeton glomeratus	halogeton	Unassigned	Prevent/Eradicate	N*
Isatis tinctoria	dyers woad	Unassigned	Prevent/Eradicate	N*
Myriophyllum spicatum ♦	Eurasian water milfoil	Unassigned	♦	N

N* = these species are not known to occur within treatment areas for the project, but are of concern due to their proximity and potential effects to restoration treatments. Partners have expressed concern for these species. Their rating system is explained below (Smith, 2012).

Partner Rankings

The Landscape Working Group and Science and Monitoring Group (LSWG-SMWG) representing Four Forest Restoration Initiative external partners have expressed concern for the following noxious or invasive weed species. Their rankings, goals for management and rationale are discussed below. These concerns were considered and incorporated into the discussion on noxious or invasive weeds.

High Risk -- These species currently have limited geographic distribution within Four Forest Restoration Initiative treatment areas, and if current inventories indicate their presence within treatment areas, these species should be eradicated as soon as practicable.

These species include leafy spurge (*Euphorbia esula*), camelthorn (*Alhagi maurorum*) spotted knapweed (*Centaurea maculosa*), diffuse knapweed (*Centaurea diffusa*), Russian knapweed (*Acroptilon repens*), white top (*Cardaria draba*), Mediterranean sage (*Salvia aethiopis*), Scotch thistle (*Onopordum acanthium*), salt cedar (*Tamarix spp.)* and musk thistle (*Carduus nutans*). The FEIS goal of eradication for leafy spurge, white top, musk thistle spotted knapweed, and Scotch thistle is the same as given by the partners. The goals assigned to the other species differ, with the Forest Service goals for area-wide control of these species generally being slightly lower on an area-wide basis but adaptive management allows for site-specific goals as well. Therefore, the partners' goal eradication of these species within treatment units is not in conflict with the goals of the FEIS.

Medium Risk -- These species have widespread distribution within Four Forest Restoration Initiative treatment areas in large populations, with either no effective treatment, or cost-prohibitive effective treatment, or for which effectiveness of current treatment strategies is unknown or not monitored. The stakeholders recommend that areas should be prioritized for treatment based on risk to conservation value (presence or proximity of TES species) and areas of high wildlife habitat value (e.g., pine-sagebrush ecotone). Stakeholders also recommend that weed treatment strategies be monitored for effectiveness to gauge return on investment. The Four Forest Restoration Initiative includes several forms of monitoring including implementation effectiveness and adaptive management.

These species include cheatgrass (*Bromus tectorum*), Dalmatian toadflax (*Linaria dalmatica*), bull thistle (*Cirsium vulgare*), and wild oats (*Avena fatua*).

We concur with these recommendations and have incorporated them into the discussions below.

Watch List -- The partners prepared this list of species as species to watch for and exclude from treated areas. If these species are detected, aggressive eradication efforts should be a top priority and applied quickly. We reviewed the documented locations for these species and found none in the areas to be treated. We concur with the partners' assessment.

These species include Malta starthistle (*Centaurea melitensis*), Russian olive (*Elaeagnus angustifolia*), yellow starthistle (*Centaurea solstitialis*) Himalayan blackberry (*Rubus armeniacus* and *Rubus discolor*), giant reed (*Arundo donax*), sulfur cinquefoil (*Potentilla recta*), tree of heaven (A*ilanthus altissima*), Siberian elm (*Ulmus pumila*), halogeton (*Halogeton glomeratus*), dyer's woad (*Isatis tinctoria*), Eurasian water-milfoil (*Myriophyllum spicatum*), oxeye daisy (*Leucanthemum vulgare*), and Canada thistle (*Cirsium arvense*), common teasel (*Dipsacus sylvestris*)

Desired conditions for noxious or invasive weeds include

The analysis question to be answered is:

How would project activities affect the presence of noxious or invasive weeds?

This analysis issue also responds to concerns raised by the public on the potential for project activities to increase cheatgrass and spotted knapweed occurrences. Indicators used to evaluate environmental consequences are: (1) qualitative evaluation of compliance with the Forest Plans per the direction in the "Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds for Coconino, Kaibab and Prescott National Forests", (2) qualitative evaluation on whether noxious weeds and non-native invasives would have the potential to increase with mitigation, best management practices, and design features applied, (3) qualitative evaluation of the conflict between noxious or invasive weeds and the Region 3 Sensitive Plants,

- The management actions untaken in this project are **complementary and enhance the control objectives** for each noxious or invasive weed species as identified in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds for Coconino, Kaibab and Prescott National Forests.

- Appropriate treatments to **mitigate** the effects of management actions on noxious or invasive weeds **are incorporated** into the project design and implementation.
- Appropriate **Best Management Practices** as outlined in Appendix B of the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (FEIS) are incorporated into the project design and implementation. The unit of measure is compliance and effectiveness of BMPs as outlined in the 3 forest noxious or invasive weeds

Locations for noxious or invasive weeds within management units for this project are documented in Appendix B.

Effects Common to all species

Alternative A No Action

The Council on Environmental Quality (CEQ) regulations (40 CFR 1502. 14d) requires that a "No Action" alternative be analyzed. This alternative represents the existing condition against which the other alternatives are compared.

Direct and Indirect Effects

Under the No Action alternative current management activities would continue and those authorized by separate NEPA projects analyzed using the guidance of the Coconino and Kaibab NF Forest Plants would continue to occur. Examples of these include recreation, range and fuels reduction projects that occur within the footprint of this analysis but are not included in this analysis.

There would be no direct effects to noxious or invasive weeds from management actions associated with the Four Forest Restoration Initiative project because none would occur. Mitigation measures, treatments and surveys that would have been part of the Four Forest Restoration Initiative project for noxious or invasive weeds would not occur. As a result, weed infestations that would have been detected and treated would go unnoticed and continue to expand unless detected by other surveys or independent observations. Treatments that would have been part of the mitigating actions of Four Forest Restoration Initiative management would not be accomplished. As a result, weed infestations within the treatment units of Four Forest Restoration Initiative would not occur unless the locations are included in another project area or are treated by a cooperating agency. For example, treatments along highways or roadways in coordination other agencies would continue but would not expand outside of highway right of ways. The on-going weed treatments for several species in recently analyzed or future projects not included in the Four Forest Restoration Initiative such as releases of biological control insects in various parts of the forests, treatments in recent or future wildfires where noxious or invasive weeds may be problematic and would continue. These projects would not cover as much area as that being analyzed under Four Forest Restoration Initiative.

T Alternative A is the no action alternative. Under this alternative, there would be no treatments authorized by the Four Forest Restoration Initiative decision. There would be no concern for these species in the Four Forest Restoration Initiative process. Management activities authorized and analyzed.by the Coconino and Kaibab National Forest Plans as well as the previously analyzed projects would continue to occur. Treatment would continue in other projects noxious or invasive weeds occur but would not be as comprehensive as would be available in the Four Forest Restoration Initiative. The risk of noxious or invasive weeds spreading into the treatment units would continue, but not due to Four Forest Restoration Initiative management activities. Activities such as vehicle travel, dispersed recreation and wildfires could potentially introduce these and other species into the treatment areas. If the no action alternative were selected, there would be no monitoring or surveys directed by the Four Forest Restoration Initiative process. Detection of these species in the treatment areas would be incidental or would occur because of other management actions in the area.

Cumulative Effects

The boundary for this cumulative effects analysis is the Coconino and Kaibab NFs. This discussion includes management actions related to noxious or invasive weeds since 1995. Management activities and disturbances prior to 1995 have contributed to the establishment and distribution of noxious or invasive weeds on the Forest. Past forest activities such as grazing, vegetation treatments, recreation uses, mining, infrastructure development and maintenance, road maintenance and travel along roadways, including paved roads and highways, affected the abundance and distribution of noxious or invasive weeds. However, without information on known distribution of noxious or invasive weed species, the past effects of management actions are unclear. Sources of introduction for noxious or invasive weeds are often unknown or difficult to verify.

Prior to 1995, occurrences and distribution of noxious or invasive weeds on the forests were largely unknown. Beginning in 1995, the Coconino and Kaibab NFs began surveying and documenting noxious or invasive weed occurrences on the Coconino National Forest. These actions were largely due to an increasing awareness of noxious or invasive weeds and their potential effects on native ecosystems. Location data were submitted to the Southwestern Exotic Plant Mapping Program (SWEMP), a cooperative effort hosted by the USGS Colorado Field Station. SWEMP compiled data from numerous cooperating agencies including the US Forest Service. The surveys by these agencies as well as other cooperators helped document the occurrences and areal extent of noxious or invasive weeds forests. Noxious or invasive weed data from the forests were submitted to SWEMP from 1995 through 2003 when the forest replaced the SWEMP system with its own Natural Resource Information System (NRIS) threatened, endangered and sensitive plants and invasive species (TESP/INPA) database. This database later morphed into the National Resource (NRM)/TESP-Invasives database; which is the current national database of record for management of threatened, endangered and sensitive plant locations as well as non-native invasive locations, surveys and treatments.

The Forest developed the *Noxious Weeds Strategic Plan Working Guidelines Coconino, Kaibab and Prescott National Forests* in 1998 to help address and mitigate effects to noxious or invasive weeds by management actions on the forests. Forest Supervisors for the three forests accepted and signed the guidelines, which designated a series of best management practices to be incorporated into project planning and implementation on the forests. In 2002, the Peaks and Mormon Lake Ranger Districts completed the Flagstaff/Lake Mary Ecosystem Analysis (FLEA)**,** a major landscape analysis. Among other issues, it addressed noxious or invasive weeds in certain management areas with the FLEA analysis area, incorporating the guidance provided by the Strategic Plan. In 2003, Region 3 of the U. S. Forest Service completed the *Environmental Assessment for Management of Noxious Weeds and Hazardous Vegetation on Public Roads on National Forest System Lands in* Arizona, which allows treatment of noxious or invasive weeds along highway rights of ways in Region 3, including the Coconino National Forest. In 2005, the Forest completed the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona* (FEIS). This document represented a major change in the management of noxious or invasive weed control on the forests by allowing the use of herbicides on forestlands, therefore providing a management tool not previously available to forest managers. The document and its provisions were incorporated into the Coconino NF and the (former) Kaibab NF forest plans by amendments 20 (CNF) and 7 (KNF). The revised Kaibab NF forest plan (USDA 2014) focuses on desired conditions.

All of the above actions were beneficial management actions that supported management control objectives for noxious or invasive weeds on the forest. These management decisions are past cumulative actions for controlling noxious or invasive weeds on the National Forests.

Beginning in 2004, the Forests have released numerous biological control insects on Dalmatian toadflax, diffuse knapweed and leafy spurge in certain areas. The successes of these treatments are not fully known at this time. The objective is to decrease the density, areal extent and reproductive capacity of the targeted weeds within the forest. These biological control agents will not completely eliminate the targeted noxious or invasive weed species but will contribute to the management objectives established in the FEIS. Sheep grazing, a form of cultural control was used on leafy spurge at Brolliar Park in the past but has since been discontinued.

Since the finalization of the Noxious or Invasive Weeds FEIS, the forests have treated certain infestations with herbicide, including some noxious or invasive weed infestations in wilderness areas, recent wildfires and leafy spurge infestations on the forest. Additionally, the Arizona Department of Transportation and Coconino County have used herbicide to treat noxious or invasive weeds along roadways under their jurisdiction. Other entities have treated some infestations within the City of Flagstaff. Collectively, these treatments have reduced infestations in some areas and reduced the risk of noxious weeds spreading into new areas. Grand Canyon National Park (GCNP), which is adjacent to the Kaibab NF, has an active weed treatment program, but the areas and acreages treated are unknown. See Appendix C for a list of targeted species within GCNP.

Past management actions within the project area have defined the existing conditions and set the stage for the current departure from reference condition and need for change. Past activities such as fire exclusion and heavy grazing have resulted in a shift in environmental conditions. Conditions in many western forests, including the ponderosa pine forests in northern Arizona have changed from and ecosystem regulated by frequent, low intensity ground fire to a system with fire exclusion and stand-replacing fire regimes. These changes have resulted in plant communities more prone to loss from noxious or invasive weeds. Historically, native plant communities in ponderosa pine have been resilient to fire, but this resilience is threatened by invasion of noxious or invasive weeds. Once these non-native species are established, they can change community composition and ecosystem processes including the fire/fuel cycle (Collins et al, 2007).

The cumulative effects of no action include the continuation of departure from the historic fire cycles and intervals. The results would be continuation of departure in some areas and the risks of landscape scale wildfires would continue to increase. These risks and departures and the resulting change in species composition including higher risks of noxious or invasive weed invasion resulting from wildfires would continue to be addressed on individual project basis within the project area.

With no action, the risk of severe wildfire would continue to increase in many areas of the project area and the chance of fire transitioning into active crown fire would increase (see Fire Report). Factors that contribute to fire hazard ratings that would be reduced through management actions such as high canopy cover, high numbers of trees per acre and dead and down fuel loading would not be reduced. The risk of wildfire transitioning to crown fires would continue to increase in many areas of the project area. Wildfires are more likely to result in increases in noxious or invasive weed infestation as compared to prescribed fires (McGlone and Egan, 2009). Severe wildfires often result in complete removal of tree canopy, complete loss of ground cover and understory plant community and alteration of soil structure and nutrients, resulting in severe disturbance. These conditions provide potential sites for noxious weed invasion through creation of bare soil, increased light and absence of competition from desirable plant species. Therefore, increases in fire hazard and severity that would occur with no action would also increase the risk of noxious weed invasions in the project area. With no action, there would be no restoration of structure and function in the treatment areas, resulting in continued departure from the desired conditions for all resources in this project, including those for noxious or invasive weed control.

The cumulative, ongoing and future foreseeable actions discussed in Appendix F of the FEIS for this analysis would likely continue to occur. These activities would independently and collectively increase the risk of noxious or invasive weed invasions and could lead to increased acreages of one or more noxious or invasive weed species depending on local site conditions. Most of these projects would incorporate the guidance provided by the Noxious or Invasive Weeds FEIS, Forest Plans and relevant laws, regulations and manual direction. **Ongoing and future foreseeable actions**

Ongoing and future foreseeable actions include all management activities that would contribute to disturbance, transportation of soil, seeds and plant parts, recreation, grazing, timber harvest, transportation, prescribed burning and wildfire suppression. All of these activities are presently occurring in the area defined for the cumulative effects and will continue into the future. Those under Forest Service control will be mitigated but activities initiated by other individuals or by other land owners within the analysis boundary are not subject to the same mitigations and may result in the increase of noxious or invasive weeds or introductions of other weed species that are currently not present in the area. Projects under Forest Service control are disclosed in Appendix F of the FEIS. Mitigations included in the Noxious or Invasive Weeds FEIS would be incorporated into the analysis and implementation of these projects.

Climate change

Disturbance is a major factor in noxious weed invasions. Climate change is expected to be a source of widespread disturbances. Higher temperatures would occur and precipitation cycles would be modified from current patterns over large areas. The warmer climate conditions may affect ecosystems by altering biotic and abiotic factors and increase the extent and severity of disturbances for some species (Bradley, et al 2010, Hellmann, et al 2008, Middleton, 2006). Larger and more frequent fires are expected (Marlon et al. 2009). Climate may favor the spread of invasive exotic grasses into arid lands where the native vegetation is too sparse to carry a fire. When these areas burn, they typically convert to non-native monocultures and the native vegetation is killed (USDA Forest Service 2010).

Alternatives B, C, D and E

Direct and Indirect Effects

The alternatives for treatment in areas containing this species vary by alternative (see Appendix B). This analysis is qualitative and does not focus on those specific differences. Instead, the effects are discussed in general terms. One of the main differences in alternatives is fewer acres would be burned in Alternative D, but there would still be disturbance from cutting and fuel treatment in the units that are treated but not burned. Alternative treatments to the treatment of activity-generated slash such as chipping or removal from the site would be sources of disturbance as well. .

The Four Forest Restoration Initiative would restore the structure and processes of the ponderosa pine forest throughout northern Arizona. By doing this, it would reduce the risk of uncharacteristic wildfires such as the recent Schultz Fire (2010). Uncharacteristic wildfires frequently have areas of high severity fire that are more easily invaded by noxious or invasive weeds as compared to unburned areas or areas of lower severity. Reducing the risk of high severity wildfire also reduces the risk of noxious or invasive weeds in these severely burned areas.

Direct effects of management activities include ground-disturbing activities that have the potential to increase the acreage and/or density of the existing infestations within the project area. Disturbance is a natural process in our landscape but it can contribute to the spread of noxious or invasive weeds by creating potential sites for invasion. Disturbance may contribute to the spread of weeds by eliminating competition from existing vegetation and creating bare ground that is more easily invaded than undisturbed areas. The level of disturbance is important. Severe disturbance removes competitive vegetation, alters nutrient composition, and creates bare soil making potential sites for the invasion or spread of noxious or invasive weeds. Examples of management activities that would create localized severe disturbance include burned areas from slash piles, creation of log decks, bare soil created through road reconstruction, decommissioning, temporary road construction and use by machinery during mechanical thinning. Other management activities associated with the project would be sources of disturbance but the level of disturbance would not be as severe. Examples include broadcast burning and hand thinning.

Tree removal indirectly affects noxious or invasive weeds by reducing tree canopy and stand density. Treatments that reduce the tree canopy and lower the stand density would affect all understory plants, including noxious or invasive weeds by allowing more sunlight, increasing available nutrients and temporarily decreasing interspecies competition as well as intra species (between tree) competition. The increased availability of resources and decrease in competition can also provide favorable conditions for noxious or invasive weeds and could increase the size and density of existing populations, especially in areas where weed infestations already exist. These effects are reduced to a non-significant level by incorporating the mitigation measures and design features by incorporating survey and treatment in the project.

Burning is a disturbance that can release nutrients, reduce plant competition, increase the amount of available sunlight and increase bare soil. Prescribed burning may have direct and indirect effects to on all understory vegetation depending on fire severity, including existing noxious or invasive weed populations within the project area. Most prescribed burning would be of low severity with low soil heating, retention on most ground litter and little or no change in mineral soil. These assumptions are supported by the conclusions of Fowler et al (2008) who conducted a local study on the Coconino, Kaibab and Apache-Sitgreaves NFs and by Collins et al (2007). They concluded that low intensity fires in open ponderosa pine forest had minimal effects on the abundance of noxious or invasive weeds. McGlone and Egan (2009) found similar results in studies they reviewed. Prescribed or managed fires generally result in lower severity and result in lower levels of noxious or invasive weed invasion. In some situations, prescribed fire may result in moderate to higher severity (McGlone and Egan, 2009). The effects in these areas would be more severe and would be similar to slash pile burning or wildfire.

Slash pile burning would create localized severely burned areas. Consequences include but are not limited to the reduction or loss of the seed bank on these sites (Korb, 2001), death or reduction of soil organisms on the pile sites (Raison, 1979; Ballard, 2000; Korb et al., 2004) and development of hydrophobic soil (Kaye and Hart, 1998; Ballard, 2000). Slash pile sites are more prone to invasion from noxious or invasive weeds than surrounding areas and may contribute to the persistence and spread of noxious or invasive weeds in treated areas. 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. Additionally, pile sites should be monitored after burning occurs to identify and treat infestations. Management actions will be mitigated by following the Best Management Practices in Appendix B of the *Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive Weeds* and the mitigation measures and design features above. The noxious weed FEIS provides a variety of treatment options including manual control by such techniques as hand-pulling and chopping weeds with hand tools, mechanical including mowing with mechanized equipment, biological control including the introduction of insects on some species, cultural including grazing and competitive seeding and herbicide treatments.

Direct and indirect effects of temporary road construction, road reconstruction and maintenance or road decommissioning include disturbance and increased risks of dispersal of existing weed species and populations and introduction of new species. These will be mitigated by following the mitigation measures and design features above. Roads that are decommissioned as part of the Four Forest Restoration Initiative would be complementary to the goals of Travel Management objectives for the forests.

Reducing the road mileage in the treatment areas, through decommissioning would reduce the risk of present and future dispersal of noxious or invasive weeds along roadways (Rooney 2005). The reduction in risk would move toward the desired condition of managing and treating noxious or invasive weeds identified in the *Final Environmental Impact Statement for Noxious or Invasive Weeds Coconino, Kaibab and Prescott National Forests* (2005). The density of noxious or invasive weeds tends to be greater along roadways than in interior areas with fewer disturbances (Fowler et al, 2008).

Direct **effects** of spring and channel restoration would increase disturbance in the treated areas. Management actions such as digging, soil disturbance and related activities associated with spring restoration would be the sources of this disturbance. These effects will be mitigated by following the mitigation measures and design features in the section above.

Cumulative effects

The boundary for this cumulative effects analysis is the Coconino and Kaibab NFs within the project area boundary. This discussion includes management actions related to noxious or invasive weeds since 1995. Prior to 1995, occurrences and distribution of noxious or invasive weeds on the forests were largely unknown.

Beginning in 1995, the Coconino and Kaibab NFs began surveying and documenting noxious or invasive weed occurrences. This was largely due to an increasing awareness of noxious or invasive weeds and their potential effects on native ecosystems. Location data were submitted to the Southwestern Exotic Plant Mapping Program (SWEMP), a cooperative effort hosted by the USGS Colorado Field Station. SWEMP compiled data from numerous cooperating agencies including the US Forest Service. The surveys by these agencies as well as other cooperators helped document the occurrences and areal extent of noxious or invasive weeds on the forests. Noxious or invasive weed data from the forest were submitted to SWEMP from 1995 through 2003 when the forest replaced the SWEMP system with its own Natural Resource Information System (NRIS) threatened, endangered and sensitive plants and invasive species (TESP/Invasives) database and later in the NRM/TESP-Invasives database

The Forest developed the *Noxious Weeds Strategic Plan Working Guidelines Coconino, Kaibab and Prescott National Forests* in 1998 to help address and mitigate effects to noxious or invasive weeds by management actions on the forests. Forest Supervisors for the three forests accepted and signed the guidelines that designated a series of best management practices for incorporation into project planning and implementation on the forests. In 2002, the Peaks and Mormon Lake Ranger Districts completed the *Flagstaff/Lake Mary Ecosystem Analysis* (FLEA), a major landscape analysis. Among other issues, it addressed noxious or invasive weeds in certain management areas with the FLEA analysis area, incorporating the guidance provided by the Strategic Plan. In 2003, Region 3 of the U. S. Forest Service completed the *Environmental Assessment for Management of Noxious Weeds and Hazardous Vegetation on Public Roads on National Forest System Lands in Arizona* that allows treatment of noxious or invasive weeds along highway rights of ways in Region 3, including the Coconino National Forest.

In 2005, the forests completed the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (FEIS).* This document represented a major change in management of noxious or invasive weed control on the forests by allowing the use of herbicides on forestlands, therefore providing a management tool not previously available to forest managers. The document and its provisions were incorporated into the Coconino NF and (former) Kaibab NF forest plans by amendment.

All of the above actions were beneficial management actions that supported management control objectives for noxious or invasive weeds on the forest. These management decisions are past cumulative actions for controlling noxious or invasive weeds on the National Forests.

Beginning in 2004, the Forests have released numerous biological control insects on Dalmatian toadflax, diffuse knapweed and leafy spurge in certain areas. The successes of these treatments are not known at this time. The objectives of these releases are to decrease the density, areal extent and reproductive capacity of the targeted weeds within the forests. These biological control agents will not completely eliminate the targeted noxious or invasive weed species but will contribute to the management objectives established in the noxious weed FEIS. .

Since the finalization of the Noxious or Invasive Weeds FEIS in 2005, the forests have treated certain infestations with herbicide, including some noxious or invasive weed infestations in wilderness areas, recent wildfires and leafy spurge infestations on the forest. Additionally, the Arizona Department of Transportation and Coconino County have used herbicide to treat noxious or invasive weeds along roadways under their jurisdiction. Other entities have treated some infestations within the City of Flagstaff. Collectively, these treatments have reduced infestations in some areas and reduced the risk of noxious weeds spreading into new areas.

Projects analyzed since 2005 require inclusion of the provisions of the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (FEIS), specifically project survey and incorporation of best management practices. Collectively, the incorporation of these provisions and planned noxious or invasive weed treatments associated with these projects would provide noxious or invasive weed management and control within these project areas.

Despite all of these efforts, there is no evidence the magnitude or distribution of invasive weed species in decreasing on the Coconino and Kaibab NFs or surrounding lands. Rather, it is likely that weed populations are being maintained at approximately the same levels or increasing because of establishment of new populations from unmanaged uses on private, state, county, municipal and federal lands.

Fuels reduction, prescribed fire, recreation and grazing allotment analyses on the forests since the incorporation of the noxious weed FEIS by amendment into the forest plans have been required to include analyses of noxious or invasive weeds. These included those projects in the Cumulative Effects document analyzed since 2005. These have included several fuels reduction projects with treatments and effects that were similar to those for this project.

Ongoing and reasonably foreseeable actions

This is a partial summary of the ongoing and foreseeable actions within or adjacent to the project boundary. For a complete summary, see Appendix F of the FEIS.

Implementation continues on numerous projects that have analyzed in the past (see Appendix F of the FEIS). These projects will continue to provide sources of effects similar to the direct and indirect effects described above including mitigations for noxious or invasive weed control. These include a variety of projects such as fuels reduction and forest health projects with effects similar to those discussed for this project.

The Coconino and Kaibab National Forests implemented the Travel Management Rule in 2012. The cumulative effects to this and other species are the reduction in the numbers of motorized routes and the elimination of cross-country travel. Negative effects from motorized vehicles such as crushing of plants, damage to potential habitat such damage to soils, fragmentation of habitat and introduction of noxious or invasive weeds into the habitats and/or populations have been reduced. These reductions would be from the elimination of most cross-country travel and through the reduction of road density. These actions, combined with such actions as road decommissioning in this project would reduce the impacts of vehicle traffic and the risks of noxious or invasive weed invasions that accompany motor vehicle travel.

Project implementation will continue in previously analyzed projects. These include the Hart Prairie Fuels Reduction and Forest Health Project (2010), Wing Mountain Fuels Reduction and Forest Health Restoration (2012), Frenchy (2003) and Pomeroy (2003). The Flagstaff Watershed Protection Project is currently under analysis. The areal extent of the project is similar to that of the Mount Elden Dry Lake Hills trail project. Noxious or invasive weed locations were documented in the project area during pre-implementation surveys.

A non-motorized trail system, the Mount Elden, Dry Lake Hills project is a foreseeable action. The project includes new trail construction and inclusion of user created trails into the official forest system.

Other actions such as grazing will continue to occur in the project area. Livestock grazing that is currently occurring on the forests under permit will continue to utilized at the permitted levels allowed in the annual operating instructions for each allotment.

Wildfires will continue to occur in the project area. The areal extent and severity of these fires in future years are difficult to predict. The effects of these fires will include varying levels of disturbance from the fires as well as disturbance and the risks of noxious or invasive weed introductions from management activities that occur in response to suppression and rehabilitation.

Noxious or invasive survey and control will continue in other jurisdictions within or adjacent to the project boundary including survey and control along county, state and federal highways, within municipalities and on state projects receiving federal funding. Collectively, these actions are expected to reduce the densities and areas of infestations on local basis but are not anticipated to substantially reduce the distribution and acreage of noxious or invasive weeds on an area-wide basis. These actions will reduce the risk of expansion of noxious or invasive weeds from established infestations to other areas.

Actions on private lands within or adjacent areas are expected to continue, including uses that contribute to introduction and dispersal of noxious or invasive weeds, introductions of non-native plants through planting and noxious or invasive weed control on private parcels. None of these actions is under Forest Service control but affect the abundance and distribution of noxious or invasive weeds within the project boundary.

Grand Canyon National Park (GCNP) adjoins the Kaibab National Forest on the northern boundary of the project area and has an active noxious or invasive weed survey and treatment program. GCNP experiences high levels of visitation from tourists across the country and around the world. Accompanying disturbance and human impacts from these visitors provide high levels of risk for exotic invasions and expansion. The Park Service engages numerous employees and volunteers to survey and control weed infestations on the National Park. Priority species for the south rim area of the National Park for 2012 are listed in Appendix D. Like other areas of the country, the National Park has experienced an increase in the number of non-native plants over the course of many years. Documentation of this increase may be partly due to the current heightened awareness of noxious or invasive weed issues in general. The numbers of non-native plant species documented in the park have increased from nine species in 1940 to 189 species in 2008 (Makarick, 2012). Without active management, these numbers could be substantially larger. Due to the common boundary, it is possible that weed infestations will move across boundary lines and invade adjoining forestlands on the Tusayan Ranger District.

The foreseeable actions include ongoing projects discussed in the cumulative effects document, management actions implemented as part of this project and the ongoing weed control programs on the forests. Collectively, these actions have the potential to control and/or eradicate many noxious or invasive weed populations on the forests and prevent the introduction of new species. The goals are complementary to the goals established in weed EIS and to current forest plan direction for the forests.

Climate Change

Disturbance is a major factor in noxious weed invasions. Climate change is expected to be a source of widespread disturbances. Higher temperatures would occur and precipitation cycles would be modified from current patterns over large areas. The warmer climate conditions may affect ecosystems by altering biotic and abiotic factors and increase the extent and severity of disturbances for some species (Bradley et al 2010, Hellmann et al 2008; Middleton 2006). Larger and more frequent fires are expected (Marlon et al. 2009). Climate may favor the spread of invasive exotic grasses into arid lands where the native vegetation is too sparse to carry a fire. When these areas burn, they typically convert to non-native monocultures and the native vegetation is killed (USDA Forest Service 2010).

Leafy spurge (Euphorbia esula)

Note: A comment that was submitted on the draft Botany Specialist's Report and the DEIS compelled us to update this section of the Specialist's Report and propose some additional design criteria for inclusion in the FEIS. See comment 165-28.

Existing Condition

Leafy spurge reproduces from adventitious root buds and seeds. Roots form extensive underground systems that can extend 30 feet into the soil, and laterally as well. Seeds are forcefully expelled and are able to travel up to 15 feet from the original plant. Leafy spurge is dispersed in several ways including by grazing animals, birds and human dispersal. Humans may vector the species by dispersing seeds or plant fragments by various activities, contaminated feed products and domestic animals. Birds may disperse leafy spurge seeds in fecal matter. These factors make the species very difficult to control making this species a priority species for control.

Infestations of leafy spurge on the Coconino NF center on the Brolliar Park area, with numerous “outlier” populations in the general area. Some of these are several miles away from the large infestation. Leafy spurge also occurs in the Hull Cabin area of the Kaibab NF.

On the Coconino NF, leafy spurge occurs mainly along forest roads 91 and 91C, southwest of Mollholland Tank, with the exception of the northernmost outlier that is located along Forest Road 91 north of Long Park Tank. The entire infested area is located to the west of Forest Highway 3, (Lake Mary Road), and spreads south into the northwestern corner of the Mogollon Rim Ranger District past Round-up Park Spring, and west into the Rattlesnake Canyon and Gash Flat areas. The infested area includes portions of several past or ongoing timber sales and fuels reduction projects including the Mint sale on Mormon Lake Ranger District and the Upper Beaver Creek Fuels Reduction Project on the Mogollon Rim Ranger District. To date there are numerous detected populations on the forest totaling more than 200 acres, dispersed over an area of about 36 square miles. The extent of most of these individual populations is 1/10th acre or less. The extent of the largest population in Brolliar Park is about 90 acres. The forest has invested a plethora of economic and human resources for survey and control of leafy spurge on the Coconino National Forest. Treatments included numerous manual treatments, herbicide control, cultural control and biological control insects. The forest prepared the Leafy Spurge Management Plan for the Coconino National Forest in 2009 documenting past treatment as well as setting goals for treatment of this species in the future. The plan reinforced the goal of eradicating leafy spurge on the Coconino NF, a goal identified in the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab and Prescott National Forests* (FEIS) (USDA-Forest Service 2005).

Leafy spurge also occurs within the project area on the Kaibab National Forest, near Hull Cabin. The infested areas are scheduled for burning in Alternatives B, C and E. The KNF has treated these infestations using herbicides on several occasions in recent years.

Table 16. Occurrences of leafy spurge and planned treatments within the project area

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Euphorbia esula	leafy spurge	8/15/2010	501	4	UEA25	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	9/1/2001	501	7	UEA10	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	9/17/2008	501	8	UEA25	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	6/15/2010	501	11	UEA40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	8/15/2010	501	12	UEA40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	8/15/2010	501	13	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	501	14	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	501	15	IT10	IT10	IT10	IT10
Euphorbia esula	leafy spurge	6/15/2010	501	19	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	8/15/2010	501	25	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	6/15/2010	501	28	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	6/15/2010	502	7	PFA - SI40	PFA - SI40	PFA - SI40	PFA - SI40
Euphorbia esula	leafy spurge	9/17/2008	502	8	PFA - IT40	PFA - IT40	PFA - IT40	PFA - IT40
Euphorbia esula	leafy spurge	9/17/2008	502	11	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	6/15/2010	502	14	IT25	IT25	IT25	IT25
Euphorbia esula	leafy spurge	6/15/2010	502	18	IT10	IT10	IT10	IT10
Euphorbia esula	leafy spurge	6/15/2010	502	20	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/15/2010	502	21	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	5/28/2009	502	22	UEA40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	7/17/1999	502	28	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/15/2010	502	31	Savanna	Savanna	Savanna	Savanna

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Euphorbia esula	leafy spurge	7/17/1999	502	33	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	9/17/2008	502	38	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	5/10/2011	502	39	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	5/10/2011	502	40	UEA40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	6/1/1999	515	12	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/1/1999	516	2	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	9/1/2001	516	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Euphorbia esula	leafy spurge	9/15/2008	526	5	UEA25	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	6/15/2010	526	6	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	8/15/2010	526	10	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	6/15/2010	526	11	UEA25	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	6/15/2010	526	29	IT10	IT10	IT10	IT10
Euphorbia esula	leafy spurge	7/10/2009	527	1	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	5/10/2011	527	5	UEA10	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	7/10/2009	527	18	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	19	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	20	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	21	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Euphorbia esula	leafy spurge	7/10/2009	527	23	IT25	IT25	IT25	IT25
Euphorbia esula	leafy spurge	8/15/2010	527	24	UEA10	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	8/15/2010	527	25	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	8/15/2010	527	26	IT25	IT25	IT25	IT25
Euphorbia esula	leafy spurge	8/15/2010	527	29	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	30	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	5/28/2009	527	37	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	7/7/2007	528	3	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/6/2006	528	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Euphorbia esula	leafy spurge	6/6/2006	528	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	11/30/2009	4140	4	Burn Only	Burn Only	Burn Only	Burn Only
Euphorbia esula	leafy spurge	11/30/2009	4140	8	Burn Only	Burn Only	Burn Only	Burn Only

Desired Condition

See the desired condition above for noxious or invasive weeds

The objective for control of leafy spurge in the noxious weed EIS (2005) is eradication. Eradication of leafy spurge would promote ecosystem health and prevent losses in the productive capacity of the land. Leafy spurge degrades native plant and wildlife habitats by aggressively forming monocultures and displacing native species.

Leafy spurge is the highest priority species for treatment in the *Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive Weeds* (2005)

Figure 15. Leafy Spurge growing in a stand of gambel oak on Coconino NF

Direct and indirect effects

Direct effects to leafy spurge include disturbance from management activities within or near existing infestations. This could lead to spread of the infestations into surrounding areas.

Several units are scheduled for tree removal (see table 16). Management activities associated with tree removal and timber harvest are sources of disturbance and may spread existing infestations. Treatments that reduce the tree canopy and lower the stand density affect all understory plants, including leafy spurge by allowing more sunlight, increasing available nutrients and temporarily decreasing interspecies competition. The increased availability of resources and decrease in competition can also provide favorable conditions and could increase the size and density of existing populations, especially in areas where weed infestations already exist. These effects would be reduced by incorporating the mitigation measures and design features, best management practices and by incorporating survey and treatment in the project.

The effects of management actions, especially those of fire on leafy spurge are of particular concern. Recent data indicate that burning may cause the density of leafy spurge to increase by stimulating the sprouting of adventitious buds and may establish from seeds after fire. However, fire may reduce the germination rate of leafy spurge seeds, and timing of burning may aid in control (Gucker, 2010). To mitigate this timing of prescribed fire and herbicide application in areas with leafy spurge will be determined by the District Fuels Specialist and District Weeds Coordinator at the time of implementation. Areas where leafy spurge biological control agents were released would be examined before prescribed fire is implemented to help mitigate the effects to the insects. See measures 29 and 30 in mitigation measures and design features above. On the Kaibab NF where leafy spurge has been documented near Hull Cabin, there is no road reconstruction, decommissioning or maintenance scheduled as part of the management actions in this project. The treatment units in this area are scheduled for burning treatments only.

On the Coconino NF, There are several haul routes as well as Forest Roads 127 and 91 current pass through the leafy spurge populations. Direct and indirect effects from these roads would be the increased risk of spreading the leafy spurge infestations to other areas through such actions as road maintenance, decommissioning and through vehicles pulling of the roadway to allow other vehicles to pass, picking up seeds or plant fragments that could be transported elsewhere. In this area, survey and prevention are especially needed (see mitigation measures and design features 18-27). Coordinate with forest and/or district noxious weed coordinators before working in this area. The Leafy Spurge Management Plan for Coconino National Forest (2009) should also be referenced for further guidance.

There are no spring or channel restoration treatments planned in areas containing leafy spurge so there are no direct or indirect effects from those actions.

All known locations within the project area have been treated using one or more control methods and will continue to assure control and eradication of this perennial and difficult to control species. Weed treatments **before implementation** of other management actions and **coordination** are especially important for the species and should be a priority for management actions in areas where infestations occur.

Cumulative effects

The boundary of this discussion is the portion of the project area infested by leafy spurge. The timeline for this discussion is from 1997 to present.

In 1997, Clark Franz reported leafy spurge at a single location near Forest Road 91. He removed the plants he found by hand pulling and disposing of them. No follow-up treatments were conducted on the site for several years, so it is unknown what if any effect this treatment had on the plants. Debra Crisp found the main population of leafy spurge at Brolliar Park in 1998. Since that detection, various surveyors have detected numerous "outliers", some several miles from the initial site. The Flagstaff Ranger District range crew has inventoried monitored and treated the area around Brolliar Park yearly since 1999. Personnel from the Supervisor's Office and Mogollon Rim Ranger District surveyed portions of the forest near the district boundary between Mogollon Rim and Mormon Lake Ranger Districts from 2004 to 2010 as part of the Upper Beaver Creek Watershed Fuel Reduction Project. Beginning in 2011, the Flagstaff Ranger District has monitored and treated most of the infestations including the main infestation at Brolliar Park.

An *Environmental Assessment for the Treatment of Leafy Spurge in Brolliar Park* was prepared in 1998 (USDA – Forest Service 1998) and the Decision Notice was signed in 2000 (USDA-Forest Service, 2000). The selected alternative for treatment was a series of treatment actions including an area closure implemented in 2000, elimination of cattle grazing in the area by "resting" the pasture; using sheep to graze the infested area to reduce plants; and mowing which included both machine mowing using a tractor and manual cutting using hand-tools and weed-whackers. As part of project planning, preliminary analysis included use of herbicides, and biological control using insects to treat leafy spurge, but these actions were not part of the selected alternative. No herbicide treatment was permitted until the signing of the *Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive Weeds* (2005).

Sheep grazing is a recognized control method for many noxious or invasive weeds including leafy spurge. A herd of about 1000 sheep was placed in Brolliar Park from 2002 -2006. The sheep grazed on the leafy spurge plants from May 15 to October 31. Based on discussions with previous Coconino Forest range staff and local sheep operators, domestic sheep used to graze near Mormon Lake from approximately 2002-2006. The operator would truck approximately one-thousand sheep to Munds Park, unload the sheep, and then gather them again at Munds Park to be moved to their next grazing area. Specifically, the grazing plan involved grazing the spurge prior to its flowering stage to minimize seed production. This action was not successful, mainly because the animals were not confined to a designated area until seeds passed through their digestive systems.

Mowing treatments on various populations have been conducted yearly since this decision, usually several times per year during the growing season. Recent mowing treatments have focused on reducing seed set and vitality of existing plants, especially in "outlier" populations.

In 2008, Coconino NF worked cooperatively with Animal and Plant Health Inspection Service (APHIS) to determine the host specificity of *Aphthona* flea beetles on two native spurges, *Euphorbia chamaesula* and *Euphorbia brachycera*, before proceeding with biological control of leafy spurge on the CNF. The native spurges were not a part of the original plant list used in host-specificity testing with leafy spurge biological control agents. It was determined that these insects did not cause significant damage to the native spurges This allowed releases of the biological control insects in the main population of leafy spurge in Brolliar Park and on certain outlier populations.

In 2008, the forests developed and initiated an indefinite date, indefinite quantity (IDIQ) contract for herbicide treatment. Much of the work done with this contract focuses on the control of leafy spurge. Since the development of this contract, leafy spurge has been treated annually by the IDIQ contractor.

In 2008, the Birdie Fire (a wildfire) erupted on the Coconino NF. As a result, Forest Road 128 was graded and used as access to the fire during initial attack. To mitigate the effects impacts such as vehicle travel and road grading, a vehicle washing station was established along the roadway, washing vehicles that were leaving the fire area using FSR 128. A strategy to minimize the potential effects of road grading and maintenance was also established during that time.

In 2009, the Coconino NF developed a management plan for leafy spurge. The objectives of this plan were to compile existing knowledge on the species, including past management actions and treatment data and to provide a document to use as a basis for partnerships in the treatment of leafy spurge. The plan has been used internally but has not been used to recruit external partners to date.

The Raptor Fire in 2010 burned near leafy spurge populations but its effects to leafy spurge are not known.

The Coconino NF in cooperation with APHIS has controlled grasshoppers on a limited basis beginning in 2010 in the area of Brolliar Park to control herbivory on native vegetation and to facilitate the recovery on vegetation cover to reduce the risk of other noxious or invasive weed species in the treated area.

Leafy spurge occurs on the Kaibab NF near Hull Cabin. The infestation was first documented in the mid-1990's. It is thought to have been transported from another known site on the North Kaibab Ranger District where it had been known for several years. The forest has treated the infestation with herbicides in 2008, 2009 and 2010. In 2011, a low severity wildland fire, the Lower Fire burned through the infestation and at least 10 plants were observed on the site.

Collectively, these actions have reduced the density, abundance and areal extent of leafy spurge on the forests. Infestations persist and the effects from management actions need to be mitigated in this project to preserve the progress toward eradication of this species and to avoid inadvertently contributing to any increases in populations.

Ongoing and Foreseeable actions

Foreseeable actions include the continued treatments of these infestations by multiple methods as part of the noxious or invasive weed programs of the forests and as part of the Four Forest Restoration Initiative. The goal of eradication for this species requires long-term commitment of resources and personnel, so these treatments are scheduled to extend well into the future. Fire management for wildfires will continue in these areas. Other activities such as grazing by wildlife and recreational activities will continue.

Upper Beaver Creek Watershed Fuels Reduction Project analyzed in 2010 contains several locations of leafy spurge and implementation of this project will occur at some point in the future.

Activities such as grazing and recreation will continue in the area.

Camelthorn (*Alhagi maurorum*)

Existing Condition

This discussion is limited to the Coconino NF. There are no recorded locations of this species within the project area on the Kaibab NF.

Camelthorn is a deeply rooted perennial shrub, native to Asia. It reproduces both by seeds and by belowground rhizomes. Root systems can extend up to 30 feet below ground. Camelthorn grows well on wet or dry sites and can grow through pavement and building foundations. The aggressive nature of this species as well as its ability to reproduce by seeds and rhizomes makes it difficult to control.

This species receives a high rating for control based on several factors including the difficulty of control. Additionally, the known acreage of this species within the project area is relatively limited, making the goal of contain/control achievable. The known locations for this species in the project area are in burn only or operational burn treatments where mechanical treatments would not occur (see Appendix B of this document for locations).

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

Direct and indirect effects of treatments include effects from burning. These include disturbance, reduction of plant competition, creation of bare soil and risk of spreading the infestation on the existing or to new locations. Camelthorn can survive burning and regenerate from root buds and seeds. Effective treatment is currently limited to herbicides and a licensed applicator would be needed to oversee the treatment(s). The direct and indirect effects to camelthorn are similar to those of white top. Both are deep-rooted perennials with the ability to regenerate from perennating root buds and seeds. Both occur in open, disturbed sites.

There was no mention of camelthorn in the Fire Effects Information System (FEIS) database. We received one comment on the effects of fire on camelthorn but it did not result in any change to the analysis.

Cumulative effects

Some of the locations recorded for this species are within Sunset Crater National Monument and are subject to control actions by the National Park Service. The extent of control actions on the monument are unknown and not under Forest Service control. Some of the documented locations are within Management Area 17 (Cinder Hills OHV Area), which was designated as an area for off highway vehicle use in the current forest plan. Heavy off highway vehicle use would continue in these areas and would be sources of disturbance and possible dispersal of infestations. Forest-wide control of noxious or invasive weeds will continue. All of the factors mentioned above will affect the distribution of camelthorn in the area. The mitigation measures and design features in this project will be complementary to the goals and objectives of the forest-wide noxious weed program by providing additional resources for survey and control of this species as burning treatments are planned and implemented.

Ongoing and Foreseeable actions

These infestations will be monitored and treated as part of the ongoing forest-wide noxious weed program. The mitigations and design features included in this project will be complementary and aid in containment and control of this species provided they are implemented as scheduled.

Russian knapweed (Acroptilon repens)

Note: A comment was submitted on the draft Botany Specialist's Report and the DEIS. The commenter requested that we consult the Fire Effects Information System and review the effects of fire on this species. We did so but proposed no change to the analysis. See comment 165-40**.**

Existing Condition

Russian knapweed reproduces by seed and by adventitious buds on horizontally spreading roots. Local infestations increase primarily by adventitious root budding. . Russian knapweed produces compounds that suppress growth in competing vegetation, which allows it to form dense monoculture over time. Russian knapweed has a bitter taste, which discourages grazing animals from eating it. This in turn can contribute to the expansion of infestations as animals select plants that are more palatable.

The area infested in the project area is less than three acres. However, control is important due to the ability of this species to expand rapidly after disturbance.

See Appendix B for the documented locations for this species within the treatment units.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

The direct and indirect effects of management actions within the project area are similar to those in the general discussion above and for the other perennial species. These include effects from disturbance, creation of bare soil, reduction ground cover and increased availability of resources for understory plants.

Effects to Russian knapweed from mechanical treatments include increased disturbance, which would lead to increases in populations of the species in units scheduled for mechanical treatment. Tree removal may decrease the amount of shade and increase the amount of resources available for understory plants. This would lead to an increase in this and other noxious or invasive weed species.

Burning is a source of disturbance that would lead to increases in this and other noxious or invasive weeds.

Effects of actions associated with road reconstruction, maintenance and decommissioning and temporary road construction include increased disturbance increased risk of dispersal of noxious or invasive weeds.

Russian knapweed does not occur in areas proposed for spring and channel restoration, so there would be no effects from the management actions associated with these activities.

Effects of these activities will be mitigated by following mitigation measures and design features 17 through 27 above.

Zouhar (2001) prepared an abstract for the Fire Effects Information System (FEIS) database. However, at that time there was no definitive information on the response of Russian knapweed in the post-fire community. Based on its life form the underground portions of the plant would likely survive fire (Pyke et al, 2010). The plant would reproduce from underground sprouting in the post-fire community.

Cumulative effects

Refer to general discussion for cumulative effects, including past actions and ongoing and foreseeable actions.

White top (Cardaria draba)

Note: A comment was submitted on the draft Botany Specialist's Report and the DEIS. The commenter requested that we consult the Fire Effects Information System and review the effects of fire on this species. We did so but proposed no change to the analysis. See comment 165-27.

Existing Condition

This discussion is limited to the Coconino NF. There are no recorded locations of this species within the project area on the Kaibab NF.

Whitetop is a deep-rooted perennial in the mustard family, native to Russia. It often grows up to 2 feet tall, with roots going 12 to 30 feet deep and reproduces from seeds and rhizomatous roots. It can produce 50 shoots in a square yard. One plant can spread 12 feet in its first year. Whitetop is an early seral species with an affinity for disturbed, open sites. It is most often found in open areas, but can withstand moderate shade (Chipping and Brossard, 2000). It does well in wet areas and roadsides. The infestation below is in a wet area on a roadside. Data in the Fire Effects database (Zouhar, 2004) suggest that this species may be top-killed by fire but survives due to deep roots and perennating buds below the soil surface. . There is only one recorded location of this species in the treatment units. It is on the Coconino NF, in location 335, site 14, which is slated for burning only.

Desired Condition

See the desired condition above for noxious or invasive weeds

Figure 16. Whitetop infestation, Coconino NF 2009

Direct and Indirect Effects

Direct and indirect effects of treatments include effects from burning. These include disturbance, reduction of plant competition, creation of bare soil and risk of spreading the infestation on the existing or to new locations. This species can survive burning and regenerate from root buds and seeds (Zouhar, 2004).

Whitetop also benefits from open conditions and areas with little or no shade. The current infestation is in a relatively open area with little or no shade.

Most management actions in Four Forest Restoration Initiative would result in more conditions that are open. The risk of spread will be mitigated by using the best management practices (BMPs) in Appendix B of the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (FEIS). The area containing this infestation should be surveyed and treated before implementation. Effective treatment of this species is currently limited to herbicides, which requires a licensed applicator to oversee the treatment(s).

There are no mechanical treatments planned for the location containing this infestation, so there would be no effect from actions associated with tree removal.

There are no activities related to road reconstruction or maintenance near this infestation, so no effects from those activities would occur.

Nearby Griffith Spring will be restored as part of this project. The spring is about 0.2 mile from the infestation so there would be no effects from activities associated with spring restoration to this infestation.

Cumulative effects

The boundary of this discussion includes the infested site mentioned above. The timeline is from the date of its discovery of this infestation in 2009 to present. The limited scope of this discussion is due to the nature of the infestation. It is limited to a very small area of the Coconino NF. It was promptly treated upon discovery. It was possibly eliminated during treatment but follow-up is needed. There are no other known populations of this species in the treatment units. Whitetop is widespread elsewhere and can cause significant degradation of the plant community in which it exists. Its’ effects to the ecosystem and native plant community in our area is currently very limited. Vigilance, treatment and mitigation will assure that the species is eliminated from the site.

Ongoing and Foreseeable actions

This infestation will be monitored and treated as part of the ongoing forest-wide noxious weed program. The mitigations and design features included in this project will be complementary and aid in eradication of this species provided they are implemented as scheduled.

Musk thistle (Carduus nutans)

Existing Condition

Musk thistle is an introduced biennial that grows up to six feet tall. Its leaves are dark green with a light green midrib. Leaves extend onto the stem giving it a winged appearance. Musk thistle invades disturbed areas and can spread rapidly, forming large monocultures. Musk thistle reproduces solely from seed but individual plants may self-pollinate, so a single plant may form a large colony if not quickly controlled. Non-native thistles including musk thistle respond well to disturbance, where they become established in patches of bare soil (Beck, 1999). Established infestations of musk thistle may self-perpetuate. At high densities scotch thistle infestations are devoid of competing vegetation. Dead flower stalks may trap winter moisture providing a favorable environment for seedling germination. Scotch thistle produces abundant seed, which germinates well in high light conditions such as disturbed areas and recently burned areas (Zouhar, 2002). There are several occurrences of musk thistle in the project area (see Appendix B). Additionally, McGlone et al (2012) detected musk thistle in Ft. Valley area on areas previously treated for restoration.

See Appendix B for locations and treatments.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

Effects to this species from mechanical treatments include increased disturbance, which would lead to increases in populations of the species in units that will be mechanically treated. Tree removal may also decrease the amount of shade and increase the amount of resources available for understory plants. This would lead to an increase in this and other noxious or invasive weed species.

Musk thistle response to fire varies among studies. It is an early successional species and establishes well on open, disturbed sites (Zouhar, 2002). Burning is a source of disturbance that would lead increases in this and other noxious or invasive weeds.

Effects of actions associated with road reconstruction, maintenance and decommissioning and temporary road construction include increased disturbance increased risk of dispersal of noxious or invasive weeds.

The effects of management actions associated with spring and channel restoration would be similar to those for other activities and include increases in disturbance and risk of dispersal of noxious or invasive weeds.

Effects of these activities will be mitigated by following mitigation measures and design features 17 through 27 above.

The direct and indirect effects of management actions within the project area are similar to those in the general discussion above. These include effects from disturbance, creation of bare soil, reduction ground cover and increased availability of resources for understory plants. This species would benefit from the creation of bare soil and open sites created through the removal of trees and through burning. These actions would create conditions favoring the establishment of new populations and the expansion of existing infestations.

Cumulative effects

Refer to general discussion for cumulative effects, including past actions and ongoing and foreseeable actions.

Diffuse knapweed (Centaurea diffusa)

Existing Condition

Diffuse knapweed is an introduced biennial or short-lived perennial, spreading only by seed. In the fall, diffuse knapweed plants break off at ground level and tumble along the ground dispersing seeds. Plants or plant fragments can be carried to new locations by wind or dragged along by vehicles. Seeds can also spread as the spiny bracts attach to animal fur, clothing, and vehicles and can spread in contaminated products such as hay. Diffuse knapweed has a large, perennial taproot that may survive fire if the root crown is not killed. It also produces large quantities of seed that may survive fire. Low severity fire may not kill seeds and root crowns of diffuse knapweed and the copious amounts seeds produced by diffuse knapweed may give it an advantage in reestablishment in fire prone ecosystems. However, seed is stored aerially (in seed heads and may be killed by fire (Zouhar, 2001).

Diffuse knapweed was first detected in the Flagstaff area in the late 1970’s and has spread from a few scattered plants to infestations on thousands of acres in the urban interface around Flagstaff. These populations continue to expand and new infestations are created after mature plants break at the base and are dispersed by the wind or by being dragged along by vehicles.

See Appendix B for locations and treatments.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

Diffuse knapweed is an early seral species and will to expand in areas of disturbance. For this reason, treatments such as tree removal and burning would provide conditions conducive to establishment and spread of this species in areas where it exists. Mitigation is especially important for diffuse knapweed to prevent the threat of spread from infested areas to those areas not currently infested because of its widespread and invasive nature.

In a local study, germination of diffuse knapweed seeds buried in severely burned soils was greater than in unburned soil in the same area (Wolfson et al, 2005) so lowering the risk of severe wild fires by the management actions proposed in Four Forest Restoration Initiative may mitigate the risk of infestations into severely burned sites. However, single low severity fire will not kill diffuse knapweed plants or seeds (Zouhar, 2001).

Effects to this species from mechanical treatments include increased disturbance, which would lead to increases in populations of the species in units that will be mechanically treated. Tree removal may also decrease the amount of shade and increase the amount of resources available for understory plants. This would lead to an increase in this and other noxious or invasive weed species.

Burning is a source of disturbance that would lead increases in this and other noxious or invasive weeds.

Effects of actions associated with road reconstruction, maintenance and decommissioning and temporary road construction include increased disturbance increased risk of dispersal of noxious or invasive weeds.

The effects of management actions associated with spring and channel restoration would be similar to those for other activities and include increases in disturbance and risk of dispersal of noxious or invasive weeds.

Effects of these activities will be mitigated by following mitigation measures and design features 17 through 27 above.

Cumulative effects

Refer to general discussion for cumulative effects, including past actions and ongoing and foreseeable actions.

Spotted knapweed (Centaurea maculosa)

Existing Condition

Spotted knapweed is short-lived perennial with a taproot from Eurasia. Spotted knapweed is allelopathic. If allowed to spread, it forms a monoculture and reduces desirable plant populations. Decreases in native grass yield in areas infested with spotted knapweed have been noted in areas of the northwestern U. S. where negative effects to soil and sedimentation have been noted. The rate of expansion of spotted knapweed infestations correlates with the level of disturbance. Higher levels of disturbance can lead to higher rates of expansion of the species (Sheley et al., 1999).

Spotted knapweed plants present before burning may sprout from root crowns, and seedlings may emerge from the soil seed bank or establish on bare ground from an off-site seed source following fire (Zouhar, 2001).

See Appendix B for locations and treatments.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

Spotted knapweed is early seral species and will to expand in areas of disturbance. For this reason, treatments such as tree removal and burning would provide conditions conducive to establishment and spread of this species in areas where they exist. Mitigation is especially important for diffuse knapweed to prevent the threat of spread from infested areas to those areas not currently infested because of its widespread and invasive nature.

Effects to this species from mechanical treatments include increased disturbance, which would lead to increases in populations of the species in units that will be mechanically treated. Tree removal may also decrease the amount of shade and increase the amount of resources available for understory plants. This would lead to an increase in this and other noxious or invasive weed species.

Burning is a source of disturbance that would increases in this and other noxious or invasive weeds.

Effects of actions associated with road reconstruction, maintenance and decommissioning and temporary road construction include increased disturbance increased risk of dispersal of noxious or invasive weeds.

The effects of management actions associated with spring and channel restoration would be similar to those for other activities and include increases in disturbance and risk of dispersal of noxious or invasive weeds.

Effects of these activities will be mitigated by following mitigation measures and design features 17 through 27 above.

Cumulative effects

Refer to general discussion for cumulative effects, including past actions and ongoing and foreseeable actions.

Scotch thistle (Onopordum acanthium)

Existing Condition

Scotch thistle is a large biennial thistle, native of Europe and eastern Asia. Characteristics of this species include broad, spiny stems with vertical ribs, large, spiny leaves with dense hairs, and violet to reddish flower heads. Scotch thistle grows in disturbed habitats and waste areas and reproduces solely from seed. Seeds are equipped with structures known as pappi, which allow the seeds to disperse on wind currents.

See Appendix B for locations and treatments.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

Effects to this species from mechanical treatments include increased disturbance, which would lead to increases in populations. Tree removal may also decrease the amount of shade and increase the amount of resources available for understory plants. This would lead to an increase in this and other noxious or invasive weed species.

Burning is a source of disturbance that would lead increases in this and other noxious or invasive weeds. Effects of actions associated with road reconstruction, maintenance and decommissioning and temporary road construction include increased disturbance increased risk of dispersal of noxious or invasive weeds.

The effects of management actions associated with spring and channel restoration would be similar to those for other activities and include increases in disturbance and risk of dispersal of noxious or invasive weeds.

Effects of these activities will be mitigated by following mitigation measures and design features 17 through 27 above.

The direct and indirect effects of management actions within the project area are similar to those in the general discussion above. These include effects from disturbance, creation of bare soil, reduction ground cover and increased availability of resources for understory plants. This species would benefit from the creation of bare soil and open sites created through the removal of trees and through burning. These actions would create conditions favoring the establishment of new populations and the expansion of existing infestations.

There was no mention of scotch thistle in the Fire Effects Information System database.

Cumulative effects

Refer to general discussion for cumulative effects, including past actions and ongoing and foreseeable actions.

Dalmatian toadflax (Linaria dalmatica)

Existing condition

Dalmatian toadflax is the most widely spread noxious or invasive weed within the ponderosa pine vegetation type on the Coconino and Kaibab NFs. There are numerous infestations of this species throughout the forests and within the project area. Mature toadflax plants have extensive, well-developed root systems. Taproots may reach depths of 4 to 10 feet, and lateral roots can extend 12 feet from the parent plant. Vegetative buds were found as deep as 6 feet (1. 8 m) in coarse soil. However, Dalmatian toadflax plants produced from vegetative buds occur on lateral roots that are found in the upper 2 to 12 inches of soil (Zouhar, 2003). Toadflax can readily establish on open and disturbed sites where competition from other plants is reduced (Lajeunesse, 1999). Seedling recruitment is more strongly influenced by plant competition than by other factors such as herbivory (Grieshop and Nowierski, 2002). Therefore, open sites free from competition from other species provide good recruitment sites for Dalmatian toadflax.

Because of its propensity to establish in dry, open areas with little plant competition, toadflax has high potential for establishing after fire (when competition from other vegetation is removed or reduced) by seed imported to the site or by soil-stored seed. Toadflax has a deep and extensive perennial, sprouting root system that is likely to allow it to survive even severe fire. Toadflax is also capable of establishing either from on-site seed, or seed dispersed into a burned area. Toadflax is able to recover after fire and may be promoted by fire, especially if other species are reduced. The post fire environment is well suited to toadflax establishment by seed (Zouhar, 2003).

Dodge et al (2008) studied Dalmatian toadflax in the Leroux Fire, a wildland fire that occurred in 2001. The authors studied the effects of fire severity on toadflax density. The period of study was from 2002 through 2004. The authors found higher levels of toadflax infestations in severely and moderately burned areas as compared to lightly burned or unburned areas within the fire perimeter. These increases persisted through the study but these increases were not statistically significant.

They investigated density dependence as well and determined that toadflax reached a critical density threshold in the second year of study. This may have resulted in the disappearance of toadflax on some plots and toadflax spread to previously uninfested areas but an increase in seed availability (seed bank) and underground plant portions that will allow the species to remain onsite and increase again when favorable conditions are available. The groups of toadflax plants seemed to be self-regulating, with decreases in density in older plants, but spreading outward to new areas allowing toadflax to persist at a stable level in the environment.

Native plant diversity increased in all levels of severity over the course of the study but was lowest on the severely burned areas and remained low throughout the study. Native richness was not correlated with toadflax density, indicating that fire severity influenced native plant richness more than the density of toadflax plants

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

Direct and indirect effects of management actions for Dalmatian toadflax within the treatment units are similar to those in the general discussion above. These include effects from disturbance, creation of bare soil, reduction ground cover and decreased availability of resources for desirable understory plants. Creation of open sites through the reduction of overstory trees and the accompanying disturbance may lead to increases in Dalmatian toadflax. Effects to Dalmatian toadflax from mechanical treatments include increased disturbance, which would lead to increases in populations of the species in units that will be mechanically treated. Tree removal may also decrease the amount of shade and increase the amount of resources available for understory plants. This would lead to an increase in this and other noxious or invasive weed species.

Dalmatian toadflax may be top-killed by fire but it may regenerate from the underground root structures. The post-fire environment provides ideal conditions for regeneration from seed (Zouhar, 2003). In a study of prescribed fire, effects on toadflax Jacobs and Sheley (2003) stated that they expected future increases in Dalmatian toadflax on the sites they studied. Removal of trees and large shrubs on burn sites increased the risk of invasion through creation of unoccupied sites. Surveys and treatments that are part of this project will help mitigate these risks.

In this project, it is anticipated that many open sites would be created by the mechanical removal of trees as well as by burning, increasing the risk of invasion for Dalmatian toadflax as well as other noxious or invasive weeds.

Effects of actions associated with road reconstruction, maintenance and decommissioning and temporary road construction include increased disturbance increased risk of dispersal of noxious or invasive weeds.

The effects of management actions associated with spring and channel restoration would be similar to those for other activities and include increases in disturbance and risk of dispersal of noxious or invasive weeds.

Effects of these activities will be mitigated by following mitigation measures and design features 17 through 27 above.

Cumulative effects

Refer to general discussion for cumulative effects, including past actions and ongoing and foreseeable actions.

Bull thistle (Cirsium vulgare)

Existing Condition

Bull thistle grows in numerous areas of the Coconino and Kaibab National Forests, mostly in the ponderosa pine forests, where it invades disturbed sites such as slash piles; old log decks, wildfires and roadsides.

Various control methods are available to control this species. Prevention is one of the first lines of defense for these as well as other weeds. Equipment cleaning after operating in areas of thistle infestations is essential to prevent spread to new areas. Herbicide, manual and cultural controls such as seeding with competitive native perennial grasses are also effective. Currently, there are no biological control insects for use on thistles in our area.

See Appendix B for locations and treatments.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

Effects to this species from mechanical treatments include increased disturbance, which would lead to increases in populations of the species in units that will be mechanically treated. Tree removal may also decrease the amount of shade and increase the amount of resources available for understory plants. This would lead to an increase in this and other noxious or invasive weed species.

Fire can create conditions that are favorable to the establishment of bull thistle such as open canopy and areas of bare soil. Bull thistle response to burning is dependent on several factors such as severity, timing of burning and whether it is present in the pre-fire community or seed bank (Zouhar, 2002).

Effects of actions associated with road reconstruction, maintenance and decommissioning and temporary road construction include increased disturbance increased risk of dispersal of noxious or invasive weeds.

The effects of management actions associated with spring and channel restoration would be similar to those for other activities and include increases in disturbance and risk of dispersal of noxious or invasive weeds.

Effects of these activities will be mitigated by following mitigation measures and design features 17 through 27 above.

The direct and indirect effects of management actions within the project area are similar to those in the general discussion above. These include effects from disturbance, creation of bare soil, reduction ground cover and increased availability of resources for understory plants. This species would benefit from the creation of bare soil and open sites created through the removal of trees and through burning. These actions would create conditions favoring the establishment of new populations and the expansion of existing infestations.

Cumulative effects

Refer to general discussion for cumulative effects, including past actions and ongoing and foreseeable actions.

Cheatgrass (Bromus tectorum)

Note: We received several comments related to cheatgrass. Many included references that included no new information but others provided additional information that we have incorporated below. See Appendix F. for comment analysis. Specifically, the article provided by Lininger by Bradley (2009) addressing climate change and cheatgrass was incorporated into the climate change section for cheatgrass**.**

Existing Condition

Cheatgrass is an erect winter and spring annual grass from Europe, but now occurs in many locations worldwide. It is most prominent in many areas of the intermountain west where it is especially problematic in sagebrush steppe habitats (Zouhar, 2003). Cheatgrass is common in many habitats including ponderosa pine forests throughout the western United States. Hulbert (1955) described the occurrence of cheatgrass in ponderosa pine habitats in the northwestern U. S. as “frequent and common”. In others studies, Pierson and Mack (1990a) found that cheatgrass was excluded from mature ponderosa pine forests by the presence of dense overstory canopy, but was able to become established in forest openings in these forests (Pierson and Mack, 1990b). These data are consistent with recent findings by Abella et al (2012) for non-native invasive plants in general on the Coconino NF. The authors found that openings such as parks were the most invaded areas of the sites they studied. Cheatgrass occurred in all soil units and habitats they studied with the exception of deep-cindered soils,

This species was addressed on a limited basis in the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds* (*FEIS*). Treatments as addressed in the FEIS are limited to certain areas within the habitats of rare plant species. Past documentation of cheatgrass infestations on the forests has been inconsistent. Some surveyors have routinely recorded cheatgrass occurrence but most have not. As a result, documentation of cheatgrass in the project area is not consistently documented. This would be remedied within the treatment units through mitigation #18, requiring survey. Documentation in other areas of the forest would remain sporadic unless reported by other surveyors working outside of the guidance of this analysis.

This portion of the analysis also addresses a public comment submitted during the scoping period. The comment expresses concern for the expansion of cheatgrass because of management actions that will be undertaken in the Four Forest Restoration Initiative. The foundation for this concern is based on work by McGlone (formerly with the Ecological Restoration Institute at Northern Arizona University). The location of his work was a restoration project implemented at a location near Mount Trumball, Arizona.

Existing condition

There are numerous infestations in the treatment units of this project. See Appendix B.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

Direct and indirect effects to cheatgrass are similar to those of other species and include disturbance from management activities such as tree cutting, burning, activities associated with road reconstruction, maintenance and decommissioning and temporary road construction and spring and channel restoration. Distribution of cheatgrass within ponderosa pine forests appears to be related to the availability of open areas. Pierson and Mack (1990b) found that cheatgrass was more common in openings of the forest. This concept is supported by the work of McGlone et al (2009a) who found that open conditions created through management became infested with cheatgrass. One of the objectives of the Four Forest Restoration Initiative project is to restore historic structure to the ponderosa pine forest, which would result in more open stand conditions, favoring such species as cheatgrass. Mitigation is particularly important to prevent cheatgrass invasions into these areas. The mitigation measures and design features in this document along with the guidance in Appendix B of the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds would mitigate these risks.

Disturbance is an important factor in the distribution and abundance for all noxious or invasive weeds including cheatgrass. The work by McGlone et al. (2009b) supports this concept. The study site on which this work is based is Mount Trumbull, AZ, which is the site of restoration studies conducted by Ecological Restoration Institute, Northern Arizona University. Treatments at this site were intensive and resulted in heavy fuel loads followed by burning. These factors may have contributed to the invasion of cheatgrass in the area. Many areas of the Four Forest

Restoration Initiative project would receive intensive treatments. There would be operational differences on this project, with most saleable material removed from the treatment areas and with slash disposed of at landings (see Silviculture and Fire Reports). This would reduce the severity of burning as compared to the Mount Trumball site. McGlone and his co-authors cite weather as a contributing factor to cheatgrass invasion. The areas he cited in his study experienced a severe drought in 2002, displacing most plants including cheatgrass. Weather is not a factor than can be controlled by management actions, but is considered during the planning and implementation of prescribed burns. It is unlikely that prescribed burning or pile burning would be implemented during severe drought.

Cumulative Effects

The cumulative effects, including past actions and actions for cheatgrass are similar to those in the general discussion. The exception is that in past actions, the occurrence of cheatgrass across the project area has not been consistently recorded on surveys and not consistently analyzed during project analyses. This trend is likely to change due to the increased concern and awareness of cheatgrass in forested landscapes. Most past research has focused on grassland and shrub land environments.

Ongoing and future foreseeable actions

Climate change

The amount of climate change and its localized effects are uncertain. Bradley (2009) modelled the effects of climate change on the distribution of cheatgrass in the Great Basin. The author determined several scenarios including a decrease in cheatgrass in some areas if precipitation increases because of the influence of climate change. On the opposite end of the modelling spectrum, cheatgrass would continue to expand as the climate continues to get drier and hotter. These conditions would favor cheatgrass but would have adverse effects on native perennial plants that would compete with cheatgrass.

See climate change discussions above for additional discussion. Salt cedar (Tamarix ramosissima)

Note: the species was changed between the publication of the DEIS and FEIS. A review of the data revealed that only *T. ramosissima* was present within the analysis area.

Salt cedar occurs in many riparian areas throughout the West. There have been multiple introductions of this species for use as an ornamental and for erosion control. Since the escape of salt cedar from cultivation, it has spread into wildland areas throughout the western U. S. at a rapid rate, particularly in riparian areas. Salt cedar communities are frequently associated with past disturbances and/or changes in historic disturbance regimes (Zouhar, 2003).

Salt cedar is less sensitive to changes in ground water availability than native riparian trees with which it is commonly associated (Zouhar, 2003) and out-competes native riparian trees. It can remove underground water not available to native species and can dry up springs and creeks. The foliage of salt cedar can add salt deposits to the soil, inhibiting growth of other species. It can also increase the risk of fire in riparian ecosystems through deposition of flammable fuels. Because of its' invasive nature in riparian areas, populations in wildland settings or the urban interface could pose threats to the objectives of Four Forest Restoration Initiative to restore ecological processes and function to riparian areas in the project area.

Existing Condition

There three areas containing salt cedar in the treatment units. The first area is location 336 site 13 on the Coconino NF (uneven age treatment) which is in the Pumphouse Wash area near Kachina Village. The second area is in the Pittman Valley area at location 2266 site 41(savanna treatment) and location 2268 site 31 (grassland restoration) on the Kaibab NF.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

See the general discussion above,

Much of the information on the effects of salt cedar to native plant communities is based on research for riparian areas. These infestations above are small (approx. 1/10 acre) and along roadways, not near riparian areas and are not likely to expand rapidly. The presence of these infestations still is relevant to the goals of restoration in the Four Forest Restoration Initiative area. Removal of these plants before management activities would mitigate the effects of management actions

Cumulative Effects

Refer to general discussion for cumulative effects, including past actions and ongoing and foreseeable actions.

The forests have conducted manual and chemical treatments in some areas to remove scattered populations. A more comprehensive control program is currently occurring in the Verde River corridor, which is outside of the project area. Biological control insects were introduced on salt cedar in the Saint George, Utah area. They are expanding into drainage systems in northern Arizona including the Little Colorado River drainage. These insects defoliate the plants and cause eventual death in most cases. These insects may eventually reach drainages where salt cedar occurs on the national forests resulting in defoliation and death of the populations. The past outcomes of vegetative response in areas where the biological control insects have affected the plants have been varied. In some areas, native plant communities have recovered but at other sites, the salt cedar has been replaced by other non-native weed species.

Mediterranean sage (Salvia aethiopis)

Known locations of this species in the project area include the Lower Lake Mary area on the Coconino NF. There are no known occurrences of this species on the Kaibab NF. It was first collected in the Flagstaff area in 1969. Mediterranean sage is a biennial species that originated as an ornamental plant. Mediterranean sage can be a serious rangeland weed, reducing forage production for both native wildlife and domestic livestock. It is unpalatable to grazing animals, encouraging avoiding it and eating other more palatable plants, contributing to the invasion. In its native range Mediterranean sage is considered an early to mid-seral species, occupying disturbed habitats. Various methods of control have to this species in the United States including manual, chemical and biological control. Plant density in Mediterranean sage populations is can fluctuate naturally depending on natural factors such as drought and cold winters that can lead to high seedling mortality. These factors in turn interact with land management uses such as grazing and weed control practices to determine the density at any given time (Roche and Wilson, 1999). Disturbance on sites containing Mediterranean sage may lead to expansion of existing infestations.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

See the general discussion above.

There is no mention of Mediterranean sage in the Fire Effects Database

Existing Condition

There are six documented infestations in the treatment areas. Treatments in these areas include operational burns, grasslands restoration, and uneven age thin, intermediate thin and savanna treatments. See Appendix B for locations.

Cumulative Effects

Refer to general discussion for cumulative effects, including past actions and ongoing and foreseeable actions.

Noxious or invasive weeds of concern with no known locations in treatment units

These species are included because of concern expressed by partners in the Four Forest Restoration Initiative process. These species do not occur in the areas analyzed for treatment in this analysis, and if they are detected, aggressive eradication efforts should be a top priority and applied quickly. Mitigations for these species include BMPs such as vehicle washing to assure they are not introduced into the project area. The discussion of effects on these species is limited to indirect effects since no direct effects are anticipated.

These species include Malta starthistle (*Centaurea melitensis*), yellow starthistle (*Centaurea solstitalis*), Russian olive (*Eleagnus angustifolia*), Himalayan blackberry (*Rubus procerus*), giant reed (*Arundo donax*), sulfur cinquefoil (*Potentilla recta*), tree of heaven (*Ailanthus altissima*), Siberian elm (*Ulmus pumila*), halogeton (*Halogeton glomeratus*), dyer's woad (*Isatis tinctoria*), Eurasian water-milfoil (*Myriophyllum spicatum*), oxeye daisy (*Leucanthemum vulgare*), and Canada thistle (*Cirsium arvense*), common teasel (*Dipsacus sylvestris*)

Yellow starthistle (Centaurea solstitialis)

Yellow starthistle is an annual introduced from Europe, which grows 2 to 3 feet tall. The roots grow at least 3 feet deep, and it seeds prolifically. Horses grazing large quantities of this plant are susceptible to "chewing disease," a neurological disorder preventing the horse from swallowing. There is no cure for chewing disease; it is fatal. Small infestations occur on Forest Service lands in Cottonwood, Camp Verde, and Flagstaff. The majority of yellow starthistle is on private lands.

Malta starthistle (Centaurea melitensis)

Malta starthistle is an annual from Europe, growing 1 to 2 feet tall. Flower heads are yellow, located on single ends of branches and armed with small, sharp spines that are branched at the base. Infestations border Forest Service land in Cottonwood and Camp Verde, at a few isolated spots on the Coconino National Forest, and on Black Canyon Creek on the Prescott. There are no known locations for the species in the treatment units. Malta starthistle tends to occur at lower elevations such as in the Verde Valley, while yellow starthistle has been found in areas of higher elevation including the Flagstaff area.

Russian olive (Elaeagnus angustifolia)

Russian olive is a woody species forming large shrubs to medium-sized trees. Until recently, this species was favored for windbreaks and erosion control and was planted extensively in areas throughout northern Arizona. It can invade riparian areas where it eventually replaces native tree species. Because of its' invasive nature in riparian areas, populations in wildland settings or the urban interface could pose threats to the objectives of Four Forest Restoration Initiative to restore ecological processes and function to riparian areas in the project area.

Himalayan blackberry (Rubus procerus)

Syn. *Rubus armeniacus* and *Rubus discolor*)

Himalayan blackberry is an exotic species found throughout many parts of the country. The Himalayan blackberry typically grows in open weedy sites, such as along field margins, railroad rights-of-way, roadsides, and on abandoned farms. It has escaped cultivation or remains on formerly human occupied sites in various locations on the Coconino, Kaibab, and Prescott National Forests. Himalayan blackberry can form dense patches, which exclude other plant species and animals. Himalayan blackberry is present in the West Fork of Oak Creek, and at several sites in the Verde Valley.

Giant reed (Arundo donax)

Giant reed is a tall, perennial, bamboo-like grass that prefers stream banks and other wet areas. It is from the Mediterranean region. It was introduced as an ornamental and for erosion control. Giant reed can attain heights of 25 feet and once established would crowd out all other native vegetation. Its ability to developing hundreds of stems in one clump, and rapidly expand outward makes it a threat to riparian zones. Roots can form mats and debris dams, leading to flood damage. The roots can float downstream for miles and establish new populations. The species has been found mostly along the Verde River, although populations have also been found along other stream corridors. If giant reed were to become established in areas slated for spring or channel restoration, it would seriously affect the restoration of the area.

Sulfur cinquefoil (Potentilla recta)

Sulfur cinquefoil is a perennial species that grows to a height of 1 to 1½ feet. It has a well-developed underground root system and a woody stem. Regeneration is mostly from seeds. However, mature plants can reproduce vegetatively. Each year new shoots form along the edges of the woody stem. The species grows in disturbed areas, but can invade undisturbed sites. Sulfur cinquefoil can occupy a wide variety of habitats and can compete successfully with plants such as yellow starthistle. Sulfur cinquefoil can become a dominant member of the plant community. Most grazing animals would avoid eating sulfur cinquefoil due to the presence of high levels of tannin. A few plants were detected in the Rio de Flag and along Lake Mary Road on the Coconino National Forest.

Tree of Heaven (Ailanthus altissima)

Tree of Heaven is a deciduous tree from China that can grow up to 90 feet tall. It can reproduce from seed or from root sprouts that create an extensive root system forming dense colonies that out-compete native trees like box elder. Infestations are found at the mouth of the West Fork of Oak Creek and other areas in Oak Creek and the Verde Valley area. The species tolerates adverse environmental conditions, including high levels of air pollution. It was planted in areas of the Verde Valley during the days of mining in the Jerome area during the historic days of smelter operations associated with copper mining. It was widely used as an ornamental species. It is limited to lower elevations of the Coconino NF outside of the project areas and is not known to occur within the project area on the Kaibab NF.

Siberian elm (Ulmus pumila)

Siberian elm is widely grown in many areas of northern Arizona as a shade tree. However, it is not appropriate in wildland settings where it can out-compete native tree species in riparian zones and other sensitive areas. The trees reproduce through winged seeds that can be transported long distances on the wind or by vehicles to new locations. The abundant production of seed would make this species difficult to control. There are scattered trees on forestlands within the forests but there are no documented occurrences in treatment areas. It can invade riparian areas where it can dominate the plant community at the expense of native species.

Wild oats (Avena fatua)

Wild oats is related to cultivated oats but is distinguished by characteristics such as twisted awns. Wild oats occurs in disturbed areas such as roadsides. The major concern for it occurring in these situations is its ability to carry fire into surrounding wildland areas.

Common teasel (Dipsacus fullonum)

Common teasel is a biennial species that grows to a height of 6 feet with a deep taproot. Teasel can form large monocultures eliminating other species on the site. The area around the base of the mature plant becomes bare ground as it dies. This area provides an excellent “nursery” for the next generation of teasel. Currently there are only a few known isolated populations of teasel in northern Arizona. Many of those are in the City of Flagstaff, along an ephemeral stream course near Switzer Canyon Drive heading southward to I -40. The infestation may easily spread onto lands in the Walnut Canyon drainage. There are no documented occurrences in project area.

Canada thistle (Cirsium arvense)

Canada thistle is a colony-forming perennial species. It has extensive underground roots, which are capable of producing new plants. It can also reproduce from seeds but rarely produces viable seeds. There are no known populations on the national forests. It was detected in some landscaped areas in Flagstaff.

Halogeton (Halogeton glomeratus)

Halogeton favors disturbed sites and can reach a height of 18 inches or more. The species has numerous upright stems that branch from the base. The leaves are small, fleshy, and tubular and end in a needle-like spine. Halogeton is not extremely competitive but invades disturbed and overgrazed areas. It produces oxalates, which are toxic to livestock. It is approaching Coconino National Forest along I-40 east of Flagstaff and along State Route 89 north of Wupatki National Monument. Halogeton tends to occur at lower elevations than are present in the current project area but could spread into the area along roadways such as I-40. There are no documented occurrences in project area.

Dyers woad (Isatis tinctoria)

Dyers woad is not known to occur in the project area. Dyers woad invades forest and rangelands, dominating native species and causing serious economic losses. It can thrive in rocky areas and on alkaline soil. The species has a deep taproot, which can access water and nutrient reserves not available to other species. It also produces large amounts of seed. Removal of the leaves causes the plant to regenerate from the taproot.

Alternative A

Direct and Indirect Effects

Alternative A is the no action alternative. Under this alternative, there would be no treatments authorized by the Four Forest Restoration Initiative decision. There would be no concern for these species in the Four Forest Restoration Initiative process. Management activities authorized and analyzed.by the Coconino and Kaibab National Forest Plans as well as the previously analyzed projects would continue to occur. Treatment would continue in other projects noxious or invasive weeds occur but would not be as comprehensive as would be available in the Four Forest Restoration Initiative. The risk of noxious or invasive weeds spreading into the treatment units would continue, but not due to Four Forest Restoration Initiative management activities. Activities such as vehicle travel, dispersed recreation and wildfires could potentially introduce these and other species into the treatment areas. If the no action alternative were selected, there would be no monitoring or surveys directed by the Four Forest Restoration Initiative process. Detection of these species in the treatment areas would be incidental or would occur because of other management actions in the area.

Cumulative Effects

The boundary of this discussion is the analysis area. The timeline is the same as in Appendix F of the FEIS. Many of the

Alternatives B, C, D and E.

Direct and Indirect Effects

There are no direct effects to these species from any of the action alternatives because there are no documented locations of them in the project area. These species were included in the discussion due to concerns brought forward by the partners. If these species were detected in the project area, the same mitigation measures and design features would be used to control these species as would be used for species known to occur in the project area. Surveying treatment areas (mitigation #18) is be the best current strategy to detect these species. If infestations are detected during survey, they will then be treated the same as the documented noxious or invasive weed species. These effects will be mitigated by following the best management practices in Appendix B of the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (FEIS).*

Cumulative Effects

See the discussion for the no action alternative above.

Monitoring Requirements

Table 17. Monitoring requirements

Requirement	Timing	Purpose
Review and apply the mitigation measures and design features in this document	Implementation	Assures compliance with mitigations and design features included in this document so the assumptions on which this analysis is based are included in the treatment initiation.
Survey activity area before implementation and avoid the	Implementation	Avoids loss of plant populations.

Requirement	Timing	Purpose
known locations of Region 3 Sensitive plants. Focus on special features and microhabitat where the species of interest is likely to occur. Examples include drainage areas for Arizona sneezeweed or dolomitic limestone for Flagstaff pennyroyal.		
Monitor the effects of treatment on region 3 sensitive plants after treatments are completed.	Post treatment	Provides opportunities to obtain knowledge on local species that are often poorly understood. Allows for adaptive management in future treatments.
Survey activity area before implementation for noxious or invasive weeds and treat infestations	Implementation	Identifies and mitigates effects of noxious or invasive weeds.
Monitoring sites such as slash piles and treat noxious or invasive weeds if needed	Post treatment	Mitigates the effects of noxious or invasive weeds
Monitor noxious or invasive weed treatments for effectiveness	Post treatment	Allows for adaptive management in weed management.

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Appendix A. Region 3 Sensitive Plant Species List

Species Name	Species Status			Not in project area	Present on Coconino	Present on Kaibab
	Federal	State	Forest Service			
Arizona Cliffrose, *Purshia subintegra*	E	--		X		
San Francisco Peaks Groundsel, *Senecio franciscanus* (*Packera franciscana*)	T			X		
Tonto Basin Agave, *Agave delamateri*	--	S1	Sen	X		
Phillips' Agave, *Agave phillipsiana*	--	SNR	Sen	X		
Sacred Mountain Agave, *Agave verdensis*		SNR	Sen	X		
Page Springs Agave, *Agave yavapaiensis*		SNR	Sen	X		
Mt. Dellenbaugh Sandwort, *Arenaria aberrans*	--	SNR	Sen	X		
Rusby's Milkvetch, *Astragalus rusbyi*	--	S3	Sen		X	X
Crenulate Moonwort, *Botrychium crenulatum*		SH	Sen	X		
Cochise Sedge, *Carex ultra (C. spissa* var. *ultra)*	--	S2	Sen	X		
Disturbed Rabbitbrush, *Chrysothamnus molestus*		S3	Sen	X		
Arizona Bugbane, *Cimicifuga arizonica*	--	S2	Sen		X	X
Mogollon thistle, *Cirsium parryi* ssp. *mogollonicum*		S1	Sen	X		
Arizona leatherflower, *Clematis hirsutissima* var. *hirsutissima*		S2	Sen		X	X
Metcalfe's Tick-trefoil, *Desmodium metcalfei*	--	SNR	Sen	X		
Rock Fleabane, *Erigeron saxatilis*	--	S3	Sen	X		
Heathleaf Wild Buckwheat, *Eriogonum ericifolium* var. *ericifolium*	--	S2	Sen	X		
Ripley Wild Buckwheat, *Eriogonum ripleyi*	--	S2	Sen	X		
Flagstaff Pennyroyal, *Hedeoma diffusum*	--	S3	Sen		X	X
Arizona sneezeweed, *Helenium arizonicum*		S3	Sen		X	
Arizona sunflower, *Helianthus arizonensis*		SNR	Sen	X		
Eastwood Alum Root, *Heuchera eastwoodiae*	--	S3	Sen	X		
Verde Breadroot, Pediomelum verdiensis		SNR	Sen	X		
Lyngholm's Brakefern, *Pellaea lyngholmii*	--	SNR	Sen	X		
Sunset Crater beardtongue, *Penstemon clutei*		S2	Sen		X	
Flagstaff beardtongue, *Penstemon nudiflorus*		S2S3	Sen		X	X
Arizona Phlox, *Phlox amabilis*		S2	Sen			X

Alcove Bog Orchid, *Platanthera zothecina*	--	S2	Sen	X		
Hualapai Milkwort, *Polygala rusbyi*	--	S3	Sen	X		
Ertter's Rose, *Rosa woodsii* var. *ertterae*		SNR	Sen	X		
Blumers' Dock, *Rumex orthoneurus*		S3	Sen		X	
Bebb's Willow, *Salix bebbiana*		SNR	Sen		X	
Mearns Sage, *Salvia dorrii* ssp. *mearnsii*	--	S3	Sen	X		
Table Legend: Federal Status: E = Endangered, T = Threatened, P = Proposed, C = Candidate State Status: S1 = critically imperiled, S2 = imperiled, S3 = vulnerable to extirpation or extinction, S4 = demonstrably widespread, abundant, and secure. Forest Service Status: Sen = Sensitive						

Table 18. Region 3 Sensitive Species List

Appendix B. Noxious or invasive weeds within the treatment units for the Coconino and Kaibab National Forests Four Forest Restoration Initiative First EIS as documented in the TESP/INPA database January 2014*

*these data were valid through January 2014. More locations for noxious or invasive weeds may be found before implementation. Data should be reviewed prior to implementation.

Table 19. Noxious or invasive weeds within treatment units

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Euphorbia esula	leafy spurge	501	4	UEA25	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	501	7	UEA10	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	501	8	UEA25	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	501	11	UEA40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	501	12	UEA40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	501	13	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	501	14	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	501	15	IT10	IT10	IT10	IT10
Euphorbia esula	leafy spurge	501	19	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	501	25	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Euphorbia esula	leafy spurge	501	28	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	502	7	PFA - SI40	PFA - SI40	PFA - SI40	PFA - SI40
Euphorbia esula	leafy spurge	502	8	PFA - IT40	PFA - IT40	PFA - IT40	PFA - IT40
Euphorbia esula	leafy spurge	502	11	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	502	14	IT25	IT25	IT25	IT25
Euphorbia esula	leafy spurge	502	18	IT10	IT10	IT10	IT10
Euphorbia esula	leafy spurge	502	20	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	502	21	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	502	22	UEA40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	502	28	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	502	31	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	502	33	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	502	38	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	502	39	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	502	40	UEA40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	515	12	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	516	2	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	516	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Euphorbia esula	leafy spurge	526	5	UEA25	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	526	6	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	526	10	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	526	11	UEA25	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	526	29	IT10	IT10	IT10	IT10
Euphorbia esula	leafy spurge	527	1	Savanna	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	527	5	UEA10	UEA10	UEA10	UEA10

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Euphorbia esula	leafy spurge	527	18	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	527	19	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	527	20	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	527	21	UEA40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	527	23	IT25	IT25	IT25	IT25
Euphorbia esula	leafy spurge	527	24	UEA10	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	527	25	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	527	26	IT25	IT25	IT25	IT25
Euphorbia esula	leafy spurge	527	29	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	527	30	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	527	37	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	528	3	IT40	IT40	IT40	IT40
Euphorbia esula	leafy spurge	528	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Euphorbia esula	leafy spurge	528	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Euphorbia esula	leafy spurge	4140	4	Burn Only	Burn Only	Burn Only	Burn Only
Euphorbia esula	leafy spurge	4140	8	Burn Only	Burn Only	Burn Only	Burn Only
Cardaria draba	whitetop	335	14	Burn Only	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	222	1	Burn Only	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	222	5	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Alhagi maurorum	camelthorn	223	5	Burn Only	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	234	3	Burn Only	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	239	1	Burn Only	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	241	1	Burn Only	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	241	3	Burn Only	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	241	9	Operational Burn	Operational Burn	Operational Burn	Operational Burn

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Alhagi maurorum	camelthorn	251	1	Burn Only	Burn Only	Burn Only	Burn Only
Acroptilon repens	Russian knapweed	38	15	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Acroptilon repens	Russian knapweed	38	18	Savanna	Savanna	Savanna	Savanna
Acroptilon repens	Russian knapweed	38	19	UEA40	UEA40	UEA40	UEA40
Acroptilon repens	Russian knapweed	99	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Acroptilon repens	Russian knapweed	405	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Acroptilon repens	Russian knapweed	2261	27	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	27	10	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	27	14	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	28	25	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	28	26	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	37	4	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	37	5	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered	Burn Only - Core Area Draft
Linaria dalmatica	Dalmatian toadflax	37	6	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	40	8	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	40	10	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Linaria dalmatica	Dalmatian toadflax	40	11	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Linaria dalmatica	Dalmatian toadflax	48	6	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	52	12	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	65	24	IT25	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	76	2	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	78	8	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	78	11	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	78	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	83	2	IT10	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	83	5	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	84	7	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	84	30	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	84	32	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	84	33	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	84	41	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	85	3	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	85	11	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	85	15	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	86	1	PFA - IT25	PFA - IT25	PFA - IT25	PFA - IT25
Linaria dalmatica	Dalmatian toadflax	86	8	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	86	12	SI25	SI25	SI25	SI25
Linaria dalmatica	Dalmatian	86	20	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	86	26	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	86	29	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	90	1	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	90	2	WUI55	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	90	3	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	90	6	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	90	8	WUI55	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	90	9	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	90	10	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	90	11	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	90	12	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	90	13	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	90	14	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	90	15	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	90	16	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	90	17	SI10	SI10	SI10	SI10
Linaria dalmatica	Dalmatian toadflax	91	5	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	91	11	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	92	1	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	92	2	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	92	3	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	92	4	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	92	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	92	7	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	92	7	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	92	7	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	92	8	WUI55	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	92	11	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	92	12	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	92	19	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	93	1	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	93	2	IT25	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	93	3	IT10	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	93	5	PFA - SI25	PFA - SI25	PFA - SI25	PFA - SI25
Linaria dalmatica	Dalmatian toadflax	93	9	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	93	10	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian	93	12	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	94	4	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	94	6	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	94	7	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	94	8	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	94	12	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	94	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	95	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	95	2	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	95	4	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	95	6	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	95	7	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	95	13	IT10	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	95	14	IT25	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	95	15	WUI55	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	95	16	WUI55	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	95	17	WUI55	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	95	20	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	96	3	IT25	IT25	IT25	IT25

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	96	5	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	96	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	96	8	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	96	11	PFA - IT25	PFA - IT25	PFA - IT25	PFA - IT25
Linaria dalmatica	Dalmatian toadflax	96	12	PFA - IT25	PFA - IT25	PFA - IT25	PFA - IT25
Linaria dalmatica	Dalmatian toadflax	96	13	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	96	18	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	99	1	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	99	13	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	100	21	WUI55	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	120	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	120	9	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	120	10	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	120	11	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	120	12	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	120	13	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	120	14	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	120	15	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian	120	16	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	120	17	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	120	18	IT25	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	120	19	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	120	20	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	120	21	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	120	22	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	120	23	UEA40	UEA40	UEA40	Prescribe fire only
Linaria dalmatica	Dalmatian toadflax	120	24	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	120	25	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	120	27	UEA40	UEA40	UEA40	Prescribe fire only
Linaria dalmatica	Dalmatian toadflax	137	10	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	138	14	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	138	15	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	151	4	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	155	6	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	157	9	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	157	11	UEA40	AZGFD Trt	UEA40	AZGFD Trt
Linaria dalmatica	Dalmatian toadflax	157	15	UEA40	AZGFD Trt	UEA40	AZGFD Trt

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	162	4	IT10	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	162	5	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	162	7	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	162	8	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	163	1	UEA40	AZGFD Trt	UEA40	AZGFD Trt
Linaria dalmatica	Dalmatian toadflax	163	4	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	163	5	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	163	6	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	173	8	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	173	11	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	181	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	181	3	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	181	4	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	181	13	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	220	4	WUI55	WUI55	WUI55	Savanna
Linaria dalmatica	Dalmatian toadflax	220	6	UEA25	UEA25	UEA25	Burn Only
Linaria dalmatica	Dalmatian toadflax	221	5	Burn Only	Burn Only	Burn Only	WUI55
Linaria dalmatica	Dalmatian toadflax	221	12	Burn Only	Burn Only	Burn Only	UEA25
Linaria dalmatica	Dalmatian	222	6	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	222	7	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	1	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	2	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	9	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	10	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	14	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	19	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	20	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	21	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	22	Operational Burn	Operational Burn	Operational Burn	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	23	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	229	24	Burn Only	Burn Only	Burn Only	Operational Burn
Linaria dalmatica	Dalmatian toadflax	239	1	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	239	2	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	240	1	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	248	10	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	248	14	Operational Burn	Operational Burn	Operational Burn	Burn Only
Linaria dalmatica	Dalmatian toadflax	248	17	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	249	2	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	249	6	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	249	13	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	250	5	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	250	7	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	261	4	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	261	10	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	271	4	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	277	1	IT10	IT10	IT10	Filtered û other projects
Linaria dalmatica	Dalmatian toadflax	277	2	UEA40	UEA40	UEA40	Filtered û other projects
Linaria dalmatica	Dalmatian toadflax	277	3	UEA40	UEA40	UEA40	Filtered û other projects
Linaria dalmatica	Dalmatian toadflax	277	4	UEA40	UEA40	UEA40	Filtered û other projects
Linaria dalmatica	Dalmatian toadflax	277	9	PFA - UEA25	PFA - UEA25	PFA - UEA25	PFA - UEA25
Linaria dalmatica	Dalmatian toadflax	277	10	PFA - IT25	PFA - IT25	PFA - IT25	PFA - IT25
Linaria dalmatica	Dalmatian toadflax	277	15	PFA - UEA10	PFA - UEA10	PFA - UEA10	PFA - UEA10
Linaria dalmatica	Dalmatian toadflax	277	16	PFA - UEA10	PFA - UEA10	PFA - UEA10	PFA - UEA10
Linaria dalmatica	Dalmatian toadflax	277	35	IT10	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	279	19	IT10	IT10	IT10	IT10
Linaria dalmatica	Dalmatian	279	21	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	279	22	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	279	24	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	279	24	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	284	1	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	289	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	290	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	290	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	290	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	290	5	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	290	9	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	294	6	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	294	7	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	297	3	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	297	10	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	297	12	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	299	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	299	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	299	4	Operational Burn	Operational Burn	Operational Burn	Operational Burn

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	314	1	Operational Burn	Operational Burn	Not PIPO or Filtered	Operational Burn
Linaria dalmatica	Dalmatian toadflax	314	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	314	3	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	314	4	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	314	5	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	314	6	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	314	7	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	314	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	314	9	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	314	10	UEA25	UEA25	UEA25	Prescribe fire only
Linaria dalmatica	Dalmatian toadflax	314	11	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	314	12	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	314	13	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	314	14	SI25	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	314	15	SI25	SI25	SI25	Prescribed fire only
Linaria dalmatica	Dalmatian toadflax	314	16	SI25	SI25	SI25	Prescribed fire only
Linaria dalmatica	Dalmatian toadflax	314	18	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	315	9	IT40	IT40	IT40	Prescribed fire only
Linaria dalmatica	Dalmatian	315	10	SI25	SI25	SI25	Prescribed fire only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	315	13	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	315	21	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	317	1	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	317	2	UEA40	UEA40	UEA40	Prescribed fire only
Linaria dalmatica	Dalmatian toadflax	317	3	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	317	4	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	317	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	317	9	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	317	10	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	318	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	318	2	SI40	SI40	SI40	Prescribed fire only
Linaria dalmatica	Dalmatian toadflax	318	3	UEA40	UEA40	UEA40	Prescribed fire only
Linaria dalmatica	Dalmatian toadflax	318	4	UEA40	UEA40	UEA40	Prescribed fire only
Linaria dalmatica	Dalmatian toadflax	318	7	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	325	16	PFA - IT40	PFA - IT40	PFA - IT40	PFA - IT40
Linaria dalmatica	Dalmatian toadflax	335	14	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	336	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	336	2	Savanna	Savanna	Savanna	Savanna

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	336	6	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	336	22	WUI55	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	340	23	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	341	10	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	341	14	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	341	15	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	341	24	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	341	35	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	341	36	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	344	5	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	344	14	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	344	21	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	344	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	345	35	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	349	4	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	349	6	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	349	11	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	349	15	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian	349	16	SI40	SI40	SI40	SI40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	349	17	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	349	18	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	349	26	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	350	3	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	350	9	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	350	10	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	350	25	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	350	29	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	354	10	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	354	17	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	363	13	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	364	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	365	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	366	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	371	20	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	371	21	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	372	2	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	372	4	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	375	15	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	375	17	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	376	24	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	377	25	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	378	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	378	2	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	378	5	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	378	14	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	385	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	386	10	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	386	14	Operational Burn	GL - Restoration	Operational Burn	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	387	2	MSO Target Trt	MSO Target Trt	MSO Target Trt	UEA40
Linaria dalmatica	Dalmatian toadflax	387	4	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	387	6	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	387	8	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	387	9	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	387	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	388	13	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian	388	14	Burn Only	Burn Only	Not PIPO or	Prescribed fire only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax					Filtered	
Linaria dalmatica	Dalmatian toadflax	397	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	397	6	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	397	15	Operational Burn	Grassland mechanical	Operational Burn	Grassland mechanical
Linaria dalmatica	Dalmatian toadflax	399	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	400	4	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	400	7	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	400	21	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	400	24	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	400	25	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	402	13	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	405	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	405	8	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	405	9	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	405	12	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	405	18	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	405	33	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	406	1	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	414	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	415	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	415	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	416	5	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	416	10	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	420	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	420	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	421	3	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	421	16	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	421	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	421	18	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	421	19	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	421	20	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	421	29	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	421	30	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	422	4	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	422	8	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	422	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	424	28	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian	428	7	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	429	6	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	435	3	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	435	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	435	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	435	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	435	12	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	436	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	436	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	436	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	436	14	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	436	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	436	20	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	454	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	466	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	471	10	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	472	1	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	472	7	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	472	8	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	472	10	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	473	2	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	480	21	IT25	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	490	1	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	490	3	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	490	4	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	490	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	490	12	SI25	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	491	3	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	491	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	491	10	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	495	12	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	502	29	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	503	9	IT10	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	503	11	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	503	13	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	504	1	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	504	2	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian	504	4	Savanna	Savanna	Savanna	Savanna

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	504	16	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	505	1	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	505	10	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	505	12	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	505	13	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	508	15	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	510	1	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	510	7	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	510	14	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	510	17	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	511	4	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	511	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	511	9	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	511	13	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	512	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	512	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	512	10	IT25	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	519	1	UEA25	UEA25	UEA25	UEA25

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	519	2	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	519	3	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	519	5	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	519	7	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	519	10	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	519	16	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	519	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	519	18	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	519	20	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	519	22	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	520	4	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	520	6	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	521	8	SI25	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	522	1	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	522	3	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	522	4	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	522	7	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	523	7	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian	523	9	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	523	10	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	523	11	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Prescribed fire only
Linaria dalmatica	Dalmatian toadflax	523	13	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	523	17	Not PIPO or Filtered	Burn Only - Core Area (18)	Not PIPO or Filtered	Burn Only - Core Area (18)
Linaria dalmatica	Dalmatian toadflax	523	18	Not PIPO or Filtered	Burn Only - Core Area (18)	Not PIPO or Filtered	Burn Only - Core Area (18)
Linaria dalmatica	Dalmatian toadflax	524	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	524	2	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	524	3	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	524	4	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	524	6	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	524	7	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	524	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	524	9	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	524	10	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	524	11	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	524	12	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	524	15	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	524	16	Operational Burn	Operational Burn	Not PIPO or Filtered	Operational Burn

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	525	9	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	525	13	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	526	6	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	526	7	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	526	8	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	526	15	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	526	16	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	526	22	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered	Burn Only - Core Area Draft
Linaria dalmatica	Dalmatian toadflax	526	23	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	526	24	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	527	28	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	528	7	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	528	10	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	528	11	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	529	2	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	529	9	IT10	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	532	1	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	532	2	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian	532	3	Burn Only	Burn Only	Not PIPO or	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax					Filtered	
Linaria dalmatica	Dalmatian toadflax	532	28	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	532	34	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered	Burn Only - Core Area Draft
Linaria dalmatica	Dalmatian toadflax	532	35	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	533	51	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	540	8	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	540	34	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	542	21	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	542	22	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Linaria dalmatica	Dalmatian toadflax	542	23	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered	Burn Only - Core Area Draft
Linaria dalmatica	Dalmatian toadflax	545	1	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	545	7	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	545	9	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	937	7	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	1513	24	PFA - UEA40	PFA - UEA40	PFA - UEA40	PFA - UEA40
Linaria dalmatica	Dalmatian toadflax	1513	25	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	1513	26	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	1524	11	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt
Linaria dalmatica	Dalmatian toadflax	1534	6	Operational Burn	Operational Burn	Operational Burn	Operational Burn

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	1534	43	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	1534	44	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	1534	48	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	1550	12	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	1556	48	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	1556	49	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	1566	62	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	1566	65	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	1566	79	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2218	6	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2218	11	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2218	25	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	2218	26	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	2218	30	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2218	33	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2218	38	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2218	41	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	2232	5	UEA25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian	2232	6	UEA10	UEA10	UEA10	UEA10

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	2233	4	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2233	5	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2233	12	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2233	13	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2233	14	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2233	15	IT40	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	2233	16	SI40	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	2233	17	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2233	20	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2233	21	Savanna	Savanna	Savanna	Burn Only
Linaria dalmatica	Dalmatian toadflax	2233	22	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2234	1	UEA40	UEA40	UEA40	Savanna
Linaria dalmatica	Dalmatian toadflax	2234	2	UEA25	UEA25	UEA25	UEA40
Linaria dalmatica	Dalmatian toadflax	2234	3	IT10	IT10	IT10	UEA25
Linaria dalmatica	Dalmatian toadflax	2234	4	UEA25	UEA25	UEA25	IT10
Linaria dalmatica	Dalmatian toadflax	2234	5	Burn Only	Burn Only	Burn Only	UEA25
Linaria dalmatica	Dalmatian toadflax	2234	6	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2234	7	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	2234	8	IT40	IT40	IT40	Burn Only - Core Area Draft
Linaria dalmatica	Dalmatian toadflax	2234	9	IT10	IT10	IT10	IT40
Linaria dalmatica	Dalmatian toadflax	2234	10	UEA25	UEA25	UEA25	IT10
Linaria dalmatica	Dalmatian toadflax	2234	11	Burn Only	Burn Only	Burn Only	UEA25
Linaria dalmatica	Dalmatian toadflax	2234	12	UEA40	UEA40	UEA40	Burn Only
Linaria dalmatica	Dalmatian toadflax	2234	13	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	2234	15	UEA25	UEA25	UEA25	Savanna
Linaria dalmatica	Dalmatian toadflax	2234	16	Burn Only	Burn Only	Burn Only	UEA25
Linaria dalmatica	Dalmatian toadflax	2234	17	IT10	IT10	IT10	Burn Only
Linaria dalmatica	Dalmatian toadflax	2234	18	Burn Only	Burn Only	Burn Only	IT10
Linaria dalmatica	Dalmatian toadflax	2234	19	UEA25	UEA25	UEA25	Burn Only
Linaria dalmatica	Dalmatian toadflax	2234	20	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered	UEA25
Linaria dalmatica	Dalmatian toadflax	2235	1	IT40	IT40	IT40	Burn Only - Core Area Draft
Linaria dalmatica	Dalmatian toadflax	2235	2	UEA40	UEA40	UEA40	IT40
Linaria dalmatica	Dalmatian toadflax	2235	3	UEA10	UEA10	UEA10	UEA40
Linaria dalmatica	Dalmatian toadflax	2235	11	IT40	IT40	IT40	UEA10
Linaria dalmatica	Dalmatian toadflax	2235	39	UEA40	UEA40	UEA40	IT40
Linaria dalmatica	Dalmatian toadflax	2235	58	Burn Only	Burn Only	Burn Only	UEA40
Linaria dalmatica	Dalmatian	2236	1	Operational Burn	GL - Restoration	Operational Burn	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	2236	2	Savanna	Savanna	Savanna	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2236	3	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2236	14	SI25	SI25	SI25	Savanna
Linaria dalmatica	Dalmatian toadflax	2236	16	UEA40	UEA40	UEA40	SI25
Linaria dalmatica	Dalmatian toadflax	2236	17	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	2237	10	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2237	12	UEA10	UEA10	UEA10	Savanna
Linaria dalmatica	Dalmatian toadflax	2237	12	UEA10	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	2237	13	Burn Only	Burn Only	Burn Only	UEA10
Linaria dalmatica	Dalmatian toadflax	2237	14	UEA25	UEA25	UEA25	Burn Only
Linaria dalmatica	Dalmatian toadflax	2237	15	Burn Only	Burn Only	Burn Only	UEA25
Linaria dalmatica	Dalmatian toadflax	2237	17	UEA10	UEA10	UEA10	Burn Only
Linaria dalmatica	Dalmatian toadflax	2237	18	Savanna	Savanna	Savanna	UEA10
Linaria dalmatica	Dalmatian toadflax	2237	19	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2237	20	UEA40	UEA40	UEA40	Savanna
Linaria dalmatica	Dalmatian toadflax	2237	26	SI40	SI40	SI40	UEA40
Linaria dalmatica	Dalmatian toadflax	2237	27	UEA40	UEA40	UEA40	SI40
Linaria dalmatica	Dalmatian toadflax	2237	28	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	2237	30	Operational Burn	GL - Restoration	Operational Burn	UEA40
Linaria dalmatica	Dalmatian toadflax	2237	33	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2237	45	UEA10	UEA10	UEA10	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2237	48	UEA25	UEA25	UEA25	UEA10
Linaria dalmatica	Dalmatian toadflax	2238	20	IT10	IT10	IT10	UEA25
Linaria dalmatica	Dalmatian toadflax	2245	42	UEA10	UEA10	UEA10	IT10
Linaria dalmatica	Dalmatian toadflax	2246	31	Burn Only	Burn Only	Burn Only	UEA10
Linaria dalmatica	Dalmatian toadflax	2248	15	UEA40	UEA40	UEA40	Burn Only
Linaria dalmatica	Dalmatian toadflax	2248	16	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2248	17	IT40	IT40	IT40	UEA40
Linaria dalmatica	Dalmatian toadflax	2254	55	Operational Burn	GL - Restoration	Operational Burn	IT40
Linaria dalmatica	Dalmatian toadflax	2254	56	UEA25	UEA25	UEA25	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2254	67	Savanna	Savanna	Savanna	UEA25
Linaria dalmatica	Dalmatian toadflax	2255	9	Operational Burn	GL - Restoration	Operational Burn	Savanna
Linaria dalmatica	Dalmatian toadflax	2256	72	Burn Only	Burn Only	Burn Only	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2257	4	UEA40	UEA40	UEA40	Burn Only
Linaria dalmatica	Dalmatian toadflax	2258	9	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2258	11	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian	2258	17	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	2258	53	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2258	62	Operational Burn	GL - Restoration	Operational Burn	UEA40
Linaria dalmatica	Dalmatian toadflax	2259	35	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2260	1	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2260	6	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	2260	16	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	Savanna
Linaria dalmatica	Dalmatian toadflax	2260	17	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	2260	19	Burn Only	Burn Only	Burn Only	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	2260	38	UEA40	UEA40	UEA40	Burn Only
Linaria dalmatica	Dalmatian toadflax	2261	1	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2261	3	UEA25	UEA25	UEA25	UEA40
Linaria dalmatica	Dalmatian toadflax	2261	5	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	UEA25
Linaria dalmatica	Dalmatian toadflax	2261	6	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	2261	7	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	2261	21	IT40	IT40	IT40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	2261	27	UEA40	UEA40	UEA40	IT40
Linaria dalmatica	Dalmatian toadflax	2261	28	SI40	SI40	SI40	UEA40
Linaria dalmatica	Dalmatian toadflax	2261	35	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	SI40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	2261	51	GL - Restoration	GL - Restoration	GL - Restoration	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	2261	63	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2261	64	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2261	65	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2261	73	UEA25	UEA25	UEA25	UEA40
Linaria dalmatica	Dalmatian toadflax	2262	15	Savanna	Savanna	Savanna	UEA25
Linaria dalmatica	Dalmatian toadflax	2262	30	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2262	36	UEA40	UEA40	UEA40	Savanna
Linaria dalmatica	Dalmatian toadflax	2262	38	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	2262	41	UEA40	UEA40	UEA40	Savanna
Linaria dalmatica	Dalmatian toadflax	2262	48	UEA10	UEA10	UEA10	UEA40
Linaria dalmatica	Dalmatian toadflax	2263	5	Savanna	Savanna	Savanna	UEA10
Linaria dalmatica	Dalmatian toadflax	2263	22	SI40	SI40	SI40	Savanna
Linaria dalmatica	Dalmatian toadflax	2263	25	Savanna	Savanna	Savanna	SI40
Linaria dalmatica	Dalmatian toadflax	2263	47	IT40	IT40	IT40	Savanna
Linaria dalmatica	Dalmatian toadflax	2263	48	UEA25	UEA25	UEA25	IT40
Linaria dalmatica	Dalmatian toadflax	2263	49	Savanna	Savanna	Savanna	UEA25
Linaria dalmatica	Dalmatian toadflax	2263	52	IT10	IT10	IT10	Savanna
Linaria dalmatica	Dalmatian	2263	59	Savanna	Savanna	Savanna	IT10

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	2264	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	Savanna
Linaria dalmatica	Dalmatian toadflax	2264	27	UEA40	UEA40	UEA40	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	2264	41	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2264	42	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2264	53	GL - Restoration	GL - Restoration	GL - Restoration	UEA40
Linaria dalmatica	Dalmatian toadflax	2264	56	Savanna	Savanna	Savanna	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2265	2	Operational Burn	GL - Restoration	Operational Burn	Savanna
Linaria dalmatica	Dalmatian toadflax	2265	14	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2265	15	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2265	23	Operational Burn	GL - Restoration	Operational Burn	UEA40
Linaria dalmatica	Dalmatian toadflax	2265	24	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2265	26	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2266	22	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2266	39	Operational Burn	GL - Restoration	Operational Burn	UEA40
Linaria dalmatica	Dalmatian toadflax	2266	40	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2266	41	Savanna	Savanna	Savanna	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2266	44	Operational Burn	GL - Restoration	Operational Burn	Savanna
Linaria dalmatica	Dalmatian toadflax	2266	48	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	2266	49	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2266	51	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2267	28	UEA25	UEA25	UEA25	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2267	71	UEA25	UEA25	UEA25	UEA40
Linaria dalmatica	Dalmatian toadflax	2268	7	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2268	8	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2268	27	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2268	30	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2268	31	GL - Restoration	GL - Restoration	GL - Restoration	Savanna
Linaria dalmatica	Dalmatian toadflax	2270	37	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	2272	40	UEA40	UEA40	UEA40	Savanna
Linaria dalmatica	Dalmatian toadflax	2273	7	Savanna	Savanna	Savanna	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2273	11	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2273	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2273	15	GL - Restoration	GL - Restoration	GL - Restoration	Savanna
Linaria dalmatica	Dalmatian toadflax	2274	4	Savanna	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	2274	5	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	2274	6	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian	2274	7	UEA40	UEA40	UEA40	UEA10

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	2274	12	UEA10	UEA10	UEA10	UEA40
Linaria dalmatica	Dalmatian toadflax	2274	13	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2274	14	Operational Burn	GL - Restoration	Operational Burn	UEA40
Linaria dalmatica	Dalmatian toadflax	2274	34	UEA40	UEA40	UEA40	Savanna
Linaria dalmatica	Dalmatian toadflax	2274	37	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	2274	40	UEA40	UEA40	UEA40	SI40
Linaria dalmatica	Dalmatian toadflax	2274	41	SI40	SI40	SI40	Savanna
Linaria dalmatica	Dalmatian toadflax	2274	42	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	2274	43	UEA40	UEA40	UEA40	Savanna
Linaria dalmatica	Dalmatian toadflax	2274	44	Savanna	Savanna	Savanna	UEA40
Linaria dalmatica	Dalmatian toadflax	2274	55	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2275	9	Operational Burn	GL - Restoration	Operational Burn	IT40
Linaria dalmatica	Dalmatian toadflax	2275	19	IT40	IT40	IT40	UEA40
Linaria dalmatica	Dalmatian toadflax	2276	13	UEA40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	2276	23	UEA40	UEA40	UEA40	Burn Only
Linaria dalmatica	Dalmatian toadflax	2276	37	Burn Only	Burn Only	Burn Only	UEA10
Linaria dalmatica	Dalmatian toadflax	2276	42	UEA10	UEA10	UEA10	UEA40
Linaria dalmatica	Dalmatian toadflax	2278	2	UEA40	UEA40	UEA40	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Linaria dalmatica	Dalmatian toadflax	2278	5	Operational Burn	GL - Restoration	Operational Burn	UEA40
Linaria dalmatica	Dalmatian toadflax	2278	6	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2278	23	Operational Burn	GL - Restoration	Operational Burn	UEA40
Linaria dalmatica	Dalmatian toadflax	2300	13	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2300	21	Operational Burn	GL - Restoration	Operational Burn	UEA40
Linaria dalmatica	Dalmatian toadflax	2303	1	UEA40	UEA40	UEA40	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2303	5	Operational Burn	GL - Restoration	Operational Burn	Burn Only
Linaria dalmatica	Dalmatian toadflax	2318	6	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2318	13	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2318	24	Burn Only	Burn Only	Burn Only	UEA10
Linaria dalmatica	Dalmatian toadflax	2318	44	UEA10	UEA10	UEA10	UEA25
Linaria dalmatica	Dalmatian toadflax	2318	45	UEA25	UEA25	UEA25	Burn Only
Linaria dalmatica	Dalmatian toadflax	2318	47	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2318	48	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2318	49	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2318	55	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2320	10	Burn Only	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2320	11	Burn Only	Burn Only	Burn Only	Savanna
Linaria dalmatica	Dalmatian	2320	12	Savanna	Savanna	Savanna	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
	toadflax						
Linaria dalmatica	Dalmatian toadflax	2320	46	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	2321	2	Operational Burn	GL - Restoration	Operational Burn	Burn Only
Linaria dalmatica	Dalmatian toadflax	4027	1	Burn Only	Burn Only	Burn Only	WUI PJ Trt
Linaria dalmatica	Dalmatian toadflax	4027	2	WUI PJ Trt	WUI PJ Trt	WUI PJ Trt	Pine Sage
Linaria dalmatica	Dalmatian toadflax	4057	3	Pine Sage	Pine Sage	Pine Sage	Pine Sage
Linaria dalmatica	Dalmatian toadflax	4058	1	Pine Sage	Pine Sage	Pine Sage	Savanna
Carduus nutans	Musk thistle	91	5	Savanna	Savanna	Savanna	GL - Restoration
Carduus nutans	Musk thistle	341	35	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	5	1	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	5	3	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	6	4	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Onopordum acanthium	Scotch thistle	6	5	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	10	20	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	10	22	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	10	24	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	10	25	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	10	26	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	10	27	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Onopordum acanthium	Scotch thistle	10	34	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	10	36	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	17	1	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	17	2	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	17	4	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	17	11	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	17	16	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Onopordum acanthium	Scotch thistle	17	17	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	17	18	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Onopordum acanthium	Scotch thistle	17	19	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	17	20	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	17	22	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	17	23	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	18	1	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	18	2	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	18	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	18	12	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	18	14	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum	Scotch thistle	18	17	PFA - UEA40	PFA - UEA40	PFA - UEA40	PFA - UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
acanthium							
Onopordum acanthium	Scotch thistle	18	18	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	18	21	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	18	22	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	23	2	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	23	9	PFA - UEA40	PFA - UEA40	PFA - UEA40	PFA - UEA40
Onopordum acanthium	Scotch thistle	23	11	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	23	12	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	23	13	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	23	15	PFA - UEA40	PFA - UEA40	PFA - UEA40	PFA - UEA40
Onopordum acanthium	Scotch thistle	23	16	PFA - IT40	PFA - IT40	PFA - IT40	PFA - IT40
Onopordum acanthium	Scotch thistle	23	17	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	23	22	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	23	27	PFA - UEA40	PFA - UEA40	PFA - UEA40	PFA - UEA40
Onopordum acanthium	Scotch thistle	30	30	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	30	31	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	30	32	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	30	33	SI40	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	30	34	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Onopordum acanthium	Scotch thistle	35	1	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	35	4	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	35	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	35	6	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	36	26	IT10	IT10	IT10	IT10
Onopordum acanthium	Scotch thistle	36	27	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	38	4	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Onopordum acanthium	Scotch thistle	38	5	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	38	6	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	38	7	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	38	47	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	39	16	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	39	39	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	39	47	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	39	52	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	39	54	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	39	55	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	39	63	UEA25	UEA25	UEA25	UEA25
Onopordum	Scotch thistle	39	65	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
acanthium							
Onopordum acanthium	Scotch thistle	39	66	IT25	IT25	IT25	IT25
Onopordum acanthium	Scotch thistle	40	1	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	45	6	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	45	7	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	45	8	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	45	11	SI40	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	45	12	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	45	14	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	45	35	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	45	37	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	53	1	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	53	4	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	53	5	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	53	7	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	53	8	IT10	IT10	IT10	IT10
Onopordum acanthium	Scotch thistle	53	9	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	53	10	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	53	12	IT40	IT40	IT40	IT40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Onopordum acanthium	Scotch thistle	53	17	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	53	18	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	53	19	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	53	21	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	53	30	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	53	31	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	53	32	UEA40	AZGFD Trt	UEA40	AZGFD Trt
Onopordum acanthium	Scotch thistle	60	10	UEA40	AZGFD Trt	UEA40	AZGFD Trt
Onopordum acanthium	Scotch thistle	60	11	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	60	13	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	60	14	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	60	15	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	60	16	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	60	61	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	60	62	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	60	63	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	92	2	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	92	3	Savanna	Savanna	Savanna	Savanna
Onopordum	Scotch thistle	93	9	UEA25	UEA25	UEA25	UEA25

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
acanthium							
Onopordum acanthium	Scotch thistle	93	10	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	93	11	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	93	12	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	94	6	SI40	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	94	7	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	94	8	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	95	1	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	99	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	137	10	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	248	17	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	344	18	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Onopordum acanthium	Scotch thistle	349	26	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	1513	5	SI40	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	1513	6	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	1513	9	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	1618	23	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	1618	27	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Onopordum acanthium	Scotch thistle	1618	59	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Onopordum acanthium	Scotch thistle	1618	60	SI40	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	2255	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	2261	70	IT40	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	2262	1	Operational Burn	GL - Restoration	Operational Burn	Operational Burn
Onopordum acanthium	Scotch thistle	2265	12	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	2265	16	Operational Burn	GL - Restoration	Operational Burn	Operational Burn
Onopordum acanthium	Scotch thistle	2265	27	Burn Only	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	2267	53	UEA25	UEA25	UEA25	UEA40
Onopordum acanthium	Scotch thistle	2267	54	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Onopordum acanthium	Scotch thistle	2269	48	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	2273	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	2274	4	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	2274	5	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	2274	6	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	2274	7	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	2274	8	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	2274	11	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Onopordum acanthium	Scotch thistle	2274	12	UEA10	UEA10	UEA10	UEA10
Onopordum	Scotch thistle	2274	13	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
acanthium							
Onopordum acanthium	Scotch thistle	2274	14	Operational Burn	GL - Restoration	Operational Burn	UEA40
Onopordum acanthium	Scotch thistle	2274	16	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	2274	21	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Onopordum acanthium	Scotch thistle	2274	34	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	2274	37	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	2274	40	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	2274	41	SI40	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	2274	42	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	2274	43	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	2274	44	Savanna	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	2274	55	UEA40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	2321	2	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	18	12	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	18	20	SI40	SI40	SI40	SI40
Cirsium vulgare	bull thistle	22	4	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	22	6	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	22	17	PFA - UEA40	PFA - UEA40	PFA - UEA40	PFA - UEA40
Cirsium vulgare	bull thistle	22	36	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	22	43	PFA - IT40	PFA - IT40	PFA - IT40	PFA - IT40
Cirsium vulgare	bull thistle	22	45	PFA - UEA40	PFA - UEA40	PFA - UEA40	PFA - UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	23	18	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	23	29	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	27	1	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	27	2	PFA - IT25	PFA - IT25	PFA - IT25	PFA - IT25
Cirsium vulgare	bull thistle	27	3	PFA - UEA25	PFA - UEA25	PFA - UEA25	PFA - UEA25
Cirsium vulgare	bull thistle	27	4	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	27	6	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	27	12	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Cirsium vulgare	bull thistle	27	14	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Cirsium vulgare	bull thistle	28	5	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	28	6	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	28	7	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	28	8	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	28	18	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	28	20	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	28	25	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	28	26	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	28	27	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	29	3	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	30	30	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	37	4	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	37	5	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Cirsium vulgare	bull thistle	37	6	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Cirsium vulgare	bull thistle	39	65	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	60	36	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	60	55	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	60	58	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	65	21	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	65	28	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	67	3	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	67	6	UEA40	AZGFD Trt	UEA40	AZGFD Trt
Cirsium vulgare	bull thistle	67	10	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	77	15	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	77	18	PFA - UEA10	PFA - UEA10	PFA - UEA10	PFA - UEA10
Cirsium vulgare	bull thistle	77	19	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	78	2	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	78	8	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	78	11	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	78	17	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	78	19	PFA - IT25	PFA - IT25	PFA - IT25	PFA - IT25
Cirsium vulgare	bull thistle	84	1	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	84	5	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	84	7	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	84	15	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	84	16	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	84	18	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	84	29	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	85	3	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	85	15	UEA10	UEA10	UEA10	UEA10

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	86	1	PFA - IT25	PFA - IT25	PFA - IT25	PFA - IT25
Cirsium vulgare	bull thistle	86	2	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	86	3	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	86	4	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	86	26	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	86	27	PFA - IT10	PFA - IT10	PFA - IT10	PFA - IT10
Cirsium vulgare	bull thistle	87	1	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	87	6	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	87	13	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	87	18	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	87	19	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	87	20	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	87	21	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	87	23	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	87	24	SI40	SI40	SI40	SI40
Cirsium vulgare	bull thistle	87	28	SI10	SI10	SI10	SI10
Cirsium vulgare	bull thistle	90	9	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	90	10	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	90	11	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	90	14	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	90	15	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	90	16	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	90	17	SI10	SI10	SI10	SI10
Cirsium vulgare	bull thistle	90	19	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	91	17	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	95	1	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	95	2	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	95	4	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	95	13	IT10	IT10	IT10	IT10
Cirsium vulgare	bull thistle	95	14	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	95	20	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	96	3	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	96	11	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	96	12	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	96	13	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	99	1	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	100	15	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	100	21	WUI55	WUI55	WUI55	WUI55
Cirsium vulgare	bull thistle	138	15	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	173	4	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Cirsium vulgare	bull thistle	181	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	181	3	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	181	4	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	181	13	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	341	35	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	344	4	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	344	5	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	344	6	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	344	19	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	344	20	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	344	21	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	344	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	349	26	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	349	36	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	350	25	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	354	11	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	354	19	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Cirsium vulgare	bull thistle	354	26	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Cirsium vulgare	bull thistle	354	35	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	363	13	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	364	1	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	368	12	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Cirsium vulgare	bull thistle	383	14	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	411	16	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	430	7	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Cirsium vulgare	bull thistle	475	11	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Cirsium vulgare	bull thistle	485	10	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Cirsium vulgare	bull thistle	485	15	Operational Burn	Pot PAC GL Trt	Not PIPO or Filtered	Pot PAC GL Trt
Cirsium vulgare	bull thistle	499	16	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	500	10	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Cirsium vulgare	bull thistle	501	15	IT10	IT10	IT10	IT10
Cirsium vulgare	bull thistle	501	25	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	505	4	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	520	2	UEA25	UEA25	UEA25	UEA25

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	520	4	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	522	7	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	532	2	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Cirsium vulgare	bull thistle	705	3	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	705	4	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	705	5	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	1513	6	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1524	11	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt
Cirsium vulgare	bull thistle	1524	24	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Cirsium vulgare	bull thistle	1526	29	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1534	9	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1534	26	SI40	SI40	SI40	SI40
Cirsium vulgare	bull thistle	1534	58	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	1535	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1535	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1535	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1536	2	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	1536	13	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1536	27	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	1536	109	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1538	4	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	1538	6	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1540	11	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1541	31	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Cirsium vulgare	bull thistle	1541	32	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	1541	33	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	1541	37	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	1541	130	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1542	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1550	20	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	1550	24	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	1551	222	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1552	2	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	1552	3	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	1552	31	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1552	36	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1554	1	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1554	8	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1565	1	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	1573	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1573	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1573	30	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	1618	7	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1618	11	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	1618	16	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Cirsium vulgare	bull thistle	1618	27	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Cirsium vulgare	bull thistle	1618	28	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Cirsium vulgare	bull thistle	2212	34	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2218	6	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2218	11	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	2218	14	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2218	21	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2218	25	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2218	26	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2218	29	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2218	30	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2218	32	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2218	33	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2218	36	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2218	38	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2218	40	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2219	48	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2220	6	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2220	30	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2220	37	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2221	42	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	2223	10	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2223	12	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2223	13	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	2224	5	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2224	10	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2225	52	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2225	54	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2225	56	PFA - UEA40	PFA - UEA40	PFA - UEA40	PFA - UEA40
Cirsium vulgare	bull thistle	2225	59	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	2229	1	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2230	52	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2230	53	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2230	57	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2230	60	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2230	62	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2230	63	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2230	64	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2230	67	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	2231	25	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2231	29	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2232	1	PFA - UEA10	PFA - UEA10	PFA - UEA10	PFA - UEA10
Cirsium vulgare	bull thistle	2232	3	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2232	5	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2232	6	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2233	12	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2233	13	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2233	14	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2233	16	SI40	SI40	SI40	SI40
Cirsium vulgare	bull thistle	2233	17	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2233	20	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2233	21	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2234	2	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2234	3	IT10	IT10	IT10	IT10
Cirsium vulgare	bull thistle	2234	4	UEA25	UEA25	UEA25	UEA25

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	2234	5	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2234	6	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2234	7	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered	Burn Only - Core Area Draft
Cirsium vulgare	bull thistle	2234	8	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2234	10	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2234	11	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2234	12	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2234	13	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2234	15	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2234	16	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered	Burn Only - Core Area Draft
Cirsium vulgare	bull thistle	2234	17	IT10	IT10	IT10	IT10
Cirsium vulgare	bull thistle	2234	18	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2234	20	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered	Burn Only - Core Area Draft
Cirsium vulgare	bull thistle	2235	1	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2235	2	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2235	3	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2235	4	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2235	6	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2235	7	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2235	11	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2235	39	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2235	58	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2236	1	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	2236	2	Savanna	Savanna	Savanna	Savanna

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	2236	3	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2236	7	Aspen Treatment	Aspen Treatment	Aspen Treatment	Aspen Treatment
Cirsium vulgare	bull thistle	2236	14	SI25	SI25	SI25	SI25
Cirsium vulgare	bull thistle	2236	16	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2236	17	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2236	18	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2236	19	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2237	10	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2237	12	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2237	13	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2237	14	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2237	15	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2237	17	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2237	18	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2237	20	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2237	25	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2237	26	SI40	SI40	SI40	SI40
Cirsium vulgare	bull thistle	2237	28	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2237	31	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	2237	33	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	2237	41	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2237	47	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2238	20	IT10	IT10	IT10	IT10
Cirsium vulgare	bull thistle	2238	25	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2241	18	UEA25	UEA25	UEA25	UEA25

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	2241	19	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2241	20	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2241	22	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2241	23	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2241	32	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	2245	14	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2245	15	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2245	27	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2245	28	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2245	36	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2245	42	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2245	43	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2246	6	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2246	9	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2246	11	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2246	12	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2247	1	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2247	4	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2247	29	IT10	IT10	IT10	IT10
Cirsium vulgare	bull thistle	2248	7	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2248	13	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2248	14	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2248	15	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2248	17	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2248	18	IT40	IT40	IT40	IT40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	2253	11	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2254	72	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2256	21	UEA40	AZGFD Trt	UEA40	AZGFD Trt
Cirsium vulgare	bull thistle	2256	38	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2256	47	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2256	74	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2256	90	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2258	3	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2258	53	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2261	26	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2261	102	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Cirsium vulgare	bull thistle	2262	26	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2263	4	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2263	5	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2263	19	PFA - IT40	PFA - IT40	PFA - IT40	PFA - IT40
Cirsium vulgare	bull thistle	2263	26	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2263	27	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2263	29	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2263	31	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2263	48	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2263	49	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2263	52	IT10	IT10	IT10	IT10
Cirsium vulgare	bull thistle	2263	59	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2264	1	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2264	27	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	2266	3	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2267	1	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2267	49	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2267	51	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2267	53	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2267	54	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	2267	68	IT25	IT25	IT25	IT25
Cirsium vulgare	bull thistle	2272	5	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2274	4	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2274	5	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2274	6	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2274	7	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2274	12	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2274	13	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2274	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Cirsium vulgare	bull thistle	2274	34	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2274	37	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2274	40	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2274	41	SI40	SI40	SI40	SI40
Cirsium vulgare	bull thistle	2274	42	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2274	43	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2274	44	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2274	55	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2284	6	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2284	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	2284	28	Savanna	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	2284	29	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	2285	39	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	2285	47	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2285	52	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2285	53	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2285	55	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2285	58	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2295	16	SI40	SI40	SI40	SI40
Cirsium vulgare	bull thistle	2296	9	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2296	19	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	2296	21	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2296	27	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2298	24	UEA40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	2298	26	IT40	IT40	IT40	IT40
Cirsium vulgare	bull thistle	2299	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	2318	5	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2318	6	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2318	8	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2318	12	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2318	13	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2318	13	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2318	24	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2318	29	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2318	30	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Cirsium vulgare	bull thistle	2318	32	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2318	44	UEA10	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	2318	45	UEA25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	2318	47	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2318	49	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2318	55	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2320	10	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	2320	11	Burn Only	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	4025	28	Pine Sage	Pine Sage	Pine Sage	Pine Sage
Cirsium vulgare	bull thistle	4139	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	84	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	84	30	UEA10	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	84	31	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	84	33	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	85	11	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	91	26	dPFA - IT25	dPFA - IT25	dPFA - IT25	dPFA - IT25
Centaurea diffusa	diffuse knapweed	91	27	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	91	28	SI10	SI10	SI10	SI10
Centaurea diffusa	diffuse knapweed	92	2	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	92	3	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	93	9	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	93	10	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	93	12	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	94	7	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	94	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Centaurea diffusa	diffuse knapweed	99	1	UEA10	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	99	2	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	99	4	SI25	SI25	SI25	SI25
Centaurea diffusa	diffuse knapweed	99	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	99	13	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	99	15	IT25	IT25	IT25	IT25
Centaurea diffusa	diffuse knapweed	99	20	UEA10	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	100	13	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	137	10	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	138	15	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	173	5	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Centaurea diffusa	diffuse knapweed	173	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	173	10	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	173	12	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	173	14	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	181	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	181	4	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	181	5	IT10	IT10	IT10	IT10
Centaurea diffusa	diffuse knapweed	181	6	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	220	4	WUI55	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	221	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	221	6	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	221	7	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	221	16	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Centaurea diffusa	diffuse knapweed	229	8	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Centaurea diffusa	diffuse knapweed	229	23	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	229	24	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	232	1	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	232	11	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	234	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	239	1	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	239	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	239	5	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	239	6	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	239	7	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	239	11	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	239	13	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	241	1	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	247	22	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	247	25	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	247	26	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	248	1	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	248	2	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	248	4	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	248	7	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	248	8	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	248	17	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	249	2	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	249	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	249	6	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Centaurea diffusa	diffuse knapweed	249	7	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	249	13	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	249	25	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Centaurea diffusa	diffuse knapweed	250	2	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	250	4	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	250	5	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	250	7	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	261	2	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	261	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	261	4	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	261	5	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	261	10	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	261	11	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	271	4	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	271	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	325	13	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	325	16	PFA - IT40	PFA - IT40	PFA - IT40	PFA - IT40
Centaurea diffusa	diffuse knapweed	325	19	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	335	1	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	335	2	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	335	4	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	335	6	UEA10	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	335	7	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	335	8	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	335	9	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Centaurea diffusa	diffuse knapweed	335	10	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	335	11	IT10	IT10	IT10	IT10
Centaurea diffusa	diffuse knapweed	335	12	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	335	13	WUI55	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	335	14	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	335	15	WUI55	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	335	16	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	335	19	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	335	20	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	335	22	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	336	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	336	2	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	336	22	WUI55	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	336	23	WUI55	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	344	1	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	344	14	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	344	15	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	344	18	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Centaurea diffusa	diffuse knapweed	344	19	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	344	22	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	344	23	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	344	24	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Centaurea diffusa	diffuse knapweed	345	1	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	345	19	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	345	20	Burn Only	Burn Only	Not PIPO or	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
						Filtered	
Centaurea diffusa	diffuse knapweed	345	21	SI25	SI25	SI25	SI25
Centaurea diffusa	diffuse knapweed	345	32	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	345	33	SI25	SI25	SI25	SI25
Centaurea diffusa	diffuse knapweed	345	34	UEA10	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	345	35	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	345	36	UEA10	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	345	37	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	345	43	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	345	49	UEA10	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	354	2	IT10	IT10	IT10	IT10
Centaurea diffusa	diffuse knapweed	354	5	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Centaurea diffusa	diffuse knapweed	354	10	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	354	14	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Centaurea diffusa	diffuse knapweed	354	15	UEA10	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	354	16	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	354	17	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	354	18	SI40	SI40	SI40	SI40
Centaurea diffusa	diffuse knapweed	354	20	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	354	21	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	354	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	354	30	UEA10	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	354	34	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	354	35	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	355	1	SI25	SI25	SI25	SI25

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Centaurea diffusa	diffuse knapweed	355	2	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	368	3	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Centaurea diffusa	diffuse knapweed	368	11	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Centaurea diffusa	diffuse knapweed	368	31	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Centaurea diffusa	diffuse knapweed	368	32	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	369	1	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	369	15	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	378	1	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	378	2	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	383	18	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	384	1	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	384	14	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Centaurea diffusa	diffuse knapweed	394	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	394	26	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	395	14	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	405	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	405	8	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Centaurea diffusa	diffuse knapweed	406	1	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	406	2	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	406	4	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	406	5	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	406	15	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	410	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	410	6	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	410	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Centaurea diffusa	diffuse knapweed	410	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	410	21	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	410	22	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	410	23	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	410	24	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	410	25	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	410	27	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	410	28	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	410	34	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	410	35	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	411	1	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	411	2	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	411	3	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	411	16	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	411	20	SI40	SI40	SI40	SI40
Centaurea diffusa	diffuse knapweed	411	21	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	411	23	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	411	29	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	424	27	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	424	28	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	425	25	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	425	26	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	425	27	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	425	29	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	459	7	UEA25	UEA25	UEA25	UEA25

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Centaurea diffusa	diffuse knapweed	459	10	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	468	2	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	470	13	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	471	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	471	5	PFA - IT40	PFA - IT40	PFA - IT40	PFA - IT40
Centaurea diffusa	diffuse knapweed	471	10	Savanna	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	472	1	IT40	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	472	2	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	472	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	472	5	SI40	SI40	SI40	SI40
Centaurea diffusa	diffuse knapweed	472	6	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	472	7	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	472	10	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	472	15	SI40	SI40	SI40	SI40
Centaurea diffusa	diffuse knapweed	473	18	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	473	21	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	475	16	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	480	3	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	495	12	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	509	1	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	509	5	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	510	1	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	510	21	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	511	4	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	511	10	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Centaurea diffusa	diffuse knapweed	511	11	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	511	12	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	511	13	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	512	1	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	512	2	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	512	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	512	9	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	519	1	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	519	2	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	519	23	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	520	1	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	520	5	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	520	11	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	520	12	UEA25	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	1216	1	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	1618	6	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	1618	23	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	2255	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Centaurea diffusa	diffuse knapweed	2261	44	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	2300	8	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Centaurea diffusa	diffuse knapweed	2300	10	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	2300	11	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	2300	13	UEA40	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	2300	19	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Centaurea diffusa	diffuse knapweed	2300	22	Operational Burn	Operational Burn	Operational Burn	Operational Burn

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Centaurea diffusa	diffuse knapweed	4057	3	Pine Sage	Pine Sage	Pine Sage	Pine Sage
Centaurea maculosa	spotted knapweed	91	11	Burn Only	Burn Only	Burn Only	Burn Only
Centaurea maculosa	spotted knapweed	349	26	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	65	18	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	65	23	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	65	24	IT25	IT25	IT25	IT25
Bromus tectorum	cheatgrass	84	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	84	30	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	84	32	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	84	33	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	84	41	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	90	1	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	90	4	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	90	6	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	90	11	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	90	12	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	90	15	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	90	16	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	92	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	92	7	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	94	7	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	94	8	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	94	14	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	95	14	IT25	IT25	IT25	IT25
Bromus tectorum	cheatgrass	96	3	IT25	IT25	IT25	IT25

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	96	5	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	96	11	IT25	IT25	IT25	IT25
Bromus tectorum	cheatgrass	96	12	PFA - IT25	PFA - IT25	PFA - IT25	PFA - IT25
Bromus tectorum	cheatgrass	96	13	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	96	18	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	155	6	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	162	1	IT10	IT10	IT10	IT10
Bromus tectorum	cheatgrass	162	27	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	163	6	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	167	16	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	221	5	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	221	7	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	221	12	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	221	16	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	222	7	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	232	1	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	232	2	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	239	1	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	248	6	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	248	8	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	248	10	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	248	12	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	248	14	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	317	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	336	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	344	14	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	344	19	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	344	20	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	350	3	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	350	9	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	350	10	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	350	19	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	350	25	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	364	1	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	375	17	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	378	2	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	378	5	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	389	11	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Bromus tectorum	cheatgrass	390	3	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	390	6	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Bromus tectorum	cheatgrass	399	8	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Bromus tectorum	cheatgrass	399	19	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Bromus tectorum	cheatgrass	405	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	405	9	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	405	12	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	405	18	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	406	1	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	420	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	420	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	421	3	SI40	SI40	SI40	SI40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	421	3	SI40	SI40	SI40	SI40
Bromus tectorum	cheatgrass	421	16	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	421	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	421	18	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	421	19	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	421	20	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	421	29	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	435	3	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	435	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	435	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	435	12	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	436	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	436	14	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	436	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	454	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	466	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	490	1	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	490	3	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	490	4	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	490	12	SI25	SI25	SI25	SI25
Bromus tectorum	cheatgrass	503	11	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	504	1	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	504	2	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	504	4	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	504	16	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	510	14	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	525	9	Burn Only	Burn Only	Not PIPO or Filtered	Burn Only
Bromus tectorum	cheatgrass	528	10	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	528	11	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	1504	81	PFA - UEA40	PFA - UEA40	PFA - UEA40	PFA - UEA40
Bromus tectorum	cheatgrass	1526	29	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1526	30	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	1528	22	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	1528	36	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	1532	18	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	1532	79	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	1534	6	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	1534	27	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1535	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	1540	1	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	1554	6	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1559	3	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1559	5	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1559	8	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	1559	19	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1559	21	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	1559	22	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1559	23	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1559	39	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1560	1	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	1560	2	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1560	3	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1560	4	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1560	12	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	1560	13	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1560	14	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	1566	62	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	1566	65	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1566	79	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	1569	34	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	1573	18	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	1573	21	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1577	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	1579	5	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1580	1	IT10	IT10	IT10	IT10
Bromus tectorum	cheatgrass	1580	4	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1580	6	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1580	7	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1580	9	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	1580	10	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	1580	11	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	1580	12	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	1580	13	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1580	14	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	1580	19	IT40	IT40	IT40	IT40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	1580	20	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1580	21	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1580	22	SI40	SI40	SI40	SI40
Bromus tectorum	cheatgrass	1580	23	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	1580	24	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1580	26	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	1580	31	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	1580	43	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	2216	7	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2218	6	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2218	11	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2218	29	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	2218	31	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2218	33	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2218	36	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2218	38	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2219	6	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2219	7	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2219	18	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2219	40	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	2219	47	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2220	6	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2220	10	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2220	37	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2221	8	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	2221	42	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	2222	23	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	2224	18	WUI55	WUI55	WUI55	WUI55
Bromus tectorum	cheatgrass	2230	52	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	2231	1	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2231	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2231	30	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2231	31	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2231	32	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2232	8	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2233	21	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2238	5	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	2238	29	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2238	47	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2243	35	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2244	31	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2245	1	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2253	11	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2254	1	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	2254	30	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2254	46	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	2254	51	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2254	52	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2254	56	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	2254	67	Savanna	Savanna	Savanna	Savanna

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	2254	68	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2254	72	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2255	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2255	12	IT25	IT25	IT25	IT25
Bromus tectorum	cheatgrass	2256	16	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2256	58	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2257	17	WUI55	WUI55	WUI55	WUI55
Bromus tectorum	cheatgrass	2257	23	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2260	1	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2260	15	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Bromus tectorum	cheatgrass	2260	17	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Bromus tectorum	cheatgrass	2260	19	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2260	28	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2260	38	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2261	1	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2261	3	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	2261	5	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Bromus tectorum	cheatgrass	2261	27	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2261	28	SI40	SI40	SI40	SI40
Bromus tectorum	cheatgrass	2261	51	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	2261	66	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2261	73	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	2262	1	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2262	4	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2262	11	Savanna	Savanna	Savanna	Savanna

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	2262	15	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2262	27	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2262	30	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2262	31	SI40	SI40	SI40	SI40
Bromus tectorum	cheatgrass	2262	36	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2262	48	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	2263	41	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2263	49	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2263	60	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2264	2	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	2264	8	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2264	27	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2264	41	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2264	42	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2264	56	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2265	2	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2265	14	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2265	15	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2265	24	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2265	26	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2265	31	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2266	22	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2266	41	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2266	44	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2266	48	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	2267	20	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	2267	25	PFA - UEA25	PFA - UEA25	PFA - UEA25	PFA - UEA25
Bromus tectorum	cheatgrass	2267	26	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	2268	4	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	2268	5	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2268	22	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	2268	24	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2268	25	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2268	26	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2268	27	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	2268	32	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2268	33	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2269	52	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2270	37	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2272	34	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	2273	15	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	2275	9	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2275	19	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	2275	19	IT40	IT40	IT40	IT40
Bromus tectorum	cheatgrass	2275	21	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2276	13	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2276	28	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2276	29	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2276	35	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2276	36	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	2276	37	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2276	42	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	2276	51	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	2276	62	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2277	2	Savanna	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	2277	24	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2278	1	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2278	2	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2278	4	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2278	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2278	6	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2278	8	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	2278	19	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2278	23	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2278	31	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	2294	13	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2294	15	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2300	13	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2300	19	Operational Burn	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	2300	21	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2303	1	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	2303	4	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2303	5	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2303	11	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2318	2	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	2318	5	UEA10	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	2320	10	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2320	11	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	2320	46	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2321	2	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2321	8	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	2322	1	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Bromus tectorum	cheatgrass	4055	5	dPFA - UEA25	dPFA - UEA25	dPFA - UEA25	dPFA - UEA25
Bromus tectorum	cheatgrass	4055	6	dPFA - Pine Sage	dPFA - Pine Sage	dPFA - Pine Sage	dPFA - Pine Sage
Bromus tectorum	cheatgrass	4059	23	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4059	25	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4060	13	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4060	14	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4060	15	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4060	16	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	4060	17	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4060	18	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4083	1	Pine Sage	Pine Sage	Pine Sage	Pine Sage
Bromus tectorum	cheatgrass	4088	12	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	4088	13	UEA40	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	4088	15	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4088	18	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4088	19	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4088	20	Burn Only	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4088	26	Burn Only	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Location	Site	Alternative B	Alternative C	Alternative D	Alternative E
Bromus tectorum	cheatgrass	4090	11	UEA25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	4140	8	Burn Only	Burn Only	Burn Only	Burn Only
Tamarix ramosissima	salt cedar	336	13	UEA40	UEA40	UEA40	UEA40
Tamarix ramosissima	salt cedar	336	13	UEA40	UEA40	UEA40	UEA40
Tamarix ramosissima	salt cedar	2266	41	Savanna	Savanna	Savanna	Savanna
Tamarix ramosissima	salt cedar	2268	31	GL - Restoration	GL - Restoration	GL - Restoration	GL - Restoration
Salvia aethiopis	Mediterranean sage	341	35	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Salvia aethiopis	Mediterranean sage	349	26	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Salvia aethiopis	Mediterranean sage	350	29	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Salvia aethiopis	Mediterranean sage	363	13	Operational Burn	GL - Restoration	Operational Burn	GL - Restoration
Salvia aethiopis	Mediterranean sage	364	1	UEA40	UEA40	UEA40	UEA40
Salvia aethiopis	Mediterranean sage	375	17	IT40	IT40	IT40	IT40
Salvia aethiopis	Mediterranean sage	378	2	Savanna	Savanna	Savanna	Savanna
Salvia aethiopis	Mediterranean sage	378	14	SI40	SI40	SI40	SI40

Appendix C. Noxious or invasive weed priority list from Grand Canyon National Park (2012), Courtesy of Lori Makarick (GCNP)

Table 20. Noxious or Invasive Weed Priority List from the Grand Canyon National Park

Location	Scientific Name	Common Name	Family Name
South Rim	Aegilops cylindrica	jointed goatgrass	Poaceae
	Amaranthus albus	tumble pigweed	Amaranthaceae
	Amaranthus retroflexus	pigweed	Amaranthaceae
	Bothriochloa ischaemum	yellow bluestem	Poaceae
	Bromus diandrus	ripgut brome	Poaceae
	Bromus inermis	smooth brome	Poaceae
	Bromus rubens	red brome	Poaceae
	Bromus tectorum	cheatgrass	Poaceae
	Cardaria draba	whitetop, hoary cress	Brassicaceae
	Carduus nutans	musk thistle	Asteraceae
	Centaurea diffusa	diffuse knapweed	Asteraceae
	Centaurea melitensis	Maltese starthistle	Asteraceae
	Chondrilla juncea	rush skeleton weed	Asteraceae
	Cirsium vulgare	bull thistle	Asteraceae
	Conium maculatum	Poison hemlock	Apiaceae
	Conyza canadensis	horseweed	Asteraceae
	Hordeum jubatum	foxtail barley	Poaceae
	Kochia scoparia	common kochia	Chenopodiaceae

Location	Scientific Name	Common Name	Family Name
	Lactuca serriola	prickly lettuce	Asteraceae
	Linaria dalmatica	Dalmatian toadflax	Scrophulariaceae
	Malva neglecta	cheeseweed	Malvaceae
	Marrubium vulgare	horehound	Lamiaceae
	Medicago lupulina	black medic	Fabaceae
	Medicago sativa	alfalfa	Fabaceae
	Melilotus alba	white sweetclover	Fabaceae
	Melilotus officinalis	yellow sweetclover	Fabaceae
	Mentha spicata	spearmint	Lamiaceae
	Nepeta cataria	catnip	Lamiaceae
	Onopordum acanthium	Scotch thistle	Asteraceae
	Polygonum aviculare	prostrate knotweed	Polygonaceae
	Portulaca oleracea	little hogweed	Portulacaceae
	Salsola tragus	Russian thistle	Chenopodiaceae
	Salvia aethiopis	Mediterranean sage	Lamiaceae
	Scorzonera laciniata	cutleaf vipergrass	Asteraceae
	Secale cereale	cereal rye	Poaceae
	Sisymbrium altissimum	tumble mustard	Brassicaceae
	Sisymbrium irio	London rocket	Brassicaceae
	Solanum elaeagnifolium	silverleaf nightshade	Solanaceae
	Tamarix ramosissima	salt cedar	Tamaricaceae
	Torilis arvensis spp. purpurea	purple field hedge parsley	Apiaceae
	Tribulus terrestris	puncture vine	Zygophyllaceae

Location	Scientific Name	Common Name	Family Name
	Ulmus pumila	Siberian elm	Ulmaceae
	Verbascum thapsus	common mullein	Scrophulariaceae
	Vinca minor	common periwinkle	Apocynaceae
	Tribulus terrestris	puncture vine	Zygophyllaceae
	Verbascum thapsus	common mullein	Scrophulariaceae

Appendix D. Risk Assessment from Three Forest Noxious Weed Strategic Plan (1998)

A risk assessment is conducted as part of the NEPA process to determine if an action may introduce or spread invasive weeds within a proposed project area. It is also used to prescribe follow-up treatments and project actions necessary to reduce or prevent the spread of invasive weeds where the risk of invasive weed establishment is moderate or high. The primary focus of risk assessment is on ground disturbing or site-altering projects conducted on National Forest System land.

Region 3 Invasive Weed Classification System. The Region 3 invasive weed classification system provides a systematic approach for assigning management emphasis priorities.

1. Class A - Those invasive weeds that are non-native (exotic) to the state and are of limited distribution or are unrecorded in the State and pose a serious threat to agricultural crop, rangelands, plants listed an endangered, threatened or sensitive, and other natural and economic resources in the ecosystem. Class A plants receive highest priority. Management emphasis is complete eradication.

2. Class B - Those invasive weeds that are non-native (exotic) species that are of limited distribution or are unrecorded in a region of the state but are common in other regions of the state. Class B plants receive second highest priority. Management emphasis is to contain the spread, decrease population ' size, and eventually eliminate the infestation when cost effective technology is available.

3. Class -C - Consists of any other invasive weeds (exotic or native). This classification receives the lowest priority. Management emphasis is to contain spread to present population size or decrease population.

The invasive weed classes may be further subdivided to meet regional, National Forest, or local needs.

Risk Assessment Process

The invasive weed risk assessment process should be accomplished by, or closely supervised by, a person who has a good understanding of invasive weed ecology. It is an integral part of the NEPA scoping process. An overview flowchart of the Risk Assessment Process is shown in Exhibit 1 of this document.

Pre-field Review

The risk assessment process begins with a review of existing information for the subject area. Suggestions for completing this task are as follows:

1. Check local Forest Service, county/state weed board, and Natural Heritage records to determine if invasive weed species have been sighted in or adjacent to the area. Develop a list of species considered for possible occurrence.
2. Compare the habitat requirements of invasive weed species with habitat known to occur in the proposed project area to determine if potential habitat for invasive weed species exists.
3. Determine if a field reconnaissance is needed using the following:

a. If no invasive weeds are likely to occur within the area, document the results and proceed with the project as planned.

b. If the presence of invasive weed species or their habitats within or adjacent to the area is indicated by the pro-field review, conduct a field reconnaissance.

4. Summarize the results, including a list of species considered and any sources of area habitat information. File in the Risk Assessment Report and the appropriate NEPA document.

Field Reconnaissance

Use a reliable sample design in the field reconnaissance that would show that likely areas of invasive weed occurrence were searched at the proper time of year for identification of invasive weed species.

Field reconnaissance also includes inspection of potential off-site areas such as sawmills, gravel pits, equipment yards, or other areas for the presence of invasive weed species which could be transported onto NFS lands in conjunction with the proposed project.

Take the following weed management actions according to the class of invasive weed encountered:

a. Class A or B weeds are present:

(1) Develop and implement management measures to eliminate weeds.

(2) Monitor management measures for 5 years.

(3) Determine the risk of introducing invasive woods.

B. Class C weeds are present:

(1) Develop and implement management measures to prevent spread or eliminate invasive weeds.

(2) Monitor management measures for 3 years.

(3) Determine the risk of introducing invasive weeds.

c. No weeds are present or likely to occur:

(1) Document the results.

(2) Proceed with the project as planned.

File in the Risk Assessment Report and the appropriate NEPA document. Include a list of species for which a reconnaissance was conducted, a description of the survey design, and a narrative of the habitat information developed in the pre-field review. Report all sightings of invasive weed species to the appropriate interested and affected parties, including County and/or State agencies, other Federal agencies, and monitoring and oversight groups (County and/or State weed board, State Natural Heritage organization, etc.).

Using the risk assessment factors shown in Exhibit 2 of this document, determine the risk rating of introducing invasive weeds in-'the area. Document the results, including positive management actions such as planned prevention, control, and monitoring measures that may reduce or eliminate the risk of invasive weed establishment in the project area. Include a list of species considered for possible occurrence and any sources of area habitat information, along with supporting material from the pre-field review and field reconnaissance. Summarize the results and file in the Risk Assessment Report and the appropriate NEPA document

Appendix E. Forest Plan Amendments

All proposed amendments are specific, one-time variances for the Coconino NF portion of the restoration project. The language proposed does not apply to any other forest projects. The amendments would be authorized per direction in the National Forest Management Act of 1976 (NFMA) and its implementing regulations found in 36 CFR 219 (1982).

Alternatives B, C and D

Alternatives B, C and D each contain non-significant forest plans to address issues related to Mexican Spotted Owl (MSO) and Northern goshawk issues on the Coconino NF. These amendments focus on allowing treatments in MSO PACs and Northern goshawk habitats that are currently outside the authority of the current plans. These amendments are needed to accomplish the objectives of restoration as defined in the Four Forest Restoration Initiative. The expected results are increased resiliency and forest health in the treated areas as well as reduction in fire risk in these areas.

None of these amendments is expected to change the analysis for Region 3 sensitive plants or for noxious or invasive weeds significantly, if the mitigations and design features outlined in the Botany Specialist Report are incorporated into the management actions that will result from these changes. No significant changes to the effect analyses will result from these changes. Minor but insignificant changes to the amount of canopy cover and interspaces will result from the changes allowed in these amendments. These changes could result in minor but insignificant increases in growing space for all understory plants including sensitive plants and noxious or invasive weeds. The results would be minor increases in resources for sensitive plants and a slight increase in opportunities for new occupation but these effects are minor and discountable. There may also be a minor but insignificant increase in disturbance resulting from treatments that will occur because of these treatments, but the increase will not significantly increase the risk of noxious or invasive weed invasions.

Appendix F. Comment Analysis Botany and Noxious or Invasive Weeds

Comment 165-47

The Ecological Restoration Institute (ERI) recommends that Table 14 (page 96-97 of the Botanist Report) be roughly ranked using the Invasive Species Assessment Protocol: http://www.natureserve.org/getData/plantData.jsp , which evaluates invasive species based on their impact to biodiversity. Or as an alternative, rather than ranking them in order, it might be more useful to have low, medium, and high impact categories, since individual species impacts can change temporally and geographically.

ERI recommends ordering the descriptions of individual species (starting on page 109 of the Botany Specialist's Report), within the document in the same way as the table on pages 96-97 (Specialist's Report).

ERI recommends including fire and/or thinning effects on each individual species from Fire Effects Information System database, where available. Some descriptions in the report contain this information for each species and some do not. If information were unavailable, then that would be useful to state as well.

Analysis

There are two different ranking systems in the Botany Specialist's report. The table referred to in the comment comes directly from the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests (FEIS) (2005). The FEIS includes a numerical ranking system for the species we addressed. The order of the narratives in Botany Report reflects ranking of the weeds as they are addressed in the noxious weed FEIS. It is based on lifecycle of the species and the perceived difficulty of control. We regret any confusion. A partner-working group provided the "high, medium, low" ranking.

We did not use the NatureServe system and prefer not to change our ranking at this time. The ranking and assessment of weed species as reflected in the order of the narratives comes directly from the noxious weed FEIS.

We acknowledge the threat to biodiversity by non-native species including weeds. The Four Forest Restoration Initiative analysis incorporates measures to conserve biodiversity on the forests. Biodiversity is identified in the purpose and need (page 8 of the DEIS). Specifically "The project is expected to move almost 600,000 acres toward comprehensive, landscape-scale restoration with benefits that include improved forest function and health, <u>vegetation biodiversity</u>, wildlife habitat, soil productivity, watershed function, and reduced risk of severe fire effects". Biodiversity is incorporated into the definition of heterogeneity for the project. Page 345 of the DEIS states "Heterogeneity – For the purposes of this analysis, heterogeneity refers to having <u>biodiversity</u> in terms of habitat and forest structure across the landscape". Table 144 in Appendix E uses biological diversity as one of the major factors for landscape effectiveness monitoring (see page 666 of the DEIS).

We consulted the Fire Effects Information System for each noxious or invasive weed species and updated our narratives to reflect the changes needed.

Conclusion:

We rearranged the narratives as mentioned above and consulted the Fire Effects Information System database. No new mitigations or design criteria are proposed for this comment. ERI recommendations were accepted and the narratives in the botany specialist report were updated in the narratives for each species to improve clarity. The FEIS will be updated to incorporate this clarification. The mitigation and design criteria in the DEIS and Botany Specialist's Report are sufficient and no new mitigation or design criteria are proposed in response to this comment.

Comment 165-28 relating to leafy spurge

The second part of the comment expressed concern over burning in the area of leafy spurge because burning may cause an increase in density. The commenter requested specific language to address this concern.

Analysis

We consulted the Fire Effects Information System (FEIS). There are data that support use of prescribed fire in combination with herbicide to control leafy spurge.

Gucker (2010) (FEIS) discussed the effects of fire on leafy spurge. The species is a geophyte with deep underground rhizomes that allow the plants to regenerate after above ground portions are killed. Leafy spurge recolonizes burned sites from both on-site sources and off-site seeding. Leafy spurge seeds present on a burned site may be killed by fire. Leafy spurge will likely increase on burned sites, but successful treatment of the area with herbicides has been reported in other areas.

Gucker reports that fire alone does not control leafy spurge but positive results can be obtained when used in conjunction with herbicide treatment or biological control insects. Burning followed by herbicide treatment within two to three weeks after burning has been successful elsewhere. Locally, the most success treatment with herbicide has been in the fall as the plants senesce. Plant senescence varies from year to year depending on growing conditions. This would make the timing of the burn/herbicide treatment difficult to predict from year to year and would require on the ground monitoring and local coordination. Timing of prescribed fire is also critical for the survival of the biological control insects (*Aphthona* spp.) that have been released on several sites on the forest. Burning in established insect release areas while the insects are active may negatively affect them. Insects are generally active from mid-May to mid-August (Gucker, 2010). Timing restrictions for insects during this time are not anticipated to conflict with prescribed fire objectives. Mid-May through mid-August is generally a time of high fire risk on the forest and prescribed fire would not be implemented in these conditions.

Conclusion:

We are **not** proposing excluding fire from areas containing leafy spurge. Instead, timing of burning and herbicide application in areas with leafy spurge will be determined by the District Fuels Specialist and District Weeds Coordinator at the time of implementation. Sites and locations of areas containing leafy spurge where burning will occur will be included in the Botany Specialist's report. However, the most current data available should be used at the time of implementation.

Two design criteria are needed to address this issue

- Fire should be excluded from leafy spurge areas where biological control insects for leafy spurge are active during the summer months generally from mid-May to August, **except** if monitoring and surveys fail to detect the presence of the biological control insects. Prescribed fire may be implemented during that time if the insects are absent from the site and there are no other resource concerns. Monitoring prior to implementation will be needed to confirm the presence/absence of the insects.

- Timing of prescribed fire and herbicide application in areas with leafy spurge will be determined by the District Fuels Specialist and District Weeds Coordinator at the time of implementation. The most successful herbicide treatments for populations of leafy spurge on the Coconino National Forest have been in the fall. However, the logistics of treating plants with herbicide in the fall after burning may be difficult. The above ground portions of the plants will be absent and resources would have been drawn into the underground storage structures of the plants. A spring herbicide treatment following a fall burn may be necessary to address help facilitate control but this issue will be addressed on a site-specific basis.

Comment 165-29

These comments were received from ERI relating to camelthorn.

The commenter mentioned that Appendix B was not present in the document.

Analysis

We found Appendix B (weed locations) and checked to make sure it included camelthorn locations.

Conclusion:

Appendix B is sufficient and no change is needed in the botany report or the FEIS.

Comment 165-29

"Our current knowledge of the effects of fire on this species should be included, since the report mentions that some infestations are in areas slated for burning. -There is no information on this species in the Fire Effects Information System database. However, the California Invasive Plant Council mentions that: Plants may re-sprout from roots left behind after mechanical removal, and the roots are stimulated to re-sprout by fire. http://www.calipc.
org/ip/management/plant_profiles/Alhagi_maurorum.php - date accessed 5/13/13.

Analysis

The information from the California Invasive Plant Council is useful and CalIPC is a respected organization. However, the paragraph presented has no reference and no mention of experimental analyses. There is no indication that it was peer reviewed or refereed. Therefore, we cannot give it as much weight in consideration as we would a peer reviewed article or a website such as Fire Effects Information System that provides documentation for the discussion of the species. Therefore, we did not the information from California Invasive Plant Council in our revision of this report.

Conclusion:

The analysis is sufficient and no change is needed in the FEIS.

Comment 165-29

Prescribed burning is not recommended for camelthorn control (from the Field Guide for Managing Camelthorn in the American Southwest - http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410108.pdf)"

Analysis:

We could not find this publication at the link provided so could not review the information.

Conclusion:

We are proposing no change to the analysis or mitigations at this time based on this article. We were unable to find this document at the link provided.

Comment 165-40

These comments were received from ERI relating to Russian knapweed.

The commenter mentioned that Appendix B was not present in the document.

Analysis:

We found Appendix B (weed locations) and checked to make sure it included Russian knapweed locations.

Conclusion:

The analysis is sufficient and no change is needed in the FEIS.

Comment 165-40

What are the effects of fire? There is little documented information on the Fire Effects Information System website, but the following information is provided: "When planning a prescribed burn, pre-inventory the project area and evaluate cover and phenology of any **Russian knapweed** present on or adjacent to the site, and avoid ignition and burning in areas at high risk for Russian knapweed establishment or spread. Avoid creating soil conditions that promote weed germination and establishment. Discuss weed status and risks in burn rehabilitation plans. To prevent infestation, re-establish vegetation on bare ground as soon after fire as possible, using either natural recovery or artificial techniques as appropriate to site conditions and objectives. When reseeding after wildfires and prescribed burns, use only certified weed free seed. Monitor the burn site and associated disturbed areas after the fire and the following spring for emergence of Russian knapweed, and treat to eradicate any emergent Russian knapweed plants. Regulate human, pack animal, and livestock entry into burned areas at risk for weed invasion until desirable site vegetation has recovered sufficiently to resist weed invasion. Additional guidelines and specific recommendations and requirements are available."

Analysis:

Zouhar (2001) prepared an abstract for the Fire Effects Information System database. However, at that time there was no definitive information on the response of Russian knapweed in the post-fire community. Based on its life form the underground portions of the plant would likely survive fire (Pyke et al, 2010). The plant would reproduce from underground sprouting in the post-fire community.

We do not anticipate the need for a burn rehabilitation plan for Four Forest Restoration Initiative treatments.

The remaining concerns addressed in this comment are mitigated through the design features in Appendix C of the DEIS or through the incorporation of the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests* (2005).

Conclusion:

The analysis is sufficient and no change is needed in the FEIS.

Comment 165-38

These comments were received from ERI relating to **white top**.

Fire effects are not well documented but the only known location in the treatment units is slated for burning only**.** We recommend that this area not be burned. According to the Fire Effects Information System database entry for Cardaria sp., "When planning a prescribed burn, pre-inventory the project area to evaluate cover and phenology of any hoary cress or other invasive plants present on or adjacent to the site, and avoid ignition and burning in areas at high risk for hoary cress establishment or spread due to fire effects. Avoid creating soil conditions that promote weed germination and establishment. Areas of soil disturbance (e.g. those brought about by fire suppression activities) are especially susceptible to invasive plant establishment. Weed status and risks must be discussed in burn rehabilitation plans".

Analysis:

Thank you for the input. The area containing the white top infestation has been inventoried several times already during the detection and treatment of it. Design criteria B15 in Appendix E (page 570 of DEIS) requires that all areas be surveyed for noxious or invasive weeds before implementation so the area will be surveyed and treated again before implementation.

The infestation itself is near the right of way fence of a major highway in a rocky area. There is an archaeological site adjacent to the site so the likelihood of disturbance from fire suppression activities is very low. Design criteria HR/TR5 in Appendix C of the DEIS provides mitigation for this and similar sites. Design criteria B13, B15 and B16 in Appendix C of the DEIS provide mitigation and guidance that would apply to this area. These design features will be included in the final EIS.

Conclusion:

The analysis is sufficient and no change is needed in the FEIS.

Comment 165-39

These comments were received from ERI relating to Dalmatian toadflax.

This species is widespread throughout the forest and it would seem that avoiding burning treatments in infested areas would be unwieldy

Analysis:

We recognize that this species is widespread throughout the area (see Appendix B of the Botany Specialist's Report). We are not would not avoid these areas during burning treatments. The effects would be mitigated using the mitigations in this document, design criteria B13, B15 and B16 in Appendix C of the DEIS.

Conclusion:

The design features (B13, B15 and B16 in Appendix C of the DEIS) will be included in the final EIS.

Comment 165-39

ERI commented: There are at least three local papers that document the effect of burning (wildfire and prescribed) on this species (Dalmatian toadflax) that should be incorporated into the entry for this species.

Dodge and Fule 2008 (Leroux Fire) -
http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH88c4.dir/doc.pdf

Stoddard et al. 2008 (Fort Valley Experimental Forest restoration plots)
http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH01a7/a40955ae.dir/doc.pdf

Stoddard et al. 2011 (Fort Valley Experimental Forest restoration plots)
http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH32da.dir/doc.pdf

McGlone et al. 2012 (Fort Valley Experimental Forest restoration plotshttp://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH4411.dir/doc.pdf

Dodge, Rita and Peter Z. Fulé and Carolyn Hull Sieg. (2008). Dalmatian toadflax (Linaria dalmatica) response to wildfire in a southwestern USA forest. Écoscience. Vol. 15 (2). Pages 213-222.

Dodge et al studied Dalmatian toadflax in the Leroux Fire, a wildland fire that occurred in 2001. The authors studied the effects of fire severity on toadflax density. The period of study was from 2002 through 2004. The authors found higher levels of toadflax infestations in severely and moderately burned areas as compared to lightly burned or unburned areas within the fire perimeter. These increases persisted through the study but these increases were not statistically significant.

The authors investigated density dependence as well and determined that toadflax reached a critical density threshold in the second year of study. This may have resulted in the disappearance of toadflax on some plots and toadflax spread to previously uninfested areas but an increase in seed availability (seed bank) and underground plant portions that will allow the species to remain onsite and increase again when favorable conditions are available. The groups of toadflax plants seemed to be self-regulating, with decreases in density in older plants, but spreading outward to new areas allowing toadflax to persist at a stable level in the environment.

Native plant diversity increased in all levels of severity over the course of the study but was lowest on the severely burned areas and remained low throughout the study. Native richness was not correlated with toadflax density, indicating that fire severity influenced native plant richness more than the density of toadflax plants

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings. The research is based on local conditions. It was conducted within a wildfire and gives insight to the introduction and cyclic nature of toadflax infestations. One of the goals of the Four Forest Restoration Initiative project is to reduce the risk of wildfire and therefore reduce the risk of scenarios similar to the Leroux Fire. Design Features B13, B15 and B16 in Appendix C of the DEIS were designed to mitigate the effects of noxious or invasive weeds in the project area. These features will be included in the final EIS.

Design criteria B13, B15 and B16 (pages 569 -570 of Appendix C) provide for noxious weed mitigation to botanical resources and survey and control of noxious or invasive weeds prior to implementation. There are several design criteria in other resource areas that also address noxious or invasive weeds (see design feature FE10 and the soil and watershed and transportation sections of Appendix C).

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis. The study was conducted in a local wildfire where fires severity was high. We will incorporate this information into our existing condition information for Dalmatian toadflax in the Botany Specialist's Report and FEIS.

Comment 165-39

Stoddard, Michael T., Christopher M. McGlone and Peter Z. Fulé. 2008. Effects of Ecological Restoration Alternative Treatments on Nonnative Plant Species Establishment. In Olberding, Susan D., and Moore, Margaret M., tech. coords. 2008. Fort Valley Experimental Forest-A Century of Research 1908-2008. Conference Proceedings; August 7-9, 2008; Flagstaff, AZ. Proc. RMRS-P-55. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 282 pp.

Stoddard et al discuss the effects of the level of treatments on the cover and richness of native and non-native plants in a restoration experiment at Ft. Valley, which is a local area within the boundary of the Coconino National Forest. Three levels of thinning to simulate reference conditions were incorporated into this study, plus an untreated control. Trees were harvested, removed from the site by "whole tree skidding" and the area broadcast burned.

Plant cover and species richness were greatest in the mid to high intensity treatments every year post treatment but non-native species were also higher on the mid to high intensity treatments compared to the low or untreated areas. Over time, the portion of plant community that was formed by non-native species began to converge toward the untreated control. The most prevalent non-native species was common mullein (Verbascum thapsus).

Analysis:

This article is part of a conference proceedings published by Rocky Mountain Research Station. This article was peer reviewed but not refereed publications as compared to journal articles. It is based on sound science.

The article provides good information on forest restoration and non-native weeds. We did not find any mention of Dalmatian toadflax in this article.

Design criteria B13, B15 and B16 (pages 569 -570 of Appendix C) provide for noxious weed mitigation to botanical resources and survey and control of noxious or invasive weeds prior to implementation. There are several design criteria in other resource areas that also address noxious or invasive weeds (see the soil and watershed and transportation sections of Appendix C).

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment. ,

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis. We are proposing no change to the analysis or mitigations at this time because we found no mention of Dalmatian toadflax in the article.

Comment 165-39

Stoddard. Michael T., Christopher M. McGlone, Peter Z. Fulé, Daniel C. Laughlin, and Mark L. Daniels. 2011. Native Plants Dominate Understory Vegetation Following Ponderosa Pine Forest Restoration Treatments. Western North American Naturalist 71(2). Pages 206–214

This article discusses the same restoration treatments as the article above. The authors noted that native plants dominated most areas and most treatments. The authors noted an increase in non-native plant cover but by the end of the study but by the end of the study, non-native plant cover represented less than 6% of the total plant cover across all treatments. Dalmatian toadflax was the only non-native indicator species in the statistical analyses of the plant community response. All others were native plant species.

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings.

This article was submitted as a comment on Dalmatian toadflax. We recognize that Dalmatian toadflax will remain part of the plant community on any given site once it enters the site. Despite the increase of Dalmatian toadflax over time, it did not dominate the site and there was no mention of it being problematic. Design criteria B13, B15 and B16 (pages 569 -570 of Appendix C) provide for noxious weed mitigation to botanical resources and survey and control of noxious or invasive weeds prior to implementation. There are several design criteria in other resource areas that also address noxious or invasive weeds (see the soil and watershed and transportation sections of Appendix C).

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS.

Comment 165-39

McGlone, Christopher M., Michael T. Stoddard, Judith D. Springer, Mark L. Daniels, Peter Z. Fulé, and W. Wallace Covington. 2012. Nonnative species influence vegetative response to ecological restoration: Two forests with divergent restoration outcomes. Forest Ecology and Management. Vol. 285.Pages 195–203.

This study is a comparison between the understory response between two similar restoration treatments both conducted by ERI. One is in Ft. Valley and the other is Mount Trumbull, AZ. Both received similar restoration treatments. Timing of treatments was similar on both sites, occurring in 1999. No toadflax was observed in the Mount Trumbull area but cheatgrass was the dominant non-native plant after 10 years of treatment. Dalmatian toadflax was present on the Fort Valley site prior to treatment but at very low levels. It increased in cover after treatment but did not dominate the site. After 10 years, native plant cover dominated the Fort Valley site.

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings.

This article was submitted as a comment on Dalmatian toadflax. We recognize that Dalmatian toadflax will remain part of the plant community on any given site once it enters the site. Design criteria B13, B15 and B16 (pages 569 -570 of Appendix C) provide for noxious weed mitigation to botanical resources and survey and control of noxious or invasive weeds prior to implementation. There are several design criteria in other resource areas that also address noxious or invasive weeds (see the soil and watershed and transportation sections of Appendix C).

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weeds.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS.

Comment 165-41

ERI submitted the following comments on musk thistle.

The existing condition paragraph also includes information on Scotch thistle. It is not clear whether this information applies to Musk or Scotch thistle.

Fire adaptations (from Fire Effects Information System): “Musk thistle can produce abundant seed and establish well in high light environments (see Successional Status). Fire creates conditions that are favorable to the establishment of musk thistle (i.e. open canopy, reduced competition, areas of bare soil), so if musk thistle seeds are present and competition minimal, musk thistle may be favored in the post-fire community “(From Fire Effects Information System database - http://www.fs.fed.us/database/feis/plants/forb/carnut/all.html#FIRE ECOLOGY – Date accessed 5/14/13). The evidence for whether fire can be used to control musk thistle is conflicting and probably site-dependent.

McGlone, Christopher M., Michael T. Stoddard, Judith D. Springer, Mark L. Daniels, Peter Z. Fulé, W. Wallace Covington. 2012 Nonnative species influence vegetative response to ecological restoration: Two forests with divergent restoration outcomes. Forest Ecology and Management 285. Pages 195–203.

Analysis:

We separated the discussion of musk thistle and Scotch thistle in our updated Specialist’s Report to clarify our discussion.

We already included information from the Fire Effects Information System in our analysis. We cited the reference as Zouhar, 2002 who is the author of the abstract for musk thistle in Fire Effects Information System. This information was accessed in 2012 during the preparation of the Botany Specialists Report.

We noted that McGlone et al, 2012 detected musk thistle in the post treatment vegetation assessment at Fort Valley when we reviewed the publication for the comment on Dalmatian toadflax and urge prompt control of this species in the experimental area if it has not already been removed.

Conclusion:

The Botany Specialist Report will be updated to include the information on musk thistle and Scotch thistle. We find that the botany analysis included information from the Fire Effects Information System and that Zouhar (2002) was cited. The information from McGlone et al. 2012 will be incorporated into the Botany Specialist’s Report but will not change the analysis.

Comment 165-42

ERI submitted the following comments on Scotch thistle

Although the **Fire Effects Information System** does not contain information on fire effects, there should be a number of other available sources on-line. Fire will likely provide conditions conducive to the establishment of Scotch thistle populations.

McGlone et al. 2012 (Mt. Trumbull) contains some data on Scotch thistle presence in a restoration research site outside of the Four Forest Restoration Initiative area but in northern Arizona.

Analysis:

We will update the Botany Specialist’s Report to acknowledge there is no information available in the Fire Effects Information System database for Scotch thistle and agree that fire will provide favorable conditions for the establishment of Scotch thistle as well as other noxious or invasive weeds.

Design criteria B13, B15 and B16 (pages 569 -570 of Appendix C) provide for noxious weed mitigation to botanical resources and survey and control of noxious or invasive weeds prior to implementation.

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment

We noted that McGlone et al, 2012 detected Scotch thistle in the post treatment vegetation assessment at Mount Trumbull when we reviewed the publication for the comment on Dalmatian toadflax and urge prompt control of this species in the experimental area if it has not already been removed.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We will update the Botany Specialist's Report to acknowledge there is no information available in the Fire Effects Information System database for Scotch thistle.

Comment 165-43

ERI provided this comment on bull thistle.

The following papers contain information on bull thistle presence following ecological restoration treatments in the Four Forest Restoration Initiative area: - Stoddard et al. 2008 (Fort Valley Experimental Forest restoration plots)
http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH01a7/a40955ae.dir/doc.pdf - Stoddard et al. 2011 (Fort Valley Experimental Forest restoration plots)
http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH32da.dir/doc.pdf

-McGlone et al. 2012 (Fort Valley Experimental Forest restoration plots
http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH4411.dir/doc.pdf -

The ERI has unpublished information indicating that bull thistle is present following thinning treatments alone, without the addition of prescribed burning.

Other unpublished data seem to indicate that bull thistle becomes only a minor presence in the aboveground vegetation approximately 3-5 years following burning. However, seeds are probably still present in the soil seed bank for a time.

Analysis:

Stoddard et al 2011 noted that 12% of the plots on the Fort Valley restoration project contained bull thistle in 2001 and decreased slightly to 10% in 2002 and was never significant enough to become an indicator species.

McGlone et al, 2012 detected bull thistle on vegetation plots at Fort Valley in 2011. The species was present in control as well as the treated areas supporting part of the next portion of the comment that burning is not necessary to produce bull thistle infestations. We urge follow up visits to the location to monitor this infestation and treat it if necessary.

Other portions of this comment citing unpublished data are likely valid but were not supported by documentation so are not responded to in this analysis.

Design criteria B13, B15 and B16 (pages 569 -570 of Appendix C) provide for noxious weed mitigation to botanical resources and survey and control of noxious or invasive weeds prior to implementation.

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment

Conclusion:

There is no conflict between science used in these articles and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS.

Comment 165-35

ERI provided this comment on diffuse knapweed

The effects of fire on this species are unknown, according to Fire Effects Information System, and, "When planning a prescribed burn, inventory the project area and evaluate the cover and phenology of any diffuse knapweed present on or adjacent to the site, and avoid ignition and burning in areas at high risk for diffuse knapweed establishment or spread due to fire effects. Avoid creating soil conditions that promote weed germination and establishment.

Discuss weed status and risks in burn rehabilitation plans." (http://www.fs.fed.us/database/feis/plants/forb/cendif/all.html#FIRE ECOLOGY – Date accessed 5/14/13).

Analysis:

We included fire effects information from Fire Effects Information System database in our preparation of the Botany Specialist's Report. We cited the reference as Zouhar, 2001 who is the author of the abstract for diffuse knapweed in the Fire Effects Information System database.

We do not anticipate the need for a burn rehabilitation plan for Four Forest Restoration Initiative treatments.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS.

ERI provided these comments on cheatgrass

Comment 47-18

The potential for significant cumulative impacts of noxious weed spread in the project area is high because McGlone and others (2009) showed that cheatgrass abundance and distribution increased 90-fold above a pre-treatment baseline as a result of forest treatments similar to the proposed action.

ERI provided the following references for review

McGlone, C.M., Springer, J.D., Covington, W.W., 2009. Cheatgrass encroachment on a ponderosa pine forest ecological restoration project in northern Arizona. Ecol. Rest. 27(1), 37-46.

McGlone, C.M., Springer, J.D., Laughlin, D.C. 2009. Can pine forest restoration promote a diverse and abundant understory and simultaneously resist not native invasion? For. Ecol. Manage. 258, 2638-2646. Fort Collins, CO; U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Pages 193-198.

McGlone and others (2009) prepared two articles on cheatgrass invasion after restoration treatments at Mount Trumbull, AZ. In one article, published in Ecological Restoration titled *Cheatgrass Encroachment on a Ponderosa Pine Forest Ecological Restoration Project in Northern Arizona*, the cheatgrass invasion was documented in 2003, several years after the initial treatment in some units of the study. McGlone and his co-authors cite weather as a contributing factor to cheatgrass invasion. The areas he cited in his study experienced a severe drought in 2002, displacing most plants including cheatgrass. Then the area received above average precipitation in September 2002. Since cheatgrass is a winter annual, the cycle was conducive to cheatgrass germination. During that time, significant increases were seen in cheatgrass cover in all treatments including the control (no treatment area). A similar weather cycle was observed in many parts of the western US during that time, including the Flagstaff area. We believe this is the article the commenter is referring to in his comments.

The authors discussed the issue of cheatgrass invasion on the same study area. In that publication, native plant richness and cover increased after treatments but the cover was not sufficient to exclude the cheatgrass invasion and again cites drought as a contributing factor. While we cannot control the weather and other environmental conditions, we will incorporate mitigation measures such as not burning during severely dry periods which is one of McGlone’ s recommendations.

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings.

Occurrences of cheatgrass within the Four Forest Restoration Initiative boundary are not well documented. Areas likely to contain cheatgrass infestations include severely disturbed areas such as recent wildfires. The Four Forest Restoration Initiative will restore the structure and processes of the ponderosa pine forest throughout northern Arizona.

The Forest Service recognizes the significance of cheatgrass invasions and their effects to ecosystem functions and processes, especially the effects on fire frequency and areal extent. The forests completed the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds* (*FEIS*) in 2005, which provides the guidance for treatment noxious or invasive weeds on the Coconino, Kaibab and Prescott National Forests.

We plan to survey and treat noxious or invasive weeds prior to the implementation of management activities in the units to be treated. Adaptive management and additional treatments will be used if needed to address the effects of noxious or invasive weeds.

See appendix C of the DEIS (page 569), design criteria B 15 and B16 for features addressing the survey, treatment and prevention of noxious or invasive weeds.

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

The Four Forest Restoration Initiative will also incorporate the NEPA decisions and treatment strategies in the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds* (2005).

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS.

Comment 165-37

ERI recommends that the botanist's specialist report add in recommendations to areas that have been invaded by cheatgrass (Bromus tectorum) and (see Steven 2004). These areas may require additional treatments following fire, as well as deferred livestock grazing since it has been demonstrated that fire promotes the spread and establishment of cheatgrass. We would ask that the decision to burn these cheatgrass infested areas be carefully weighed against the benefit of fuel reduction and other resource benefits of burning.

We would like to note that this is a restoration project and not solely a fuels reduction project. Other factors including a healthy understory community will be considered in the decision.

ERI provided the following references for review on cheatgrass

Gundale, M.J Sutherland, S., DeLuca, T.H. 2008 Fire, native species and soil resource interactions influence the spatio-temporal invasion pattern of Bromus tectorum. Ecography 31, 201-210

Keeley, J.E., McGinnis, T.W. 2007. Impact of prescribed fire and other factors on cheatgrass persistence in a Sierra Nevada ponderosa pine forest. International Journal of Wildland Fire 16(1), 96-106.

McGlone, C.M..., Hull-Sieg, C., Kolb T.E. 2011 Invasion Resistance and persistence: established plants win, even in disturbance and high propagule pressure. Biological Invasions. 13, 291-304.

McGlone, C.M., Springer, J.D., Laughlin, D.C. 2009. Can pine forest restoration promote a diverse and abundant understory and simultaneously resist not native invasion? For. Ecol. Manage. 258, 2638-2646. Fort Collins, CO; U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Pp 193-198.

McGlone, C.M., Springer, J.D., Covington, W.W., 2009. Cheatgrass encroachment on a ponderosa pine forest ecological restoration project in northern Arizona. Ecol. Rest. 27(1), 37-46.

Sorenson, C.D., McGlone, C.M. 2010. Ponderosa pine understory response to short-term grazing exclusion (Arizona). Ecological Restoration, 28 (2): 124-126.

Steven, R. 2004. Management of restored and revegetated sites. In: Monsen, Stephen B; Stevens, Richard; Shaw, Nancy L., comps. 2004 Restoring Western Range. Gen. Tech. Rep. RMRS GTR-136-vol-1.

Here is our review and analyses of these articles.

Gundale et al, 2008

This study was conducted in Montana and is documented in a peer-reviewed journal. The study was conducted in a bunchgrass/ponderosa pine community where ponderosa pine trees were solitary or occurred in low density and distributed in grassy areas. The study consisted of three components, a field study, a greenhouse study and a germination study. The field study sites were on the edges of a large wildfire that had occurred five years prior to the beginning of the experiment. The greenhouse study assessed the effects of nutrient limitations on cheatgrass and a germination study used extracts from pine litter on the germination of cheatgrass in a laboratory setting to study the effects of the presence of ponderosa pine litter on cheatgrass germination.

On the study site cheatgrass occurred in two types of infestations after burning – 1) as a ring of infestation around the base of the ponderosa pine tree. These persisted for 5-10 years and diminished over time in the absence of fire or 2) as low to moderate infestations in the bunch grass community both before and after fire. The authors found two different mechanisms regulating the infestations, one mechanism for trees and one for grassy areas. There is a strong interaction between fire disturbance and cheatgrass under trees but not in grassy areas.

Findings included a strong relationship between added nitrogen from burning at the bases of the trees. Factors influencing this relationship include the increases of nitrogen and phosphorus after fire consumed the pine litter. In the greenhouse and germination studies, cheatgrass germination and growth were suppressed by the presence of pine litter.

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings. We acknowledge that resources including nitrogen and phosphorus will increase and litter will decrease after burning is conducted, increasing the risk of noxious or invasive weed invasions.

The site conditions (open ponderosa pine/bunch grass areas) are limited or non-existent in the project area. Instead, much of the area to be treated is comprised of dense ponderosa pine stands with little or no understory vegetation. Understory vegetation is expected to increase after treatments. The presence of cheatgrass as well as other noxious or invasive weeds could negatively affect the post treatment understory plant community. To mitigate these effects we plan to survey and treat noxious or invasive weeds prior to the implementation of management activities in the units to be treated. See appendix E of the DEIS (page 569), design criteria B 15 and B16 for features addressing the survey, treatment and prevention of noxious or invasive weeds.

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

The Four Forest Restoration Initiative will also incorporate the NEPA decisions and treatment strategies in the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds* (2005).

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS.

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Keeley and McGinnis (2007)

Keeley and McGinnis conducted a study on cheatgrass invasions in the Kings Canyon National Park, California in a ponderosa pine community. Ponderosa pine was the dominant tree but incense cedar and two species of oaks were also present. The understory was comprised of various grasses, forbs and shrubs including manzanita, suggesting a lower elevation or different plant community than is present locally.

The cheatgrass invasions have been introduced by prescribed fire in the park in the 1990's and the prescribed burning program was halted until the problem could be assessed. The authors used a series of variable including fire intensity, cover, shade, biomass and season of burning to measure the results of the burning experiments. They also added nutrients to the soils in some treatments.

In one experimental treatment, pine needles were added to the burned area to assess the effects of them on cheatgrass germination and persistence. The authors discussed the historic fire regimes and concluded that the area burned about every 11 years. They also noted that in the pre-European era native plant communities were free from competition from non-native invasives such as cheatgrass, which can affect fire interval and intensity. Fire and livestock were thought to play an important role in the introduction and dispersal of cheatgrass in the area. In their study, the only successful treatment of cheatgrass was the pine accumulation treatment.

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings. The plant community is dominated by ponderosa pine but is slightly different from the local plant communities within the Four Forest Restoration Initiative area.

The major conclusion of this study is similar to Gundale et al (2008) where pine litter suppressed cheatgrass germination and growth. We anticipate that pine litter will be reduced or removed from the units that receive burning treatments in the Four Forest Restoration Initiative area but will increase over time due to natural processes.

We plan to survey and treat noxious or invasive weeds prior to the implementation of management activities in the units to be treated. Adaptive management and additional treatments will be used if needed to address the effects of noxious or invasive weeds.

See appendix C of the DEIS (page 569), design criteria B 15 and B16 for features addressing the survey, treatment and prevention of noxious or invasive weeds.

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

The Four Forest Restoration Initiative will also incorporate the NEPA decisions and treatment strategies in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005)

Grazing was mentioned in this article. Design criteria R6 (page 578; Appendix C) addresses post-fire assessment of soil and perennial plants prior to grazing.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS.

McGlone, Hull-Sieg, and Kolb 2011

This article documents a follow-up study conducted by McGlone at a restoration site near Mount Trumbull, AZ. Previous articles prepared by McGlone and various co-authors documented a high level of invasion of cheatgrass on the restoration units after treatments including tree removal and burning occurred. The treatments reduced the total tree density by nearly one-half and the total basal area by more than one third. Commercial timber was removed and the remaining slash was lopped and scattered. (Roccaforte et al, 2010). Following the treatments, McGlone noted the high level of invasion.

This study revisited the restoration units for a study on native plant competition. The authors used a reciprocal seeding study and a clipping study to assess native plant competition. The studies included replicated areas where native species were seeded in cheatgrass infestations and where cheatgrass was seeded into native plant dominated areas. The authors also conducted a clipping study to assess the effects of biomass removal on cheatgrass. The hypotheses for the reciprocal seeding study was that disturbance to the native plant area would reduce the resistance to invasion; and that disturbance to the cheatgrass dominated area would reduce its resistance to invasion.

At the end of the study, the cheatgrass dominated areas remained dominated by cheatgrass and the native species dominated areas remained dominated by native species. The study lasted for three years. The authors noted some shifts in plant community over the course of the study but no significant changes. Squirrel tail (*Elymus elymoides*) a perennial native grass was one of the seeded species and was present in the native plant community before seeding. It remained a dominant species in the native plant areas after the experiment. Cheatgrass remained dominant in the previously infested areas.

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings. It revisited a previous location addressed in the comments submitted by ERI. The study area is in northern Arizona and is generally similar to the areas included in the Four Forest Restoration Initiative analysis. The authors were unable to prove the hypotheses they developed but had some positive results in the seeding study. The species they used in their seed mix have been reported elsewhere as potential species for native plant restoration and competition with non-native species.

Mitigations for noxious or invasive weeds are included in appendix C of the DEIS and will be carried forward into the final document. Refer to design criteria B13 on page 568 of the DEIS “Manage prescribed burns to promote native species and to hinder weed species germination”. The purpose of this design feature is to “promote healthy native plant communities and reduce the risk of noxious or invasive weed invasions.” The soil and watershed section of Appendix C also contains several provisions for seeding disturbances caused by management actions. Appendix E will provide monitoring and feedback for management actions and adaptive management including the understory herbaceous community and noxious or invasive weeds. Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

We referred to John P. Roccaforte, Peter Z. Fule´ and W. Wallace Covington. 2010. Monitoring Landscape-Scale Ponderosa Pine Restoration Treatment Implementation and Effectiveness. Restoration Ecology. Vol 18 (6). Pages 820–833 to help us understand the treatments at the study site.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS.

McGlone, Springer and Laughlin 2009

This article is based on the restoration experiments conducted at Mt. Trumbull as in the article above. The restoration experiments focused on the reduction of the risk of crown fire and increasing the native understory and species diversity. Treatments included tree removal and prescribed fire to simulate pre-settlement conditions. Merchantable timber was removed and the remaining slash was scattered. Slash was disposed of by broadcast burning. Slash accumulations on some portions of the restoration units was ample enough to cause high severity fire, high soil heating and tree mortality in some portions of the restoration treatments. No seeding of understory species occurred as part of the initial restoration study.

This study evaluated the magnitude and direction of the understory vegetation change for the first five years after treatments. The pre-treatment data detected low species diversity in the herbaceous plant community as compared to the surrounding area. Recovery of the native plant community was potentially compromised by the impoverished seed bank and the presence of seed sources for noxious or invasive weeds. Plant communities with low species diversity are more easily invaded than those with greater diversity. The presence of cheatgrass in the pretreatment community could have contributed to the invasion. There was a major drought during the study. The authors postulated that drought in the summer of 2002 followed by rain events in September 2002 could have contributed to the increase in cheatgrass. Cheatgrass tends to germinate in the early fall and then overwinters and matures in the following growing season. The rain event would have corresponded to this cycle. Cheatgrass was additive to the native plant community, did not displace the native plant community. Even with cheatgrass invasion, native plant community continued to increase through 2005 (end of study).

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings. It was part of a restoration study conducted near Mt. Trumbull, AZ. The study area is in northern Arizona and is generally similar to the areas included in the Four Forest Restoration Initiative analysis.

Mitigations for noxious or invasive weeds are included in appendix C of the DEIS and will be carried forward into the final document. Refer to design criteria B13 and B15 on page 568 of the DEIS. The soil and watershed section of Appendix C also contains several provisions for seeding disturbances caused by management actions. Appendix E will provide monitoring and feedback for management actions and adaptive management including the understory herbaceous community and noxious or invasive weeds.

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the

McGlone, Springer and Covington, 2009

This article is based on the restoration experiments conducted at Mt. Trumbull as in the article above. The authors discuss the increase in cheatgrass that occurred in 2003. Cheatgrass increased in all treatments but was highest in the thin/burn treatments. They cite several factors that could have contributed to the increase in cheatgrass. In this article, the authors discuss the severe drought that occurred over the course of the year between August 2001 and August 2002 followed by precipitation in September 2002. This series of events contributed to stress to native species followed by ideal growing conditions for the cheatgrass in September 2002which would have facilitated the invasion. The year of burning seemed to have no effect on whether the individual sites were invaded. Cattle were allowed to re-enter the area after a four-year absence but the increase in cheatgrass could not be directly attributed to grazing. The historic grazing use in the area was much higher than the stocking allowed in the area in 2002 or 2003. The restoration treatments were seeded but the authors stated that the seeding was not heavy enough to suppress noxious or invasive plant invasions. The authors mentioned that cheatgrass could have been present in the seeding mix. Similar cheatgrass infestations were observed in other areas of the region including some areas that were not recently treated or burned.

The authors include six recommendations in their article

1) Isolate areas containing non-native species from further disturbance
2) Reduce population size of non-natives prior to implementing the treatments.
3) Limit post treatment seeding to areas already containing non-natives.
4) Minimize disturbance on the landscape.

5) Do not conduct ecological restoration treatments during droughts or other climatic conditions that may compromise the success of the project
6) Conduct long-term post-treatment monitoring and aggressively control nonnative population expansion.

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings. It revisited a previous location addressed in the comments submitted by ERI.

The study area is in northern Arizona and is generally similar to the areas included in the Four Forest Restoration Initiative analysis. The concerns above are addressed in the same order in which they appear above.

1) We cannot completely avoid the areas infested with non-native species from further disturbance and still accomplish the goals of restoration and fuels reduction. However, there are several mitigations that will help minimize the spread of noxious or invasive weeds and will provide for control of then before implementation begins. For example design criteria B13, B15 and B16 (pages 569 -570 of Appendix C) provide for noxious weed mitigation to botanical resources and survey and control of noxious or invasive weeds prior to implementation. There are several design criteria in other resource areas that also address noxious or invasive weeds (see the soil and watershed and transportation sections of Appendix C).
2) Infestations will be reduced using design criteria B15.
3) There are many instances where it may be necessary to seed the area for resource protection including the prevention or control of noxious or invasive weeds (see soil and watershed section of Appendix C). Native seed that has been certified weed free will be used in these instances.
4) Levels of disturbance will vary depending on treatments designed for a specific area. There are many mitigations incorporated throughout the document and Appendix C that will address and minimize the level of disturbance as much as possible while still accomplishing the goals of restoration and fuels reduction.
5) It would be unlikely that timber harvest or prescribed fire would occur during a severe drought. Fire danger on national forest lands would likely be extreme if this were to occur. Timber harvesting and prescribed fire would be severely limited or halted during times of high fire risk.
6) Four Forest Restoration Initiative includes a long-term monitoring plan for many resources including noxious or invasive weeds and provisions for adaptive management to address issues with noxious or invasive weeds.

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS

Sorenson and McGlone 2010

This article is based on the restoration experiments conducted at Mt. Trumbull as in the articles above. It assessed the effects of cattle grazing on the cheatgrass infestation. The authors established ten paired plots consisting of a grazing treatment exclosure and a similarly sized grazed control. Of the ten pairs, five were located in a thinned and burned forest and five in unrestored areas. The study area is in northern Arizona and is generally similar to the areas included in the Four Forest Restoration Initiative analysis. It utilized the cattle and grazing regime of an existing BLM allotment. The authors noted that grazing intensity and duration were light, making it difficult to detect significant change. No statistically significant trends for the utilization of native perennial grasses were detected. The authors attributed this to the highly variable precipitation during the three years of the study. However, the authors state that grazing facilitated cheatgrass persistence during the life of the study.

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings. It revisited a previous location addressed in the comments submitted by ERI. The vagaries of the weather as well as cattle use on the area made it difficult to detect any significant changes on the study.

Design criteria R6 (see page 578 of Appendix C) addresses range readiness after the implementation of prescribed fire on Four Forest Restoration Initiative treatment areas. This mitigation will allow for assessment of plant readiness and grazing. Additionally, the annual operating instructions for each allotment would be used to regulate and restrict grazing if necessary. Noxious or invasive weed issues would use the design criteria discussed in the articles above. Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS

Steven, R. 2004

This article is a chapter from a General Technical Reference. It addresses the management of post-treatment vegetation to ensure the success of the treatments. The author notes that the success of widely used species may vary from site to site and is partly dependent on precipitation, which will affect the outcome. Success in dry years is much harder to achieve than in years with ample precipitation. Treatment in below average years affects the post-treatment management of the site. There are several factors including wildlife and weather that cannot be controlled by the range manager. Human and livestock activities can positively or negatively affect the results and must be regulated to ensure success. Grazing plans need to be flexible enough to allow for nonuse or reduced use if necessary. The authors recommend no grazing until the end of the second growing season. However, many factors should be considered including precipitation before the treatment, vegetation type, site preparation, wildlife present and the presence and quantity of competing weedy species. Season of grazing should be considered. Grazing in spring and early summer can be damaging to recently planted sites when plants are young. The author states that intensity of grazing during the establishment period needs to be adjusted on a season-to-season basis based on plant phenology, as well as climatic and biotic influences.

Sites with aggressive annuals such as cheatgrass may need special attention. Seeded and native species tend to develop more slowly in the presence of these aggressive annuals compared to sites where they are absent. Most annuals are never completed eliminated from a site. They remain on site and increase when the plant community is weakened.

Analysis:

This article is part of a general technical reference prepared for guidance on grazing management. General technical references are peer reviewed but not refereed publications as compared to journal articles but based on sound science.

This article was submitted as a comment on cheatgrass. We recognize that cheatgrass will remain part of the plant community on any given site once it enters the site. Other articles above document the importance of a healthy perennial plant community to help regulate and control cheatgrass. Design criteria as well as monitoring and adaptive management are included in the Four Forest Restoration Initiative analysis to help mitigate the effects of cheatgrass invasions.

Design criteria R6 (see page 578 of Appendix C) addresses range readiness after the implementation of prescribed fire on Four Forest Restoration Initiative treatment areas. This mitigation will allow for assessment of plant readiness and grazing. Additionally, the annual operating instructions for each allotment would be used to regulate and restrict grazing if necessary. Design criteria B13, B15 and B16 (pages 569 -570 of Appendix C) provide for noxious weed mitigation to botanical resources and survey and control of noxious or invasive weeds prior to implementation. There are several design criteria in other resource areas that also address noxious or invasive weeds (see the soil and watershed and transportation sections of Appendix C).

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS

Comments of Arthur Firstenberg

Mr. Firstenburg commented that the DEIS Fails To Address the Impact of Herbicides

- All the alternatives, says the DEIS, will increase noxious weed growth (p. 258).

- Not to worry, says the Forest Service: amendments 20 (Coconino NF) and 7 (Kaibab NF) have allowed the use of herbicides to control them (p. 259).
- But the DEIS is then required to address the massive use of herbicides that this project would entail by encouraging noxious weeds to proliferate over half a million acres of forest land, and the impacts of those herbicides on animals, plants, waterways, and humans living in and around the project area.

Mr. Firstenberg's comments are based on the information he found within the DEIS. He did not provide supplemental information.

We divided Mr. Firstenberg's comments into several portions to focus on the issues within

Analysis:

Mr. Firstenberg asserts that all alternatives will increase noxious weed growth

We reviewed page 258 of the DEIS as cited above. This page addresses cumulative effects all alternatives on noxious or invasive weeds. **All alternatives including the "no action" would lead to increases in noxious or invasive weeds**. If the no action alternative were selected, risks that would lead to noxious weed introduction and expansion of existing infestations such as the increased risk of severe wildfire would not be addressed. Noxious or invasive weed treatment would rely on other funding sources to detect and treat weeds. None would be as comprehensive as the survey, treatment or monitoring that would be part of the Four Forest Restoration Initiative project.

The action alternatives would provide direction and funding for treatment of noxious or invasive weed infestations.

Appendix C of the DEIS contains many design criteria and mitigations to address the noxious or invasive weed infestations. Design criteria B15 and B16 (Table 21) are designed to address and mitigate noxious or invasive weed issues. These criteria are copied directly from the DEIS and inserted below. These features contain several mitigations to prevent and treat noxious or invasive weed infestations in the treated areas of the Four Forest Restoration Initiative analysis.

Table 21. Design Criteria B15 and B16

Design Criteria No.	Description	Purpose	Comment or Purpose
B15	Follow the guidance in appendix B of the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott NFs within Coconino, Gila, Mojave, and Yavapai Counties, Arizona including: (1) surveying the treatment area and evaluating weeds present before implementation; avoiding or removing sources of weed seed and propagules to prevent new weed infestations and the	X	Provides guidance and mitigation for noxious or invasive weeds and complies with The Coconino and Kaibab NF plans.

Design Criteria No.	Description	Purpose	Comment or Purpose
	spread of existing weeds, (2) treating weed infestations within treatment units before implementing treatments, (3) managing prescribed fires as an aid to control of existing weed infestations and to prevent the spread of existing weeds, and (4) monitoring slash pile sites after burning and control noxious or invasive weeds.		
B16	Incorporate weed prevention and control into project layout, design, alternative evaluation, and project decisions. Prevent spread of potential and existing noxious or invasive weeds by vehicles used in management activities by washing vehicles and equipment prior to entering the project area and when moving from one area to another. Review timber sale contract clauses for vehicle cleaning and incorporate appropriate clauses. Also, see SW4 for timber sale clauses and FE10 that addresses preventative measures for weeds from prescribed burning.	X	Mitigate effects of management actions on existing and potential noxious or invasive weed infestations; measure is complementary to timber sale contract clause CT WO-C/CT 6.36 and watershed best management practices.

In addition to the criteria above, Appendix C contains design criteria in other resource areas that will be useful in preventing and controlling noxious or invasive weed infestations. For example, design criteria FE10 states “When prescribed burns are conducted in areas with, or near known populations of invasive weeds, follow-up monitoring would be conducted.” The purpose of this feature is to detect and treat noxious or invasive weeds that may have been introduced or increased due to prescribed burning.

Appendix E of the DEIS contains the Monitoring and Adaptive Management Plan for the project. Parameters are included to monitor and treat noxious or invasive weeds. One of the monitoring questions used to develop the plan states “Did actions minimize the spread of noxious weeds in compliance with the forest plans (noxious weeds and special area guidance), FSM direction for noxious weeds and special areas (FSM 2090)” Table 145 of the DEIS contains trigger points for adaptive management (see page 675) of the DEIS. This desired condition and its adaptive management features are designed to **reduce** the infestations of noxious or invasive weed infestations in the project area.

Analysis:

Amendments 20 (Coconino NF) and 7 (Kaibab NF) allow use of herbicides

We agree with this statement. The amendments are based on a NEPA analysis already conducted and are not part of the decision to be made by the Four Forest Restoration Initiative analysis. Instead, the amendments form part of the foundation for the Four Forest Restoration Initiative analysis. They incorporated Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests (FEIS) (2005) into the Forest Plans of their respective forests.

Prior to the integration of the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests* (2005) (noxious weed EIS) into the forest plans with the amendments no herbicides could be used on the forests. Noxious weeds were controlled mostly by manual or mechanical control, which can be costly and is inefficient on large infestations. The noxious weed EIS analyzed several treatment methods including manual, mechanical, cultural and biological in addition to the use of herbicides to control noxious or invasive weeds.

Conclusion:

We are proposing no change to the analysis or mitigations at this time based on this comment. Our analysis is sufficient and no change is needed in the FEIS.

Analysis:

The DEIS is required to address the massive use of herbicides

There is no statement in the DEIS or elsewhere that supports this assertion. Many of the mitigations in the Four Forest Restoration Initiative DEIS and in the noxious weed EIS mentioned above strive at minimizing the use of herbicides either through preventative measures such as in the table above or through the use of other treatments. There is only one mention of herbicide in the DEIS and that is on page 258 (cumulative effects of noxious or invasive weeds), **allowing the use** of herbicides. There is no statement on the amounts or locations where herbicides would be used. If herbicides are used as part of the treatment in the Four Forest Restoration Initiative project, the use will follow all applicable law, regulation and policy. These include such mitigations as limited spray zones around areas such as communities, recreation sites, trailheads, and scenic overlooks. More information on these areas and other mitigations can be found in the noxious weed EIS.

Conclusion:

We are proposing no change to the analysis or mitigations at this time based on this comment. Our analysis is sufficient and no change is needed in the FEIS.

Jay Lininger on behalf of Center for Biological Diversity May 29, 2013

Mr. Lininger submitted a letter containing many comments relating to the Four Forest Restoration Initiative analysis. We searched for comments relating to Region 3 sensitive plants or noxious or invasive weeds. The comments below were copied from Mr. Lininger’s letter.

"Exotic plant spread is a potentially significant forest-wide cumulative impact of the proposed action. Treatments similar to the proposed action in northern Arizona left forest sites overrun with cheatgrass (*Bromus tectorum*) (McGlone et al. 2009). Although it is not extensive in the project area today, exotic grass invasion is foreseeable and has important long-term implications for native plant communities in fire-adapted ecosystems and wildlife. Melgoza and others (1990) studied cheatgrass soil resource acquisition after fire and noted its competitive success owing to its ability suppress the water uptake and productivity of native species for extended periods of time. They further showed that cheatgrass dominance is enhanced by its high tolerance to grazing. Its annual life-form coupled with the abilities to germinate readily over a wide range of moisture and temperature conditions, to quickly establish an extensive root system, and to grow early in the spring contribute to its successful colonization. In addition, Melgoza and others (1990) showed that cheatgrass successfully competes with the native species that survive fire, despite these plants being well-established adult individuals able to reach deeper levels in the soil. This competitive ability of cheatgrass contributes to its dominance when lands experience synergistic disturbances from grazing, mechanical treatments, and fire."

Mr. Lininger provided two journal publications to support his comments.

Melgoza, Graciela, **Robert S. Nowak, and Robin J. Tausch. 1990**. Soil water exploitation after fire: competition between Bromus tectorum (cheatgrass) and two native species. Oecologia Vol.83. Pages 7-13.

This study was conducted in southwestern Nevada. The focus of the study was to investigate how cheatgrass exploits soil resources after fire. The objectives of the study were to determine patterns of soil water use after fire by plants in an arid environment; and to investigate if competition between native species and cheatgrass affects productivity and water status of the perennial plants. The study used a recent fire and a fire that had burned 12 years before the beginning of the study (long-term reference) where cheatgrass was present.

The researchers investigated the effects of competition between cheatgrass and two native species, yellow rabbitbrush (*Chrysothamnus viscidiflorus*) and needle and thread grass (*Stipa comata*) for soil moisture. These natives had been previous documented as being able to survive late summer fires. Forty-eight individuals of each species were selected for the study, which lasted two years. Thirty-two plants of each species were within the recently burned area and 16 plants of each species were in the previous. Soil water content, plant water potential, above ground biomass, cheatgrass tiller length and water use efficiency were measured for each native plant and for cheatgrass during the two-year study.

Soil moisture was higher for the native plants in the burned area without cheatgrass present than for plants in the burned area with cheat grass or for plants in the long-term reference. Water depletion in the upper layers of topsoil was higher near native plants in the burned area with cheatgrass as compared to the other scenarios. Biomass for native plants in the burned area without cheatgrass was higher than in the plants/burned/cheatgrass scenario. Precipitation received in the study area was 95% normal in the first year of the study but 50% in the second year.

The authors concluded that cheatgrass presence had a greater effect on plant productivity than time since fire

Analysis:

This study is scientifically sound and is peer reviewed and refereed giving credence to its findings.

The Melgoza study is an open arid environment. The authors of the article did not provide a description of the ecosystem at the study site, but based on geographic location we assume it is grassland or shrub land. The effects of cheatgrass invasion in these areas are well documented in these areas but the Four Forest Restoration Initiative area does not include similar desert environments. Only recently, has research focused more on ponderosa pine ecosystems (see comment 165-37 above from Ecological Restoration Institute).

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS

The commenter cited McGlone**, C.M., J.D. Springer and W.W. Covington. 2009.** Cheatgrass encroachment on a ponderosa pine forest ecological restoration project in northern Arizona. *Ecological Restoration* 27: 37-46.

We reviewed the McGlone publication in the section above in the comments presented by Ecological Restoration Institute. One of the most significant determinations of that article was the presence of a severe drought in the beginning of the study that contributed to cheatgrass invasion and establishment on the study area and in the region in general. We noted that precipitation was below normal in the Melgoza study as well but the authors attributed the adverse effects on the native species studied to cheatgrass.

Recently, research in the Great Basin on cheatgrass invasions has focused on plant spatial patterns within the plant community to help explain and possibly prevent the invasion of cheatgrass into native perennial grass communities. **Rayburn, et al (2014)** researched the effects of spatial arrangements of native and non-native bunch grasses on the invasibility of cheatgrass. Perennial bunch grass communities with large gaps between plants were more easily invaded that those where bunch grasses were closer together. This study may help explain some of the effects such as those in the Melgoza study where native plants were perhaps widely spaced after fire.

Mitigations for noxious or invasive weeds are included in appendix C of the DEIS and will be carried forward into the final document. Refer to design criteria B13 and B15 on page 568 of the DEIS. The soil and watershed section of Appendix C also contains several provisions for seeding disturbances caused by management actions. Appendix E will provide monitoring and feedback for management actions and adaptive management including the understory herbaceous community and noxious or invasive weeds.

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

We referred to **Rayburn, Andrew P., Eugene W, Schupp and Shannon Kay. 2014. Effects of perennial semi-arid bunchgrass spatial patterns on performance of the invasive annual cheatgrass (Bromus tectorum L.).** Plant Ecology. Vol. 215. Pages 247–251 in this analysis.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS

Jay Lininger on behalf of Center for Biological Diversity May 30, 2013

On May 30, 2013, we received this message with attachments from Mr. Lininger. "Please find attached to this message several items referenced in the Center for Biological Diversity's comment letter, previously sent, on the Four Forest Restoration Initiative DEIS. Additional messages will follow this one containing more items referenced in the comment letter". There were no specific questions attached. We reviewed the journal articles attached.

Belsky, A. Joy and Dana M. Blumenthal. 1997. Effects of Livestock Grazing on Stand Dynamics and Soils in Upland Forests of the Interior West Conservation Biology, Vol. 11 (2). Pages 315-327.

Analysis:

This article is scientifically sound and is peer reviewed and refereed giving credence to its findings.

The authors focus on the past effects of grazing on structure, function and species composition in forests in the interior west and cite grazing as a factor driving the current conditions seen in the forests today. These assertions are supported by references throughout the article.

We acknowledge that past activities including grazing created the existing condition across the region and in the project area. The existing condition forms the baseline of this analysis for all resources including botanical resources. However, the focus of this analysis is not grazing. Grazing and associated activities in the project area are analyzed separately and are regulated by the annual operating instructions for each allotment.

The DEIS contains design criteria and monitoring features that focus on grazing. Design criteria R6 (see page 578 of Appendix C) addresses range readiness after the implementation of prescribed fire on Four Forest Restoration Initiative treatment areas. This mitigation will allow for assessment of plant readiness and grazing. Additionally, the annual operating instructions for each allotment would be used to regulate and restrict grazing if necessary.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We are proposing no change to the analysis or mitigations at this time based on this article. Our analysis is sufficient and no change is needed in the FEIS

Bradley, Bethany A. Regional analysis of the impacts of climate change on cheatgrass invasion shows potential risk and opportunity. 2009. Global Change Biology Vol. 15. Pages 196–208.

Analysis:

This article is scientifically sound and is peer reviewed and refereed giving credence to its findings.

Bradley constructed a climate envelope model to predict the future occurrence of cheatgrass in the Great Basin using several scenarios for climate change. On one end to the spectrum, the climate in the Great Basin would continue to get hotter and drier and would favor the expansion of cheatgrass. On the opposite end, there would be an increase in summer precipitation in many areas that would favor native perennial plants and allow for more competition between native plants and cheatgrass. This would in turn lead to a reduction of the acreage of cheatgrass throughout these areas.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We added some of the data presented in this article to our climate change discussion in the Botany Specialist’s Report.

Matthew L. Brooks, Carla M. D ’Antonio, David M. Richardson, James B. Grace, Jon E. Keeley, Joseph M. DiTomaso , Richard J. Hobbs, Mike Pellant, and David Pyke. 2004. Effects of Invasive Alien Plants on Fire Regimes. BioScience. Vol. 54(7). Pages 677-688.

Analysis:

This article is scientifically sound and is peer reviewed and refereed giving credence to its findings.

This article discussed the effects of noxious or invasive weeds on fire regimes in areas throughout the west. Weeds can change the fire regime by increasing fuels and creating a continuous fuel bed, bringing fire into areas where fire did not play a major role in ecosystem processes or can shift fire dependent communities away from fire by replacing native plants that traditionally provided fuel and reducing the fuel bed. The article used the presence of cheatgrass and its effects on the altered fire cycle in the Great Basin as an example of fire regime change by noxious or invasive weeds. No other species were cited.

Mitigations for noxious or invasive weeds are included in appendix C of the DEIS and will be carried forward into the final document. Refer to design criteria B13 and B15 on page 568 of the DEIS. The soil and watershed section of Appendix C also contains several provisions for seeding disturbances caused by management actions. Appendix E will provide monitoring and feedback for management actions and adaptive management including the understory herbaceous community and noxious or invasive weeds.

Table 145 (see page 675 of DEIS) in the monitoring plan provides for effectiveness monitoring for noxious or invasive weed treatment , providing specific language and trigger points for cheatgrass infestations. It states that if cheatgrass increases above the pre-treatments level, treatment in adjacent high risk areas will be discontinued until an alternative approach is developed.

Conclusion:

There is no conflict between science used in this article and the science we used for our analysis

We acknowledge that fire regime change can be a consequence of noxious or invasive weed invasions.

McGlone et al. 2009 was also included in the attachment but we addressed it above in Mr. Lininger's previous article.

Comments of Susan Gunst

Ms. Gunst commented that the DEIS fails to address the impact of herbicides. This comment has verbatim wording as in those of Arthur Firstenberg above. Please refer to that analysis.

Comments of Jan Boyer

Ms. Boyer commented that the DEIS fails to address the impact of herbicides. This comment has verbatim wording as in those of Arthur Firstenberg above. Please refer to that analysis.

Comments of Dick Artley

Each of the comments were reviewed and analyzed to determine if they were within **the scope of the proposed action; specific to the proposed action; have a direct relationship with the proposed action; and, include supporting reasons for the Responsible Official to consider**.

Letter 8 (Artley) included attachments containing "opposing views" related to timber harvest activities, roads and herbicides. The opposing views were reviewed, which consisted of short quotations from various sources, including quotations from the scientific gray literature, primary science, and popular press. Scientific gray literature can be characterized as something appearing objective and scientific in nature, but with limited or no peer review (e.g., trade journals, subscriptions published by industrial/environmental organizations, and Forest Service General Technical Reports). Examples of primary science would include refereed journals, theses and dissertations. Popular press would include sources such as newspapers, magazines, and internet blogs. The opposing views were reviewed to determine which opposing views were related to the comments provided by the interested party. Opposing views not related to the comments were not considered in greater depth.

Table 22. Botany Response to Comment Letter 8

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
8	Artley	Comment on FEIS	Herbicides containing Glyphosate, Methyl Parathion, Triclopyr, Imazapyr, and Imidacloprid must Never be used on Public Land for Any Reason. Under the Proposed Action Table 16 states the following phrase several times: "remove noxious weeds." Beginning at page 256 the DEIS discusses Noxious and Invasive Weeds. If herbicides will be applied the public will want to know where and the type of herbicide that will be applied. Why? The research shows the herbicides listed above are lethal to some species.	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B -	No additional mitigation is needed in the FEIS.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
8			Comment: Please expand the description of the proposed action to describe the types of herbicide that will be applied and the exact location of this application with a map of sufficiently small scale that the public can easily locate and avoid these areas.	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page	No additional mitigation is needed in the FEIS.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
			Comment: The chemicals listed above kill aquatic life even if the concentrations of the chemical in water are very low. Fish deaths will occur in the streams in the project area and the herbicide toxicity will extend many miles downstream. Herbicides must never be allowed to contact water … even so-called aquatic-safe herbicides. These chemicals are also quite toxic to mammals (including humans), birds and insects. Under some conditions, they are lethal. They cause birth defects, non-Hodgkin’s lymphoma, mitochondrial damage, cell asphyxia, miscarriages, attention deficit disorder, endocrine disruption, DNA damage, skin tumors, hairy cell leukemia, Parkinson disease, premature births, decrease in the sperm count, harm to the immune system in fish, death of liver cells, severe reproductive system disruptions, chromosomal damage.	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	No additional mitigation is needed in the FEIS.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			Comment: Please comply with 40 C.F.R. § 1502.9(a) by responding to each opposing view in Attachments #9a and #18.	See replies below	
			Of course noxious weeds and non-native invasive plant species are a huge problem on public lands, but please use alternatives to chemicals in spite of the fact it costs more.	The Forests will use several methods of control including manual, mechanical, cultural, biological and herbicide treatment. These were analyzed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). One or more methods may be used on any particular site depending on localized conditions and the species of weeds being treated.	No additional mitigation is needed in the FEIS.
			Would you spray these chemicals on your yard prior to letting your grandchildren play in the grass? After reading the statements in the attachments written by unbiased, independent scientists referenced above do you have 100% trust in your FP Amendment #20 based on the outdated 2005 three-forest noxious weed FEIS/ROD written using safety data provided by a lab paid by the herbicide manufacturer to conduct safety analysis?	The Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005) contains provisions for limited spray zones around communities, recreational sites and trailheads. Herbicide treatment areas are routinely posted on the ground and on a publicly available website.	No additional mitigation is needed in the FEIS.
			Opposing Science Attachment #9a	See comment above where Mr. Artley requested replies to this series of comments	See below
8/9-1	Dick Artley	Popular press	Glyphosate safety opposing view #1 - "Chronic Effects of Glyphosate versus Formulations: Howe,	The effects of herbicide use were analyzed and disclosed in	The decision to use herbicides to treat weeds is based on a

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			Christina Ph.D., Michael Berrill Ph.D., and Bruce D. Pauli 2001 "The Acute and Chronic Toxicity of Glyphosate-Based Pesticides in Northern Leopard Frogs" http://www.trentu.ca/biology/berrill/Research/Roundup_Poster.htm	the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.
8-9/2		Popular press	Glyphosate safety opposing view #2 - "After spraying, glyphosate herbicides can remain in soils for long periods. The herbicide can drift onto neighboring fields, streams or hedges. Roundup kills beneficial insects. It wipes out habitat for birds and animals. Glyphosate causes genetic damage to fish. It is "extremely lethal to	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			amphibians", according to assistant professor of biology Rick Relyea at the University of Pittsburgh. It is hazardous to earthworms. Glyphosate reduces nitrogen fixation. Roundup reduces the growth of mycorrhizal fungi. Roundup can increase the spread and severity of plant diseases (see WRM Bulletin no. 18)." "Glyphosate herbicides can have a range of impacts on human health, including genetic damage, skin tumors, thyroid damage, anemia, headaches, nose bleeds, dizziness, tiredness, nausea, eye and skin irritation, asthma and breathing difficulties. Several studies have indicated a link between glyphosate herbicides and non-Hodgkin's lymphoma, a type of cancer." Lang, Chris "Glyphosate herbicide, the poison from the skies"WRM's bulletin Nº 97, August 2005 http://www.wrm.org.uy/bulletin/97/Glyphosate.htm l	separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	This comment is outside the scope of analysis. No change is needed.
8-9/3		Popular press	Glyphosate safety opposing view #3 - "In California, where there is a mandatory system of reporting pesticide poisoning, Glyphosate is the third most common cause of pesticide illness in farm workers. It is the most common form of reported pesticide poisoning in landscape gardeners." "Two separate studies in Sweden have linked exposure to Glyphosate to Hairy Cell Leukemia and Non-Hodgkin's Lymphoma. These types of cancers were extremely rare; however, non-Hodgkin's lymphoma is the most rapidly increasing cancer in the Western world. It has risen by 73% in the USA since 1973. Another study has found a higher incidence of Parkinson disease	Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS.	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			amongst farmers who used herbicides, including glyphosate.” “Other studies show that Glyphosate and commercial herbicides containing Glyphosate cause a range of cell mutations and damage to cell DNA. These types of changes are usually regarded as precursors to cancer and birth defects.” “Studies show that exposure to Glyphosate is associated with a range of reproductive effects in humans and other species. Research from Ontario, Canada found that a father's exposure to Glyphosate was linked to an increase in miscarriages and premature births in farm families.” “Glyphosate caused a decrease in the sperm count of rats and an increase in abnormal and dead sperms in rabbits. Pregnant rabbits exposed to Glyphosate had a decrease in the weight of their babies.” Leu, Andre “Monsanto's Toxic Herbicide Glyphosate: A Review of its Health and Environmental Effects” Organic Producers Association of Queensland, May 15, 2007 http://www.organicconsumers.org/articles/article_5229.cfm		
opposing view #4		Popular press	Glyphosate safety opposing view #4 - “Symptoms of exposure to glyphosate include eye irritation, blurred vision, skin rashes, burning or itchy skin, nausea, sore throat and difficulty breathing, headache, lethargy, nose bleeds and dizziness. In lab tests, glyphosate and herbicides containing glyphosate caused genetic damage to human and animal cells. Long, Cheryl. “Hazards of the World’s Most Common Herbicide” Mother Earth News, October/November 2005 http://www.motherearthnews.com/Organic-Gardening/2005-10-01/Hazards-of-the-Worlds-	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			Most-Common-Herbicide.aspx	use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
opposing view #5		Popular press	Glyphosate safety opposing view #5 - “Very low doses of some types of the herbicide Roundup can endocrine disruptor the formulations' toxicity may be tied to their "inactive" ingredients rather than the active weed-killing ingredient glyphosate. Martin, Negin P. Ph. D. “Monsanto's Roundup More Deadly to Liver Cells than Glyphosate Alone “Organic Consumers Assn., August 18, 2009 http://www.organicconsumers.org/articles/article_18842.cfm	Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.
8-9/6		Popular press	Glyphosate safety opposing view #6 - “A recent study by eminent oncologists Dr. Lennart Hardell and Dr. Mikael Eriksson of Sweden [1], has revealed clear links between one of the world's biggest selling herbicide, glyphosate, to non-Hodgkin's lymphoma, a form of cancer [2].	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			In the study published in the 15 March 1999 Journal of American Cancer Society, the researchers also maintain that exposure to glyphosate 'yielded increased risks for NHL.' They stress that with the rapidly increasing use of glyphosate since the time the study was carried out, 'glyphosate deserves further epidemiologic studies.' " "New Study Links Monsanto's Roundup to Cancer" Organic Consumers Association PRESS RELEASE, June 22, 2009 http://www.organicconsumers.org/Monsanto/glyphocancer.cfm	4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	This comment is outside the scope of analysis. No change is needed.
opposing view #7		Popular press	Glyphosate safety opposing view #7 - "Safe, effective management and control of established exotic-weeds requires input from and the joint effort of scientists from several distinct disciplines, including biological control specialists, chemical control specialists, wildlife ecologists, animal science specialists, economists, and the public. The basic premise of IPM centers on employing first biological and other non-chemical pest controls, with the use of chemical pesticides only as a last resort. Since pesticide effects on public health and the environment cost the United States a conservatively estimated $9 billion per year, this	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			should be a much welcome change." Pimentel, David Ph.D., "True integrated Weed Management: Pesticides as a last resort" from a Beyond Pesticides publication, 2004 http://www.beyondpesticides.org/infoservices/pesticidesandyou/Fall%2004/Montanas%20War%20On%20Weeds.pdf	limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS.	
opposing view #8		Popular press	Glyphosate safety opposing view #8 - "Glyphosate was ranked third worst among all pesticides causing severe health problems among those working in agriculture in the State of California." "The application of glyphosate causes the production of phytoestrogens in legumes. These phytoestrogens mimic the role of hormones in the bodies of mammals that ingest them. Hence, they may cause severe reproductive system disruptions. The data on estrogen-content of the plants submitted by Monsanto does not reflect the real scope of this problem, because the tested plants were grown in a glyphosate-free environment." "Possible human health impacts of Monsanto's	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

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			transgenic glyphosate-resistant soybeans" Third World Network http://www.twnside.org.sg/title/weiz-cn.htm	areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS	
opposing view #9		Gray literature	Glyphosate safety opposing view #9 - "Glyphosate (N-(phosphonomethyl) glycine, C3H8NO5P), an herbicide, used to control unwanted annual and perennial plants all over the world. Nevertheless, occupational and environmental exposure to pesticides can pose a threat to nontarget species including human beings. Prasad, Sahdeo, Ph.D., Smita Srivastava Ph.D., Madhulika Singh Ph.D., and Yogeshwer Shukla Ph.D. "Clastogenic Effects of Glyphosate in Bone Marrow Cells of Swiss Albino Mice" Journal of Toxicology Volume 2009 (2009), Article ID 308985, 6 pages http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2809416/	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are	Limited spray zones around communities will mitigate the exposure to herbicides around areas of human habitatation. Appendix B of the noxious weed EIS directs the use of personal protective equipment (PPE) for all applicators handling herbicides. Additionally, the applicators are required to follow label instructions. Spill plans and Job Hazard Analyses are required to further mitigate the risks of herbicide application should a spill occur. The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not

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				outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS	one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.
opposing view #10 -		Popular press	Glyphosate safety opposing view #10 - “PITTSBURGH--The herbicide Roundup® is widely used to eradicate weeds. But a study published today by a University of Pittsburgh researcher finds that the chemical may be eradicating much more than that. Pitt assistant professor of biology …..Relyea found that Roundup® caused a 70 percent decline in amphibian biodiversity and an 86 percent decline in the total mass of tadpoles. Leopard frog tadpoles and gray tree frog tadpoles were completely eliminated and wood frog tadpoles and toad tadpoles were nearly eliminated. One species of frog, spring peepers, was unaffected.” Reeves, Walter. “Roundup highly lethal to amphibians, finds University of Pittsburgh researcher” The Georgia Gardener, 2009 http://www.walterreeves.com/tools_chemicals/article.phtml?cat=22&id=889d	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices,	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005)., a separate NEPA analysis. This comment is outside the scope of the 4FRI analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS.	
opposing view #11			Glyphosate safety opposing view #11 - "For all nine species of larval anurans, the Kruskal-Wallis analyses detected significant effects of pesticide concentration on mortality (p # 0.002; Fig. 1). The subsequent mean comparisons, using Dunnett's tests, indicated the lowest concentrations that caused significantly greater mortality than the control (p , 0.05). For two species (bullfrogs and spring peepers), 1 mg a.e./L of glyphosate caused significantly greater mortality than the control. Relyea, Rick A. Ph.D. and Devin K. Jones "The Toxicity of Roundup Original Max to 13 Species of Larval Amphibians" Environmental Toxicology and Chemistry, Vol. 28, No. 9, pp. 2004–2008, 2009 http://www.pitt.edu/news2009/Roundup.pdf	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS)	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

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				incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS	
#12		Popular press	Glyphosate safety opposing view #12 - "A recent study of Roundup presents new evidence that the glyphosate-based herbicide is far more toxic than the active ingredient alone. The study, published in the June 2005 issue of Environmental Health Perspectives, reports glyphosate toxicity to human placental cells within hours of exposure, at levels ten times lower than those found in agricultural use. The researchers also tested glyphosate and Roundup at lower concentrations for effects on sexual hormones, reporting effects at very low levels. This suggests that dilution with other ingredients in Roundup may, in fact, facilitate glyphosate's hormonal impacts." Rethinking Roundup"Pesticide Action Network North America (PANNA) Update, August 5, 2005 http://www.panna.org/node/466	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

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				DEIS references the incorporation of Appendix B of the Weed EIS	
#13		Popular press	Glyphosate safety opposing view #13 - "Our studies show that glyphosate acts as a disruptor of mammalian cytochrome P450 aromatase activity from concentrations 100 times lower than the recommended use in agriculture, and this is noticeable on human placental cells after only 18 hr., and it can also affect aromatase gene expression. Richard, Sophie Ph.D., Safa Moslemi Ph.D., Herbert Sipahutar, Nora Benachour and Gilles-Eric Seralini Ph.D., 2005 "Differential effects of glyphosate and Roundup on human placental cells and aromatase" Mindfully.org http://www.mindfully.org/Pesticide/2005/Glyphosate-Roundup-Placental24feb05.htm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

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#14		Popular press	Glyphosate safety opposing view #14 - “There are serious health implications from the use of this pesticide. There is a long list of reported toxic effects from glyphosate exposure and this Swedish study provides compelling evidence of the links between glyphosate and cancer.” “Swedish study shows links between glyphosate and cancer” The European NGO Network on Genetic Engineering, 1999http://www.gene.ch/genet/1999/Jun/msg00018.html	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. Limited spray zones around communities will mitigate the exposure to herbicides around areas of human habitatation. Appendix B of the noxious weed EIS directs the use of personal protective equipment (PPE) for all applicators handling herbicides. Additionally, the appicators are required to follow label instructions. Spill plans and Job Hazard Analyses are required to further mitigate the risks of herbicide application should a spill occur This comment is outside the scope of analysis. No change is needed.
#15		Popular press	Glyphosate safety opposing view #15 - “This review suggests that the silvicultural use of glyphosate needs to be re-evaluated with respect to	We are not proposing to use glyphosate or any other herbicide for silvicultural	This comment is outside the scope of analysis. No change is needed.

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			non-target impacts on amphibians in B.C. Govindarajulu, Purnima P. Ph.D. "Literature review of impacts of glyphosate herbicide on amphibians: What risks can the silvicultural use of this herbicide pose for amphibians in B.C.?" British Columbia Ministry of Environment, Wildlife Report No. R-28, June 2008 http://www.llbc.leg.bc.ca/public/pubdocs/bcdocs/442206/finishdownloaddocument.pdf	purposes. The use of herbicides is solely for the control of noxious or invasive weeds and was analysed in separate NEPA [Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005)].	
#16		Popular press	Glyphosate safety opposing view #16 - "E. Wider ecological concerns of the genetically engineered soya beans. 1. Glyphosate is a broad-spectrum herbicide which will have major impacts on biodiversity (see Greenpeace Report, 1998, and references therein). It kills all plants indiscriminately. Affidavit submitted by Mae-Wan Ho Ph.D. , August 12, 1998 http://www.i-sis.org.uk/greenpeace.php?printing=yes	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

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				B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	
#17			Glyphosate safety opposing view #17 - "Glyphosate was formerly considered relatively non-toxic however there is now a considerable body of evidence for deleterious effects of Roundup, glyphosate and its adjuvants on a wide range of non-target species, including humans. Brennan-Rieder, Denise Ph.D. June, 2008 "PROPOSED COSMETIC PESTICIDE BAN IN PROVINCE OF ONTARIO SCIENTIFIC BASIS FOR BANNING BOTH SALE AND USE OF SYNTHETIC PESTICIDES" http://www.pesticidereform.ca/RoundupDrBrennan-Rieder.PDF	This reference was not found, therefore we cannot reply to it	No change needed
#18		Popular press	Glyphosate safety opposing view #18 - "1. Glyphosate was ranked third worst among all pesticides causing severe health problems among those working in agriculture in the State of California. Tappeser, Beatrix Ph.D. and Christine von Weizsacker "Possible human health impacts of Monsanto's transgenic glyphosate-resistant soybeans" Third World Network	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. Limited spray zones around communities will mitigate the exposure to herbicides around areas of human habitatation. Appendix B of the noxious weed EIS directs the use of personal protective equipment (PPE) for all applicators handling herbicides. Additionally, the appicators are

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	required to follow label instructions. Spill plans and Job Hazard Analyses are required to further mitigate the risks of herbicide application should a spill occur This comment is outside the scope of analysis. No change is needed.
#19		Popular press	Glyphosate safety opposing view #19 - “A recently published study by Italian researchers [3] examined the toxicity of four popular glyphosate based herbicide formulations on human placental cells, kidney cells, embryonic cells and neonate umbilical cord cells and surprisingly found total cell death of each of these cells within 24 hours “Toxicity of Glyphosate” Natural Communities magazine, July 16th, 2009 http://naturalcommunitiesmag.com/2009/07/16/gm-soy-destroy-the-earth-and-humans-for-profit/	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices,	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	
#20		Popular press	"A study released by an Argentine scientist earlier this year reports that glyphosate, patented by Monsanto under the name "Round Up," causes birth defects when applied in doses much lower than what is commonly used in soy fields. The study was directed by a leading embryologist, Dr. Andres Carrasco, a professor and researcher at the University of Buenos Aires. In his office in the nation's top medical school, Dr. Carrasco shows me the results of the study, pulling out photos of birth defects in the embryos of frog amphibians exposed to glyphosate. The frog embryos grown in petri dishes in the photos looked like something from a futuristic horror film, creatures with visible defects—one eye the size of the head, spinal cord deformations, and kidneys that are not fully developed." Trigona, Marie "Study Released in Argentina Puts Glyphosate Under Fire" Znet, July 28, 2009 http://www.zcommunications.org/study-released-	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			in-argentina-puts-glyphosate-under-fire-by-marie-trigona	weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	
#21		Popular press	Glyphosate safety opposing view #21 - “Controversy exists around the use of herbicides more commonly used by home gardeners, such as, 2, 4-D and Roundup. Vinje, Eric, “Chemical Quandary: The Problem with Pesticides, Herbicides and Chemical Fertilizer” Planet Natural http://www.planetnatural.com/site/garden-chemicals.html	We are not proposing using the formulations of these herbicide for home gardeners avaiable from the retail market. The herbicides that will be used for noxious or invasive weed control in this project will be formulated for wildland weed control. The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	
#22		Popular press	Glyphosate safety opposing view #22 - "According to Mr. Carrasco's research, even tiny quantities of glyphosate could cause embryonic malformations in frogs and thus, by extrapolation, may have implications for humans. Weber, Jude and Hal Weitzman "Argentina Pressed to Ban Crop Chemical" The Financial Times, UK, May 29, 2009 http://www.gene.ch/genet/2009/Jun/msg00006.html	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and	The effects of herbicides to frogs were addressed in the Noxious or Invasive Weed EIS (2005). The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	
#23		Popular press	Glyphosate safety opposing view #23 - "Fish and aquatic invertebrates are more sensitive to Roundup than terrestrial organisms.[24] Glyphosate is generally less persistent in water than in soil, with 12 to 60 day persistence observed in Canadian pond water, yet persistence of over a year have been observed in the sediments of ponds in Michigan and Oregon."[9] Wikipedia, the free encyclopedia, April 10, 2010 http://en.wikipedia.org/wiki/Roundup#Toxicity_2	We are not proposing to use Roundup for weed control in this project. The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. The effects of herbicides to frogs were addressed in the Noxious or Invasive Weed EIS (2005). This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	
#24			Glyphosate safety opposing view #24 - "In the study published in the 15 March 1999 Journal of American Cancer Society, the researchers also maintain that exposure to glyphosate 'yielded increased risks for NHL.' They stress that with the rapidly increasing use of glyphosate since the time the study was carried out, 'glyphosate deserves further epidemiologic studies.' " DaSilva, Guy MD, "New Study Links Monsanto's Roundup to Cancer"daSilva Institute - Antiaging & Functional Medicine http://www.dasilvainstitute.com/article.asp?artid=18&areacode=ITN	This reference was not found, therefore we cannot reply to it	No change
#25		Popular press	Glyphosate safety opposing view #25 - "These latest studies confirm a wealth of evidence on the toxicities of glyphosate and Roundup formulations [2] (Glyphosate Toxic & Roundup Worse , SiS	This reference was not found, therefore we cannot reply to it	No change

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			26), and pinpoint the different sites of action, all of which result in cell death. Ho Mae-Win Ph.D. and Brett Cherry "Death by Multiple Poisoning, Glyphosate and Roundup" an Institute of Science in Society news release submitted to the USDA November 2, 2009 http://current.com/146im4c		
#26			Glyphosate safety opposing view #26 - "Terrestrial toxicity: A number of species of birds, mammals and beneficial insects suffer population loses through habitat and/or food supply destruction resulting from the use of glyphosate. There are also direct lethal and sublethal effects Watts, Meriel and Ronald Macfarlane, "Glyphosate"A Pesticide Action Network - Asia and the Pacific publication, 1999 http://www.poptel.org.uk/panap/pest/pe-gly.htm	This reference was not found, therefore we cannot reply to it	No change
#27		Popular press	Glyphosate safety opposing view #27 - Regarding your article, Mystery of Disappearing Honeybees (SiS 34), Broek, Hans van den, "Glyphosate kills bees" The Institute of Science in Society Science in Society #38, summer 2008 http://www.i-sis.org.uk/SIS38lettersToTheEditor.php	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	
#28		Popular press	Glyphosate safety opposing view #28 - "Glyphosate herbicides can have a range of impacts on human health, including genetic damage, skin tumours, thyroid damage, anaemia, headaches, nose bleeds, dizziness, tiredness, nausea, eye and skin irritation, asthma and breathing difficulties. Several studies have indicated a link between glyphosate herbicides and non-Hodgkin's lymphoma, a type of cancer. Lang, Chris, "Glyphosate herbicide, the poison from the skies" WRM's bulletin Nº 97, August 2005 http://www.wrm.org.uy/bulletin/97/Glyphosate.htm l	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. Limited spray zones around communities will mitigate the exposure to herbicides around areas of human habitatation. Appendix B of the noxious weed EIS directs the use of personal protective equipment (PPE) for all applicators handling herbicides. Additionally, the appicators are required to follow label instructions. Spill plans and

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	Job Hazard Analyses are required to further mitigate the risks of herbicide application should a spill occur This comment is outside the scope of analysis. No change is needed.
#29		Popular press	Glyphosate safety opposing view #29 - "A 1999 study, A Case-Control Study of Non-Hodgkin Lymphoma and Exposure to Pesticides, (American Cancer Society, 1999), found that people exposed to glyphosate are 2.7 times more likely to contract non-Hodgkin Lymphoma. chemicalWATCH Factsheet" Published by Beyond Pesticides, August 2009 http://www.beyondpesticides.org/pesticides/factsheets/Glyphosate.pdf	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B -	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. Limited spray zones around communities will mitigate the exposure to herbicides around areas of human habitatation. Appendix B of the noxious weed EIS directs the use of personal protective equipment (PPE) for all applicators handling herbicides. Additionally, the appicators are required to follow label instructions. Spill plans and Job Hazard Analyses are required to further mitigate the

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	risks of herbicide application should a spill occur This comment is outside the scope of analysis. No change is needed.
#30		Popular press	Glyphosate safety opposing view #30 - "The USDA first deregulated Roundup Ready alfalfa in 2005. Internal emails recently obtained by Truthout show that Monsanto worked closely with regulators to edit its original petition to deregulate the alfalfa. One regulator accepted Monsanto's help in conducting the USDA's original environmental assessment of the alfalfa. Ludwig, Mike "Farmers Sue USDA Over Monsanto Alfalfa – Again" Truthout, March 25, 2011 http://www.truth-out.org/farmers-sue-usda-over-monsanto-alfalfa-again68656	This reference was not found so we cannot reply to it directly. There is no mention of alfalfa or genetically modified organisms in the 4FRI DEIS. We believe this reference refers to a recent farming practice where certain crops are "genetically engineered" to resist herbicides such as Roundup, which can then be applied on the crop to control undesirable plants within the crop.	This comment is outside the scope of analysis. No change is needed.
#31		Popular press	opposing view #31 GE-S: JH: You said you had found that very low doses of glyphosate had caused these effects on aromatase. Are they the kind of doses that would be used in practical agriculture in the European Union?"	Limited spray zones around communities will mitigate the exposure to herbicides around areas of human habitatation. Appendix B of the noxious weed EIS directs the use of	This view applies to the effects of glyphosate on human hormone activity and is outside of the scope of his project.

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			"GE-S: They are about ten to 100 times less than the doses used by agricultural workers. One has to be cautious because these are in vitro results but we do not want to wait for death when the precautionary principle suggests a need for measures to avoid any harmful effects on foetuses and children." "Glyphosate disrupts of human hormones"An interview with Professor Gilles-Eric Seralini Ph.D.Published by ecochem http://www.ecochem.com/ENN_glyphosate(2).html	personal protective equipment (PPE) for all applicators handling herbicides. Additionally, the appicators are required to follow label instructions. Spill plans and Job Hazard Analyses are required to further mitigate the risks of herbicide application should a spill occur	
#32		Popular press	opposing view #32 "The December/January 2010 issue of The Organic & Non-GMO Report featured an interview with Robert Kremer, an adjunct professor in the Division of Plant Sciences at the University of Missouri, whose research showed negative environmental impacts caused by glyphosate, the main ingredient in Monsanto's Roundup herbicide, which is used extensively with Roundup Ready genetically modified crops.""The widespread use of glyphosate is causing negative impacts on soil and plants as well as possibly animal and human health. These are key findings of Don Huber, emeritus professor of plant pathology, Purdue University." Roseboro, Ken "Monsanto's Glyphosate Problems: Scientist Warns of Dire Consequences with Widespread Use"The Organic and Non-GMO Report, Posted June 14, 2010http://www.organicconsumers.org/articles/article_21039.cfm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	
#33		Popular press	opposing view #33 - "There is, indeed, direct evidence that glyphosate inhibits RNA transcription in animals at a concentration well below the level that is recommended for commercial spray application. Transcription was inhibited and embryonic development delayed in sea urchins following exposure to low levels of the herbicide and/or the surfactant polyoxyethyleneamine. The pesticide should be considered a health concern by inhalation during spraying [4].""New research shows that a brief exposure to commercial glyphosate caused liver damage in rats, as indicated by the leakage of intracellular liver enzymes. In this study, glyphosate and its surfactant in Roundup were also found to act in synergy to increase damage to the liver [5]." Ho, Mae-Wan Ph.D. and Prof. Joe Cummins Ph.D. "Glyphosate Toxic & Roundup Worse" An Institute of Science in Society publication, 07/03/05 http://www.i-sis.org.uk/GTARW.php	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The commenter is discussing the health effects of various formulations of herbicides and surfactants on various organisms which is outside of the scope of this analysis.	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed. No change needed
#34		Popular press	opposing view #34 "In contrast to malathion, Roundup had strong direct effects on the tadpoles".. "All of this suggests that Roundup with the POEA surfactant can cause substantial mortality in larval amphibians." Relya, Rick A. Ph.D., Nancy Schoeppner and Jason T. Hoverman, "Pesticides and Amphibians: The	The documentation for this comment was presented on a website focusing on organic farming. We do not dispute these findings but feel they do not apply to the current analysis The effects of the management	No additional mitigation is needed in the 4FRI FEIS.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			Importance of Community Context" Ecological Applications, 15(4), July 1, 2005, pp. 1125–1134 http://www.mindfully.org/Pesticide/2005/Roundup-Amphibians-Community1jul05.htm	actions on Northern leopard frogs is proposed in the 4FRI DEIS can be found on page 201. Mitigations for herbicide treatment near frog habitat is included in Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the Noxious or invasive weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	
#34		Popular press	The decline in amphibians across the globe has sparked a search for the causes, and recent evidence suggests a connection with pesticides. However, for most pesticides, tests on amphibians are rare and conducted only for short durations (1 to 4 days) and without natural stressors. Recent studies have discovered that the stress of predator cues in the water can make insecticides much more lethal to larval amphibians, but it is unknown whether this phenomenon can be generalized to other types of pesticides. Using six species of North American amphibian larvae (Rana sylvatica, R. pipiens, R. clamitans, R. catesbeiana, Bufo americanus, and Hyla versicolor), I examined the impact of a globally common herbicide (Roundup) on the survival of tadpoles for 16 days with and without the chemical cues emitted by predatory newts (Notophthalmus viridescens). LC5016-d estimates	The website for the documentation for this view did not open for us. We could not review the supporting documentation. We assume that the commenter is presenting information on the global effects of pesticides and predation which is outside the scope of this analysis.	No additional mitigation is needed in the 4FRI FEIS.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			varied from 0.55 to 2.52 mg of active ingredient (AI)/L, which was considerably lower than the few previous studies using Roundup (1.5 to 15.5 mg AI/L). Moreover, in one of the six species tested (R. sylvatica), the addition of predatory stress made Roundup twice as lethal. This discovery suggests that synergistic interactions between predatory stress and pesticides may indeed be a generalizable phenomenon in amphibians that occurs with a wide variety of pesticides." Relyea, R.A. Ph.D. "The Lethal Impacts of Roundup and Predatory Stress on Six Species of North American Tadpoles" Archives of Environmental Contamination and Toxicology v 48, n. 3, April 1, 2005 http://www.mindfully.org/Pesticide/2005/Roundup-Tadpoles-Relyea1apr05.htm		
#35		Popular press	opposing view #35 Species richness was reduced by 15% with Sevin, 30% with malathion, and 22% with Roundup, whereas 2,4-D had no effect. Both insecticides reduced zooplankton diversity by eliminating cladocerans but not copepods (the latter increased in abundance). The insecticides also reduced the diversity and biomass of predatory insects and had an apparent indirect positive effect on several species of tadpoles, but had no effect on snails. The two herbicides had no effects on zooplankton, insect predators, or snails. Moreover, the herbicide 2,4-D had no effect on tadpoles. However, Roundup completely eliminated two species of tadpoles and nearly exterminated a third species, resulting in a 70% decline in the species richness of	This article opens on the website "Mindfully.org" which is a popular press site and not a refereed journal. The study analysis the effects of various insecticides and herbicides on aquatic organisms. This study is outside the scope of the 4FRI analysis. Mitigations for herbicide treatment near frog habitat is included in Appendix B - Design Features, Best Management Practices, Required Protection Measures,	This comment is outside the scope of analysis. No change is needed. The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. Limited spray zones around communities will mitigate the exposure to herbicides around areas of human habitatation. Appendix B of the noxious weed EIS directs the use of personal protective equipment

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			tadpoles. This study represents one of the most extensive experimental investigations of pesticide effects on aquatic communities and offers a comprehensive perspective on the impacts of pesticides when nontarget organisms are examined under ecologically relevant conditions." Relyea, R.A. Ph.D. "The Impact of Insecticides and Herbicides on the Biodiversity and Productivity of Aquatic Communities" Ecological Applications v 15, n. 2, April 1, 2005 http://www.mindfully.org/Pesticide/2005/Roundup-Aquatic-Communities1apr05.htm	and Mitigation Measures of the Noxious or invasive weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	(PPE) for all applicators handling herbicides. Additionally, the appicators are required to follow label instructions. Spill plans and Job Hazard Analyses are required to further mitigate the risks of herbicide application should a spill occur
#36		Popular press	opposing view #36 "He is joined in his conclusions by Robert Bellé, from the National Center for Scientific Research (CNRS) biological station in Roscoff (Finistere), whose team has been studying the impact of glyphosate formulations on sea-urchin cells for several years. This recognized model for the study of early stages of cancer genesis earned Tim Hunt the 2001 Nobel Prize in medicine. In 2002, the Finisterian team had shown that Roundup acted on one of the key stages of cellular division. The Breton team has recently demonstrated (Toxicological Science, December 2004) that a "control point" for DNA damage was affected by Roundup, while glyphosate alone had no effect. "We have shown that it's a definite risk factor, but we have not evaluated the number of cancers potentially induced, nor the time frame within	This article opens on the website "Mindfully.org" which is a popular press site and not a refereed journal. The comment focuses on a study exploring the relationship between glyphosate formulations and cancer genesis in sea urchins. This information is outside the scope of the 4FRI analysis	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			which they would declare themselves," the researcher acknowledges. A sprayed droplet could affect thousands of cells. On the other hand, "the concentration in water and fruits is lower, which is rather reassuring." Morin, Herve "Roundup Doesn't Poison Only Weeds" Le Monde (France) March 12, 2005 http://www.mindfully.org/GE/2005/Roundup-Poison12mar05.htm		
#37		Primary science	opposing view #37 "We have evaluated the toxicity of four glyphosate (G)-based herbicides in Roundup (R) formulations, from 105 times dilutions, on three different human cell types. This dilution level is far below agricultural recommendations and corresponds to low levels of residues in food or feed."… Moreover, the proprietary mixtures available on the market could cause cell damage and even death around residual levels to be expected, especially in food and feed derived from R formulation-treated crops." Benachour, Nora and Gilles-Eric Séralini "Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells" Chem. Res. Toxicol., 2009, 22 (1), pp 97–105 DOI: 10.1021/tx800218n Publication Date (Web): December 23, 2008 http://pubs.acs.org/doi/abs/10.1021/tx800218n	This journal article analyzed the effects of several formulations of Roundup on human cells. This information is outside the scope of the 4FRI analysis..	This comment is outside the scope of analysis. No change is needed.
#38		Primary	opposing view #38	This journal article analyzed	This comment is outside the

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
		science	…" A real cell impact of glyphosate-based herbicides residues in food, feed or in the environment has thus to be considered, and their classifications as carcinogens/mutagens/reprotoxics is discussed." Gasnier, Céline Ph.D., Coralie Dumont Ph.D., Nora Benachour Ph.D., Emilie Clair Ph.D., Marie-Christine Chagnon Ph.D. and Gilles-Eric Séralini Ph.D. "Glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines"Available online 17 June 2009 http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6TCN-4WJBC0R-1&_user=10&_coverDate=08%2F21%2F2009&_rdoc=1&_fmt=high&_orig=search&_origin=search&_sort=d&_docanchor=&view=c&_searchStrId=1591140451&_rerunOrigin=scholar.google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=2adfd01803a911a1ff1eda15564d337e&searchtype=a	the effects of several formulations of glyphosate on human cells.	scope of analysis. No change is needed.
#39		Popular press	Glyphosate safety opposing view #39 - "In the study published in the 15 March 1999 Journal of American Cancer Society, the researchers also maintain that exposure to glyphosate 'yielded increased risks for NHL.' They stress that with the rapidly increasing use of glyphosate since the time the study was carried out, 'glyphosate deserves further epidemiologic studies.' " "New Study Links World's Biggest Selling Pesticides to Cancer Swedish Study Finds Exposure to Glyphosate and MCPA Increases Risk for Non-Hodgkin's Lymphoma" Press Release PAN AP, June 21, 1999 http://www.mindfully.org/Pesticide/Monsanto-	The article mentioned in this view was not found on the link provided so we cannot coment on its contents.	This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			Roundup-Glyphosate.htm		
#40		Popular press	Glyphosate safety opposing view #40 - "There is, indeed, direct evidence that glyphosate inhibits RNA transcription in animals at a concentration well below the level that is recommended for commercial spray application. Transcription was inhibited and embryonic development delayed in sea urchins following exposure to low levels of the herbicide and/or the surfactant polyoxyethyleneamine. The pesticide should be considered a health concern by inhalation during spraying [4]." New research shows that a brief exposure to commercial glyphosate caused liver damage in rats, as indicated by the leakage of intracellular liver enzymes. In this study, glyphosate and its surfactant in Roundup were also found to act in synergy to increase damage to the liver [5]. Three recent case-control studies suggested an association between glyphosate use and the risk of non-Hodgkin lymphoma [6-8]; while a prospective cohort study in Iowa and North Carolina that includes more than 54 315 private and commercial licensed pesticide applicators suggested a link between glyphosate use and multiple myoeloma [9]. Myeloma has been associated with agents that cause either DNA damage or immune suppression." Ho, Mae-Wan Ph.D. and Prof. Joe Cummins "Glyphosate Toxic & Roundup Worse" Institute of Science in Society report 07/03/05 http://www.i-sis.org.uk/GTARW.php	This information is outside the scope of the 4FRI analysis	No change needed
41		Popular	opposing view #41	This website opens to a web-	This comment is outside the

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
		press	"New scientific studies link Roundup (glyphosphate), the most widely used herbicide in the world, to a host of health risks, such as cancer, miscarriages and disruption of human sex hormones."Long, Cheryl "Hazards of the World's Most Common Herbicide"Mother Earth News, October/November 2005 http://www.motherearthnews.com/Organic-Gardening/2005-10-01/Hazards-of-the-Worlds-Most-Common-Herbicide.aspx	based version of "mother Earth News" a popular magazine. The article does not provide any information relevant to the 4Fri analysis and is outside the scope of the project.	scope of analysis. No change is needed.
#42		Popular press	opposing view #42 Glyphosate safety opposing view #42 -… "New research, however, shows that exposure to the herbicide glyphosate, commonly sold as Roundup, is one explanation. The study was published in 2003 by researchers at the National Cancer Institute, the University of Nebraska Medical Center, Kansas University Medical Center, and the University of Iowa College of Medicine." Study Links Herbicide use and Cancer A Northwest Coalition for Alternatives to Pesticides publication, 2010 http://www.pesticide.org/the-buzz/study-links-herbicide-use-and-cancer	This item does not provide any relevant information for the analysis of the 4FRI project and is outside the scope of analysis	This comment is outside the scope of analysis. No change is needed. .
#43			opposing view #43… "Recent studies have shown that tadpoles are one of the vertebrate groups most sensitive to the toxicity effects of most commercial formulations of glyphosate herbicides, including Vision."…." More detailed toxicological studies indicate that the toxicity of glyphosate herbicides arises not from the active ingredient, glyphosate, but from the surfactant, POEA." Govindarajulu, Purnima P. Ph.D., "Literature review of impacts of glyphosate herbicide on amphibians: What risks can the silvicultural use of	This article focuses on the use of herbicides in silvicultural treatments in Canada. We are not proposing to use glyphosate or any other herbicide for silvicultural purposes. The use of herbicides is solely for the control of noxious or invasive weeds. None of the amphibians listed in the study are present in the	This comment is outside the scope of analysis. No change is needed. .

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			this herbicide pose for amphibians in B.C.?" British Columbia Ministery of the Environment, Wildlife Report No. R-28, June 2008 http://www.llbc.leg.bc.ca/public/pubdocs/bcdocs/442206/finishdownloaddocument.pdf	project area.	
#44		Popular press	opposing view #44 …"A concentration at which the animals were not effected (NOEC) by The Roundup formulations was not determined by this study." Christina Howe, Ph.D., Michael Berrill Ph.D., and Bruce D. Pauli "The Acute and Chronic Toxicity of Glyphosate-Based Pesticides in Northern Leopard Frogs" Amphibian Ecology and Pathobiology, August 14, 2002 http://www.trentu.ca/biology/berrill/Research/Roundup_Poster.htm	This website contains a poster focusing on the effects of Roundup on Northern leopard frogs. The effects of the management actions on Northern leopard frogs in the 4FRI DEIS can be found on page 201. Mitigations for herbicide treatment near frog habitat is included in Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the Noxious or invasive weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety. Page 256 of the 4FRI DEIS references the incorporation of Appendix B of the Weed EIS .	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed. .
#45			opposing view #45 "Concern #1: Roundup is only intended for terrestrial use, not aquatic use While it may be intended for terrestrial use, there is overwhelming evidence that Roundup gets into aquatic habitats,	This article opens on the website "Mindfully.org" which is a popular press site and not a refereed journal. This article is a response to	This comment is outside the scope of analysis. No change is needed. .

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			typically through inadvertent (or unavoidable) aerial overspray (Newton et al. 1984, Goldsborough and Brown 1989, Feng et al. 1990, Thompson et al. 2004)… "Concern #2: The application rate of Roundup was 7 times too high"….According to U.S. Fish and Wildlife classifications, this means that Roundup can no longer be considered slightly to moderately toxic, but rather moderately to highly toxic to North American amphibians." Relya, Rick Ph.D. "Roundup is Highly Lethal" Dr. Relya Responds to Monsanto's Concerns Regarding Recent Published Study Mindfully.org, April 1, 2005 http://www.mindfully.org/GE/2005/Relyea-Monsanto-Roundup1apr05.htm	several arguments made by the manufacturers of Roundup (Monsanto) where the author, Dr. Relya refutes the Monsanto claims. This item does not provide any relevant information for the analysis of the 4FRI project	
#46		Popular press	opposing view #46 "Concern #1: Roundup is only intended for terrestrial use, not aquatic use While it may be intended for terrestrial use, there is overwhelming evidence that Roundup gets into aquatic habitats, typically through inadvertent (or unavoidable) aerial overspray (Newton et al. 1984, Goldsborough and Brown 1989, Feng et al. 1990, Thompson et al. 2004). To determine the effect on amphibians, Relyea (2005a) simulated a direct overspray of a small wetland using pond mesocosms (1000-liter tanks). The result was widespread death for many species and the death rate was much higher than expected based on previous studies of Roundup. It is relatively common knowledge that Roundup should not be applied to large ponds and lakes, but it seems to be much less commonly appreciated that many amphibians are not produced in large ponds and lakes due to predation by fish. Instead, small	This article opens on the website "Mindfully.org" which is a popular press site and not a refereed journal. It is a response to several arguments made buy the manufacturers of Roundup (Monsanto) were the author, Dr. Relya refutes the Monsanto claims. This item does not provide any relevant information for the analysis of the 4FRI project and is outside the scope of analysis	This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			temporary wetlands that may appear to be unimportant and only have 6" of water can, in fact, produce thousands of tadpoles. These small, temporary pools are either not avoided or not avoidable by aerial pesticide applications. Moreover, Roundup is not only lethal to amphibian larvae. New studies have found that Roundup can be highly lethal to terrestrial amphibians as well (Relyea 2005c)." "Concern #2: The application rate of Roundup was 7 times too high The application rate of 6 ounces per 300 square feet came directly from the label of Monsanto's "Roundup Weed and Grass Killer". What Monsanto is claiming is that the application rate for this Roundup is higher than their listed application rate for other forms of Roundup. However, both application rates come from Monsanto. Moreover, it is well accepted by Monsanto and the applicators of Roundup that some types of weeds require up to four times the recommended application rate to be effective." "Concern #4: A past risk assessment has shown that Roundup poses minimal risk to amphibians The risk assessment was conducted by Giesy et al. (2000), in cooperation with Monsanto, and the assessment was based on the available data at that time. For amphibians, data only existed for four species of Australian tadpoles and one species of African frog. From these studies, the LC50 estimates (the amount of pesticide needed to kill 50% of the animals) were 4 to 16 mg a.i./L (Mann		

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			and Bidwell 1999, Perkins et al. 2000). More recent LC50 laboratory data for North American amphibians demonstrate that North American amphibians are much more sensitive; LC50 values range from 0.5 to 4.7 mg a.i./L (Edginton et al. 2004, Relyea 2005b). According to U.S. Fish and Wildlife classifications, this means that Roundup can no longer be considered slightly to moderately toxic, but rather moderately to highly toxic to North American amphibians." Relya, Rick Ph.D. "Roundup is Highly Lethal" Dr. Relya Responds to Monsanto's Concerns Regarding Recent Published Study Mindfully.org, April 1, 2005 http://www.mindfully.org/GE/2005/Relyea-Monsanto-Roundup1apr05.htm		
#47		Popular press	opposing view #47 …" Industry scientists say it's one of the safest herbicides in the world, while independent scientists have discovered potential links among the widespread use of glyphosate-based herbicides and non-Hodgkin's lymphoma, birth defects and even attention deficit disorder. Research also shows that additives like surfactants in glyphosate in herbicides like Roundup are more toxic than glyphosate itself and can increase the toxicity of glyphosate." Ludwig, Mike "Special Investigation: The Pesticides and Politics of America's Eco-War" Published by Truthout, June 9, 2011 http://www.truth-out.org/pesticides-and-politics-americas-eco-war/1307539754	This item does not provide any relevant information for the analysis of the 4FRI project and is outside the scope of analysis	This comment is outside the scope of analysis. No change is needed. .

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
#48		Popular press	opposing view #48 The phenotypes obtained after GBH treatments or injections ofglyphosate alone are strikingly reminiscent of those observedas a consequence of an excess of RA signaling in vertebrates and humans. Acute or chronic increase of RA levels leads toteratogenic effects during human pregnancy and in experimentalFigure 4. Alejandra Paganelli, Victoria Gnazzo, Helena Acosta, Silvia L. López, and Andrés E. Carrasco "Glyphosate-Based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signaling" Publicado por NOGAL DE VIDA, May 20, 2010 http://nogaldevida.blogspot.com/2010/08/glyphosate-based-herbicides-produce.html	This website opens to a blog from Argentina presenting information on glyphosate. This item does not provide any relevant information for the analysis of the 4FRI project and is outside the scope of analysis	This comment is outside the scope of analysis. No change is needed.
#49		Popular press	opposing view #49 - "Although there is only a handful of studies on the safety of GM soybeans, there is considerable evidence that glyphosate—especially in conjunction with the other ingredients in Roundup—wreaks havoc with the endocrine and reproductive systems." Smith, Jeffery "Genitically Modified Soy Diets Lead and Uterus Changes in Rats" foodconsumer.org, September 22, 2010 http://www.foodconsumer.org/newsite/Safety/gmo/genetically_modified_soy_diets_0910100128.html	This website focuses on genetically modified soy beans, the accumulation of glyphosate in the crop and related health risks. This item does not provide any relevant information for the analysis of the 4FRI project.	This comment is outside the scope of analysis. No change is needed.
			opposing view #50 The study, published in the journal Chemical Research in Toxicology in 2010, found that glyphosate causes malformations in frog and chicken embryos at doses far lower than those used	This item does not provide any relevant information for the analysis of the 4FRI	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			in agricultural spraying". Graves, Lucia. "Roundup: Birth Defects Caused By World's Top-Selling Weedkiller, Scientists Say" by Lucia Graves Published on Friday, June 24, 2011 by Huffington Post http://www.commondreams.org/headline/2011/06/24-4		analysis. This comment is outside the scope of analysis. No change is needed.
#51		Popular press	opposing view #51 Alexey Surov says, "We have no right to use GMOs until we understand the possible adverse effects, not only to ourselves but to future generations as well. We definitely need fully detailed studies to clarify this. Any type of contamination has to be tested before we consume it, and GMO is just one of them." Smith, Jeffery "Genetically Modified Soy Linked to Sterility, Infant Mortality" foodconsumer.org, September 22, 2010 http://www.foodconsumer.org/newsite/Watch-List/genetically_modified_soy_linked_to_sterility_infant_mortality_22.html	This website focuses on the risks of genetically modified soy diet and does not provide any information relevant to the 4FRI analysis.	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.
#52		Popular press	opposing view #52 …"We injected the amphibian embryo cells with glyphosate diluted to a concentration 1,500 times than what is used commercially and we allowed the amphibians to grow in strictly controlled conditions." Dr. Carrasco reports that the embryos survived from a fertilized egg state until the tadpole stage, but developed obvious defects which would compromise their ability to live in their normal habitats." Trigona, Marie "GMO – Monsanto Soy Herbicide could Pose Health Risks"Americas Program, Center for International Policy (CIP), July 13, 2009	This website focuses on genetically modified soy beans, the accumulation of glyphosate in the crop and related health risks. This item does not provide any relevant information for the analysis of the 4FRI project.	The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			http://www.internationalnews.fr/article-36061426.html		
#51		Popular press	opposing view #51 Alexey Surov says, "We have no right to use GMOs until we understand the possible adverse effects, not only to ourselves but to future generations as well. We definitely need fully detailed studies to clarify this. Any type of contamination has to be tested before we consume it, and GMO is just one of them." Smith, Jeffery "Genetically Modified Soy Linked to Sterility, Infant Mortality" foodconsumer.org, September 22, 2010 http://www.foodconsumer.org/newsite/Watch-List/genetically_modified_soy_linked_to_sterility_infant_mortality_22.html	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	This article referenced cases involving "Roundup Ready" crops. Glyphosate application and exposure rates are much higher in these cases than those used in selective forest invasive weed control. There is no plan to use any Round-up Ready products on the 4FRI project. This comment is outside the scope of analysis. No change is needed.
#52		Popular press	opposing view #52 …"We injected the amphibian embryo cells with glyphosate diluted to a concentration 1,500 times than what is used commercially and we allowed the	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated	Refers to studies by Andres Carrasco that use exposure rates and mechanisms based on "Roundup Ready" crops but

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			amphibians to grow in strictly controlled conditions." Dr. Carrasco reports that the embryos survived from a fertilized egg state until the tadpole stage, but developed obvious defects which would compromise their ability to live in their normal habitats." Trigona, Marie "GMO – Monsanto Soy Herbicide could Pose Health Risks"Americas Program, Center for International Policy (CIP), July 13, 2009 http://www.internationalnews.fr/article-36061426.html	Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	very unlikely to occur in a forest setting. Glyphosate application and exposure rates are much higher in these cases than those used in selective forest invasive weed control. This comment is outside the scope of analysis. No change is needed.
#53		Popular press	opposing view #53 …"Round Up," causes birth defects when applied in doses much lower than what is commonly used in soy fields." Trigona, Marie "Study released in Argentina puts glyphosate under fire"SOURCE Americas Program, Center for International Policy, USA, July 13, 2009 Published by Prism Webcast News http://prismwebcastnews.com/2009/08/06/study-	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides	Article not available but refers to studies by Andres Carrasco that use exposure rates and mechanisms based on "Roundup Ready" crops but very unlikely to occur in a forest setting. Glyphosate application and exposure rates are much higher in these cases than those used in selective

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			released-in-argentina-puts-glyphosate-under-fire/	and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	forest invasive weed control This comment is outside the scope of analysis. No change is needed.
#54		Popular press	opposing view #54 - "Relyea found that Roundup caused a 70 percent decline in amphibian biodiversity and an 86 percent decline in the total mass of tadpoles. Leopard Frog tadpoles and Gray Treefrog tadpoles were completely eliminated and Wood Frog tadpoles and toad (Bufo) tadpoles were nearly eliminated." Roundup Ravages Riparian Residents"The Center for North American Herpetology. NEWS RELEASE 18 April 2005 http://www.csupomona.edu/~cmbrady/courses/bio304/Roundup.htm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and	Article not available. Glyphosate formulations with these adjuvants are not permitted to be applied next to open water or within riparian areas per the weeds EIS. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#55		Popular press	opposing view #55 The effects of glyphosate on fish have been documented using rainbow trout, which exhibited erratic swimming and labored breathing, effects which can increase the risk that fish will be eaten, as well as affecting ability to feed, migrate, and reproduce.” James, Carrie “Aerial Herbicide Spraying”SitNews (Ketchikan, Alaska) June 19, 2004 http://www.sitnews.us/0604Viewpoints/061904_carrie_james.html	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page	Glyphosate formulations with these tested adjuvants are not permitted to be applied to next to open water or within riparian areas per the weeds EIS. No aerial spraying of herbicides is planned or approved on the Coconino or Kaibab National Forests. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#56		Popular press	opposing view #56 ... "Results on toxicity to date indicate that Vision® is more toxic to all species at pH 7.5 than at pH 5.5. The reverse has been shown for Release®. In addition, the larval stage has consistently been shown to be more sensitive than the blastula stage. Understanding species sensitivities and herbicide/pH interactions will aid in altering forestry herbicide use patterns to minimize effects on amphibians and other non-target organisms." Edginton, Andrea N.Ph.D. "Multiple stressor effects in amphibians: herbicide/pH interaction"A presentation at the 5th Annual of the Canadian Amphibian and Reptile Conservation Network, September 22-25, 2000 http://www.carcnet.ca/past_meetings/2000/pastmeeting2000.php	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	Glyphosate formulations with these tested adjuvants are not permitted to be applied to next to open water or within riparian areas per the weeds EIS This comment is outside the scope of analysis. No change is needed. .
#57		Popular	opposing view #57	The effects of herbicide use	Refers to studies by Giles-Eric

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
		press	“We have evaluated the toxicity of four glyphosate (G)-based herbicides in Roundup (R) formulations, from 105 times dilutions, on three different human cell types. This dilution level is far below agricultural recommendations and corresponds to low levels of residues in food or feed. Benachour, Nora and Gilles-Eric Seralini “Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells” Chemical Research in Toxicology, 2009, 22 (1), pp 97–105 http://pubs.acs.org/doi/abs/10.1021/tx800218n	were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	Seralini that use exposure of human placental cells directly to glyphosate and glyphosate formulations. Glyphosate application and exposure mechanisms that are very unlikely to occur in a forest setting using selective spot treatment of individual weeds This comment is outside the scope of analysis. No change is needed. .
#58		Popular press	opposing view #58 According to the rationalization given in the EA (Okanogan NF, 1997, p. 17), public comments were addressed in a “higher level document”. In other words, concerns about human health and safety were not considered in the EA. By its limited scope, the agency effectively avoids having to	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The	Editorial article, these issues were addressed in the weeds EIS analysis and Design Features. This comment is outside the scope of analysis. No change is

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			consider issues that it doesn't want to. The purpose of an EA is to assess a problem, propose and evaluate alternatives and select the most effective remedy, which should be the least harmful to the environment. In this case, the alternative to use herbicides had been selected prior to doing an analysis. The EA was only used to justify a predetermined decision rather than truly explore alternatives." From Chapter 3. Adverse impacts in the report: "Risky Business: Invasive species management on National Forests - A review and summary of needed changes in current plans, policies and programs" A publication of the Kettle Range Conservation Group, February, 2001 http://kettlerange.org/weeds/Chapter-3.html	Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	needed.
#59		Popular press	opposing view #59 .."Follow-up tests indicated that much of the toxicity could be attributed to the surfactant used in the RoundUp® formulation of glyphosate." Pauli, Bruce and M. Berrill Ph.D. "Pesticides and Behaviour in Tadpoles" In Environmental Contaminants and Amphibians in Canada http://www.open.ac.uk/daptf/froglog/FROGLOG-16-5.html	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and	Article not available. Glyphosate formulations with these tested adjuvants are not permitted to be applied to next to open water or within riparian areas per the weeds EIS. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#60		Popular press	opposing view #60 "Herbicide Used in Argentina Could Cause Birth Defects" Latin American Herald Tribune, April 30, 2009 http://www.progressiveconvergence.com/roundup-report-Argentina.htm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices,	This article referenced cases involving "Roundup Ready" crops. Glyphosate application and exposure rates are much higher in these cases than those used in selective forest invasive weed control. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#61		Popular press	opposing view #61 Recognizing the threat posed by expanding use of dangerous pesticides across 18 western states, competition from invading bullfrogs, nonnative diseases, and loss of wetlands, the U.S. Fish and Wildlife Service will announce tomorrow their conclusion that western populations of the northern leopard frog may warrant protection under the Endangered Species Act." Western Leopard Frogs Move a Step Closer to Protection -- U.S. Fish and Wildlife Service: Pesticides, Disease, Invasive Species, and Habitat Loss May Threaten Native Frogs with Extinction Center for Biological Diversity news release, June 30, 2009 http://www.biologicaldiversity.org/news/press_releases/2009/western-leopard-frog-06-30-2009.html	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their	Glyphosate formulations with these tested adjuvants are not permitted to be applied to next to open water or within riparian areas per the weeds EIS. No additional mitigation is needed in the 4FRI FEIS

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				entirety.	
#62		Popular press	opposing view #62 Monsanto's original neurotoxicity studies on RoundUp were ruled invalid by the EPA due to "extensive gaps in the raw data supporting study findings and conclusions. There has been no requirement for a new study on the neurotoxicity of RoundUp." "Anecdotal Evidence of RoundUp's Toxicity" Natures Country Store From July 1987 edition of The Progressive, and article entitled 'Weed Killer' http://www.naturescountrystore.com/roundup/page7.html	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	Glyphosate formulations with these tested adjuvants are not permitted to be applied to next to open water or within riparian areas per the weeds EIS. This comment is outside the scope of analysis. No change is needed.
#63		Popular press	opposing view #63 "A group of international scientists has released a report detailing health and environmental hazards from the cultivation of genetically modified (GM) Roundup Ready soy and the use of glyphosate	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or	This article referenced cases involving "Roundup Ready" crops. Glyphosate application and exposure rates are much higher in these cases than those

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			(Roundup®) herbicide. **Antoniou, Michael, Paulo Brack Ph.D., Andrés Carrasco Ph.D., John Fagan, Mohamed Ezz El-Din Mostafa Habib Ph.D., Paulo Yoshio Kageyama Ph.D., Carlo Leifert Ph.D, Rubens Onofre Nodari Ph.D., Walter A. Pengue Ph.D. "**GM Soy: Sustainable? Responsible?" GM Watch, 13 September 2010 http://www.globalresearch.ca/index.php?context=viewArticle&code=ANA20101010&articleId=21382	Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	used in selective forest invasive weed control. This comment is outside the scope of analysis. No change is needed.
#64		Popular press	opposing view #64 Seralini suggests that this may explain the high levels of premature births and miscarriages observed among female farmers using glyphosate." Heong, Chee Yoke "New Evidence Establishes Dangers of Roundup"Third World Resurgence, No. 176, April 2005 Re-published by Project Censored http://www.projectcensored.org/top-stories/articles/13-new-evidence-establishes-dangers-of-roundup/	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the	Glyphosate formulations with these tested adjuvants are not permitted to be applied to next to open water or within riparian areas per the weeds EIS. Refers to studies by Giles-Eric Seralini that use exposure of human placental cells directly to glyphosate and glyphosate formulations. Glyphosate application and exposure mechanisms that are very

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	unlikely to occur in a forest setting using selective spot treatment of individual weeds. This comment is outside the scope of analysis. No change is needed.
#65		Popular press	opposing view #65 "Columbian Court Suspends Aerial Spraying of Roundup on Drug Crops" Reuters, July 27, 2001 Republished by Mindfilly.org http://www.mindfully.org/Pesticide/Roundup-Drug-Spray-Colombia.htm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are	This article referenced aerial application of glyphosate over very large landscapes.The exposure rates are much higher in these cases than those used in selective forest invasive weed control. No aerial spraying of herbicides is planned or approved on the Coconino or Kaibab National Forests. No additional mitigation is needed in the 4FRI FEIS

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#66		Popular press	opposing view #66 Philpott, Tom. "Why Monsanto is paying farmers to spray its rivals' herbicides" Grist, October 20, 2010 http://www.grist.org/article/food-2010-10-20-why-monsanto-paying-farmers-to-spray-rival-herbicides/	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS)	This article referenced cases involving "Roundup Ready" crops. Glyphosate application and exposure rates are much higher in these cases than those used in selective forest invasive weed control. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#67		Popular press	opposing view #67“Glyphosate is no more than slightly toxic to fish, and practically non-toxic to amphibians (McComb 1990) and aquatic invertebrate animals.” (page 4)“For glyphosate and its formulations, findings are from studies conducted by the manufacturer. These studies have been presented to EPA to support product registration, but may not be available to the public. (page 5)“Since the 1988 rating, EPA has concluded that glyphosate should be classified as having evidence of noncarcinogenicity for humans. There was no convincing evidence of carcinogenicity in new studies in two animal species (Dykstra and Ghali 1991). (page 7) “Glyphosate Herbicide Information Profile” Forest Service Pacific Northwest Region, February, 1997 http://www.fs.fed.us/r6/nr/fid/pubsweb/gly.pdf	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	Glyphosate formulations with these tested adjuvants are not permitted to be applied to next to open water or within riparian areas per the weeds EIS. This comment is outside the scope of analysis. No change is needed.
#68		Popular press	opposing view #68 “Two new studies indicate that Monsanto's	The effects of herbicide use were analyzed and disclosed in	Glyphosate formulations with these tested adjuvants are not

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			herbicide, Roundup, is a hormone-disruptor and is associated with birth defects in humans. Monsanto's Roundup Herbicide Threatens Public Health" Rachel's Environment and Health News, issue 751, Sept. 5, 2002.Reprinted by **Organic Consumers Association** http://www.organicconsumers.org/Monsanto/roundup92502.cfm http://www.whale.to/b/roundup_h.html	the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	permitted to be applied to next to open water or within riparian areas per the weeds EIS. This comment is outside the scope of analysis. No change is needed.
#69		Popular press	opposing view #69 - Although the tests of glyphosate identified as fraudulent have been replaced, these practices cast shadows on the entire pesticide registration process." Cox, Caroline, "Quality of Toxicology Testing" Journal of Pesticide Reform, Volume 15, Number 3, Fall 1995. Northwest Coalition for Alternatives	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS	The decision in the current weed EIS and FS glyphosate risk analysis are not based on Monsanto research and company policy. This comment is outside the scope of analysis. No change is

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			to Pesticides, Eugene, OR. Glyphosate, Part 1: Toxicology http://www.inspiringlandscapes.com/hope/glyphos8.htm	evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	needed.
#70		Popular press	opposing view #70 In 2004 the "Counterpart Regulations," strongly supported by industry, were proposed to streamline EPA's pesticide review process at the expense of the most vulnerable life forms in our country, Endangered and Threatened Species aka Listed Species (1,265 species are "Listed"). This latest environmental rollback can mean increasingly hazardous conditions in rivers, lakes and wetlands. A further risk is weakening of the Endangered Species Act itself. (Text of our "Comments" is available through our website -- rachelcarsoncouncil.com)" "Species from Pesticides – Weakened" Rachel Carson Council Inc., Issues & Insights	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and	This comment is outside the scope of the 4FRI analysis. No change is needed. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			October, 2004 http://www.rachelcarsoncouncil.org/index.php?page=issues-insights-october-2004	other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#71		Popular press	opposing view #71 "Used in yards, farms and parks throughout the world, Roundup has long been a top-selling weed killer. But now researchers have found that one of Roundup's inert ingredients can kill human cells, particularly embryonic, placental and umbilical cord cells….“Risk estimates for glyphosate were well below the level of concern," said EPA spokesman Dale Kemery. The EPA classifies glyphosate as a Group E chemical, which means there is strong evidence that it does not cause cancer in humans." Weed-Whacking Herbicide Proves Deadly to Human Cells By Crystal Gammon and Environmental Health News June 23, 2009 http://www.scientificamerican.com/article.cfm?id=weed-whacking-herbicide-p	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures,	Glyphosate formulations with these tested adjuvants are not permitted to be applied to next to open water or within riparian areas per the weeds EIS. Refers to studies by Giles-Eric Seralini that use exposure of human placental cells directly to glyphosate and glyphosate formulations. Glyphosate application and exposure mechanisms that are very unlikely to occur in a forest setting using selective spot treatment of individual weeds. No additional mitigation is needed in the 4FRI FEIS

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#72		Popular press	opposing view #72 "However, the U.S. government regulatory agencies seem to have given Monsanto a long rope. The clout Monsanto enjoys in the U.S. government is by no means incidental….. "A multinational Exposed" Frontline, Volume 22 - Issue 05, Feb. 26 - Mar. 11, 2005 http://www.hinduonnet.com/fline/fl2205/stories/20050311003312500.htm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their	The decision in the current weed EIS and FS glyphosate risk analysis are not based on Monsanto research and company policy. No additional mitigation is needed in the 4FRI FEIS

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				entirety.	
		Popular press	opposing view #73 "Concerns Over Glyphosate Use" The Sun (Malaysia), Friday August 20, 1999 http://www.poptel.org.uk/panap/archives/glywb.htm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	EPA has reopened glyphosate evaluation. Lennart Hardells research found significant associations found with glyphosate but no significant increase in risk, furthermore many subjects were found not to be using PPE as required by label and the weeds EIS. No additional mitigation is needed in the 4FRI FEIS
		Popular press	opposing view #74 "To protect our health, the U.S. Environmental Protection Agency (EPA) sets maximum legal residue levels for every pesticide, for dozens of crops. But a new study in the respected journal	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or	Refers to studies by Giles-Eric Seralini that use exposure of human placental cells directly to glyphosate and glyphosate formulations. Glyphosate

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			Toxicology has shown that, at low levels that are currently legal on our food, Roundup could cause DNA damage, endocrine disruption and cell death. The study, conducted by French researchers, shows glyphosate-based herbicides are toxic to human reproductive cells." Kimble-Evans, Amanda "Roundup Kills more than Weeds" Mother Earth News, December 2009/January 2010 http://www.motherearthnews.com/Sustainable-Farming/Roundup-Weed-Killer-Toxicity.aspx?page=2	Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	application and exposure mechanisms that are very unlikely to occur in a forest setting. This comment is outside the scope of analysis. No change is needed.
		Popular press	opposing view #75 "Regulatory Conclusion The use of currently registered pesticide products containing the isopropylamine and sodium salts of glyphosate in accordance with the labeling specified in this RED will not pose unreasonable risks or adverse effects to humans or the environment. Therefore, all uses of these products are eligible for reregistration." (Pg. 6) "R.E.D. FACTS Glyphosate" EPA publication - EPA-738-F-93-011, September 1993	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the	Glyphosate Reregistration Eligibility Decision specifies required product labeling changes for all end-use glyphosate products. Weeds EIS is consistent with this document. The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			http://www.epa.gov/oppsrrd1/REDs/factsheets/0178fact.pdf	use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.
		Popular press	opposing view #76 Séralini, Gilles-Eric "Issue: Cumulative Impacts to Amphibians Species" A Laboratoire de Biochimie et Biologie Moleculaire publication, Université de Caen, February 2006 http://www.signaloflove.org/clearcutting/reports/cumulativeimpactstoamphibian	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are	Glyphosate formulations with these tested adjuvants are not permitted to be applied to next to open water or within riparian areas per the weeds EIS. The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
		Popular press	opposing view #77"MYTH: The Government tests pesticides for safety before they are sold" Wild Ones Journal, Nov 17, 2006 http://www.for-wild.org/download/roundupmyth/roundupmyth.html	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS)	Article outlines how to use glyphosate 'safely' and is consistent with weeds EIS. The decision to use herbicides to treat weeds is based on a prior NEPA decision and is not one to be made in The Four Forest Restoration Initiative analysis. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
		Popular press	opposing view #78 “MYTH: There are laws…” Wild Ones Journal, Nov 17, 2006 http://www.for-wild.org/download/roundupmyth/roundupmyth.html	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	Same article as above. No additional mitigation is needed in the 4FRI FEIS
		Popular press	opposing view #79 O' Neill, Sadhbh “RoundUp—Lymphoma	The effects of herbicide use were analyzed and disclosed in	Significant associations found with glyphosate but no

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			Connection" Genetic Concern, June 22, 1999 http://www.hancock.forests.org.au/docs/herbicides Update0602.htm	the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	significant increase in risk, furthermore many subjects were found not to be using PPE as required by label and the weeds EIS. This comment is outside the scope of analysis. No change is needed.
		Popular press	opposing view #80 "Glyphosate-containing products are acutely toxic to animals, including humans. Symptoms include eye and skin irritation, cardiac depression, gastrointestinal pain, vomiting, and accumulation of excess fluid in the lungs. The surfactant used in a common glyphosate product (Roundup) is more acutely toxic than glyphosate itself; the	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS	This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			combination of the two is yet more toxic." Cox, Caroline. "Glyphosate, Part 1: Toxicology" Journal of Pesticide Reform, Volume 15, Number 3, Fall 1995 http://terrazul.org/Archivo/Glyphosate_Fact_Sheets.pdf	evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
		Popular press	opposing view #81"EPA Investigates Monsanto" RACHEL'S HAZARDOUS WASTE NEWS #400, July 28, 1994 http://www.ejnet.org/rachel/rhwn400.htm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and	The decision in the current weed EIS and FS glyphosate risk analysis are not based on Monsanto research and company policy. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
		Popular press	opposing view #82 "A study by French researchers at the University of Caen of glyphosate residue discovered that the inert ingredients in the herbicide (solvents, preservatives, surfactants) increased the toxic effect on human cells. According to the researchers, glyphosate residue can cause birth defects. Cheeseman, Gina-Marie, "Can A Company That Makes Roundup Be Sustainable?"TriplePundit, November 20th, 2009http://www.triplepundit.com/2009/11/can-a-company-that-makes-roundup-be-sustainable/	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures,	Refers to studies by Giles-Eric Seralini that use exposure of human placental cells directly to glyphosate and glyphosate formulations. Glyphosate application and exposure mechanisms that are very unlikely to occur in a forest setting. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
		Popular press	opposing view #83 "MONSANTO RoundUp (glyphosate) Empire causes BIRTH DEFECTS...in amphibian embryos, humans?" Portland independent media center, May 3, 2009 http://portland.indymedia.org/en/2009/05/391045.shtml	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their	Refers to studies by Andres Carrasco that use exposure rates and mechanisms very unlikely to occur in a forest setting. Glyphosate application and exposure rates are much higher in these cases than those used in forest invasive weed control. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				entirety.	
		Popular press	opposing view #84 **Valente, Marcela** "Scientists Reveal Effects of Glyphosate" **HEALTH-ARGENTINA,** April 15 , 2009 http://www.ipsnews.net/news.asp?idnews=46516	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	Refers to studies by Andres Carrasco that use exposure rates and mechanisms very unlikely to occur in a forest setting. Glyphosate application and exposure rates are much higher in these cases than those used in forest invasive weed control. This comment is outside the scope of analysis. No change is needed.
		Popular press	opposing view #85 Watts, Meriel Ph.D. "Roundup's Not OK" ORGANIC NZ, November/December 2009 http://www.livingorganics.co.nz/roundups-not-	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or	This article was no longer available, Meriel Watts 2012 report "Human Health Impacts of Exposure to Pesticides" referenced many valid

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			ok.php	Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	scientific studies. These studies referenced cases involving "Roundup Ready" crops. Glyphosate application and exposure rates are much higher in these cases than those used in forest invasive weed control. No additional mitigation is needed in the 4FRI FEIS
#86		Popular press	opposing view #86' "Do Seed Companies Control GM Crop Research?" Scientific American, Editorial, August 2009 edition, published 21 July 2009 Reprinted by Combat-Monsanto.org http://www.combat-monsanto.co.uk/spip.php?article399	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the	This refers to "Roundup Ready" crops that are not proposed for use in forest invasive weed control. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#87			opposing view #87 France Finds Monsanto Guilty of Lying Infowars Ireland, November 23, 2009 http://info-wars.org/2009/11/23/france-finds-monsanto-guilty-of-lying/	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are	The decision in the current weed EIS and FS glyphosate risk analysis are not based on Monsanto research and company policy. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#88		Popular press	opposing view #88 …..It is very clear that if G, POEA, or AMPA has a small toxic effect on embryonic cells alone at low levels, the combination of two of them at the same final concentration is significantly deleterious." Damato, Gregory Ph.D., "GM-Soy: Destroy the Earth and Humans for Profit" Fourwinds10.com, May 27, 2009 http://www.fourwinds10.com/siterun_data/science_technology/dna_gmo/news.php?q=1243529527	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS)	This refers to "Roundup Ready" crops that are not proposed for use in forest invasive weed control. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#89		Popular press	opposing view #89 “Everything you Never Wanted to Know about Monsanto’s Modus Operandi (M.O.)” Mindfully.org http://www.mindfully.org/Pesticide/Monsanto-Roundup-Glyphosate.htm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	The decision in the current weed EIS and FS glyphosate risk analysis are not based on Monsanto research and company policy. This comment is outside the scope of analysis. No change is needed.
#90		Popular press	opposing view #90 Gillam, Carey “Patents Trump Public Interest in	The effects of herbicide use were analyzed and disclosed in	This refers to “Roundup Ready” crops that are not

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			Monsanto's Ag Empire - Special Report: Are Regulators Dropping the Ball on Biocrops?" Reuters, April 13, 2010 http://www.commondreams.org/headline/2010/04/13-0	the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	proposed for use in forest invasive weed control. This comment is outside the scope of analysis. No change is needed.
#91		Popular press	opposing view #91 Rossol, Monona "Say What? A Chemical Can Damage Your Lungs, Liver and Kidneys and Still Be Labeled "Non-Toxic"?" Ms. Rossol is a research chemist, author and member of the American Industrial Hygiene Association May 9, 2011	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS	Information about evaluating toxicity, examples include aspestous, water and lead, all consistent with analysis in the weeds EIS. No additional mitigation is needed in the 4FRI FEIS

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
			http://www.alternet.org/story/150888/say_what_a_chemical_can_damage_your_lungs%2C_liver_and_kidneys_and_still_be_labeled_%22non-toxic%22?page=entire	evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#92		Popular press	opposing view #92 PAN UK "Resistance to glyphosate" This data was first published in Pesticides News No. 41, September 1998, page 5 http://www.pan-uk.org/pestnews/Issue/pn41/PN41p5.htm	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and	This refers to "Roundup Ready" crops that are not proposed for use in forest invasive weed control. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#93		Popular press	opposing view #93 Schafer, Kristin, "Mother takes on Monsanto, wins global prize" Published in GroundTruth, April 13, 2012 Pesticide Action Network North America http://www.panna.org/blog/mother-takes-monsanto-wins-global-prize	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures,	This refers to "Roundup Ready" crops that are not proposed for use in forest invasive weed control. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of corresponde nce)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	
#94			opposing view #94 Moench, Brian, MD., "The Autism Epidemic and Disappearing Bees: A Common Denominator?" Published in Truthout, April 21, 2012 http://truth-out.org/news/item/8586-the-autism-epidemic-and-disappearing-bees-a-common-denominator	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their	This refers to insecticides not used in forest invasive weed control. This comment is outside the scope of analysis. No change is needed.

Comment #	Name of commenter (date of correspondence)	Source	Comment/Issue	Response – What does DEIS and report say? What does weed FEIS/ROD say? Is there additional BAS that could be added?	Analysis – Conclusion is anything changing in FEIS and report? If so, why? If not, why
				entirety.	
#95		Popular press	opposing view #95 Barrett, Mike, "Monsanto's Roundup Ready Crops Leading to Mental Illness, Obesity" Natural Society, December 15, 2011 Source: http://naturalsociety.com/monsanto-roundup-ready-crops-decreased-gut-flora/	The effects of herbicide use were analyzed and disclosed in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds (2005). The 4FRI project tiers to this separate NEPA analysis. The Noxious or Invasive Weed EIS evaluated the impacts of glyphosate based herbicides and proposed restrictions on the use of these chemicals within limited spray zones (buffers around human habitation and recreation sites), near water and other critical wildlife habitat areas. These restrictions and extra protective measures are outlined in the Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures of the weed EIS. BMP B15 (page 570 of 4FRI DEIS) incorporates the weeds mitigation measures (appendix B of the weed EIS) in their entirety.	This refers to "Roundup Ready" crops that are not proposed for use in forest invasive weed control. This comment is outside the scope of analysis. No change is needed.

Appendix G. Arizona bugbane Administrative Study: Fire effects

The FS is collaborating with the FWS to finalize a strategy to monitor the impacts of prescribed fire on Arizona bugbane.

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Introduction

This treatment and monitoring is designed to be incorporated into the current 4FRI analysis. To address concerns over the potential fire effects to Arizona bugbane, we are proposing a prescribed burning and monitoring project at plant sites in the Upper West Fork area that are currently proposed for treatment. The burning and monitoring project may be carried out as part of this analysis or as a separate administrative study.

Pre-and post-monitoring would occur across multiple Arizona bugbane populations. Areas outside of the 4FRI analysis area may be used for controls or treatment after consultation with district personnel. All activities would be subject to limitations such as human safety, timing restrictions as they apply to MSO nesting seasons, burn windows, wilderness considerations, etc.

As part of 4FRI implementation, prescribed burning may occur in or near some populations of Arizona bugbane. Direct effects to Arizona bugbane could include death or top killing of individual plants, or parts of plants. Indirect effects may come from the decreased shade from decreased canopy cover if trees or portions of tree crowns are killed in the surrounding area; increased sprouting and/or flowering resulting from the post-fire nutrient pulse and decreased litter cover; increased seedling establishment from increased area of exposed mineral soil; or other more complex effects resulting from changes to surface albedo, precipitation reaching the soil, decreased competition, and/or other changes resulting from the fire and the antecedent conditions. Under the current NEPA analysis, mitigations would include managing prescribed fires to keep severity low in and near the bugbane.

Current knowledge of fire effects on Arizona bugbane is based largely on observations from two local wildfires, the Fry Fire in 2003, and the Slide Fire in 2014, both on the Coconino National Forest (Crisp et al. 2004, 2014 personal observation). The Fry Fire covered 180 acres of upland and canyon habitats in Fry Canyon and was of mixed severity. The highest severity fire effects in areas with individual Arizona bugbane plants initially included loss of the above ground portions. On a subsequent visit in 2004, Arizona bugbane plants were observed along the fire line near the canyon bottom, some in severely burned areas. Observers noted a variety of plant sizes and ages, ranging from immature plants to adults with mature fruits. An adult plant with fruits and blackened soil at the base is shown in figure 17. The lower portion of the canyon supports mixed-conifer forest and is more mesic than the upland ponderosa pine forest along the rim of the canyon. Arizona bugbane populations were informally monitored again in 2005 and 2010, and plants were persisting and thriving. Although quantitative data has not yet been compiled from the Slide Fire, similar effects were observed in most affected populations.

A literature search did not return any published data for fire effects to Arizona bugbane. However, based on taxonomic information for the genus *Cimicifuga* in the Flora of North America, members of the genus *Cimicifuga* have long-lived perennial rhizomes (see Vol. 3 page 177) that would persist after the top portions of the plants senesces in the fall. This allows the plants to regenerate from the underground rhizomes when conditions are favorable in the spring. Pyke et al (2010) addressed the persistence of plants after wildfires using several traits including life form. Perennial species such as bugbane are categorized as cryptophtyes (see table 1 of article). Plants with this life form are generally one of the most protected from death during fire because the soil insulates the underground portions of the plants. In these cases, the top portions of the plant may be killed, but the underground structures, such as rhizomes, are able to persist (Pyke et al. 2010).

Figure 17. Arizona bugbane plants near the fire line on Fry Fire. September 2004

Figure 18. Arizona bugbane sprouting from roots about a month after the Slide Fire burned though this population.

A related species in the same genus, *Actaea rubra*, has been studied in the Northwestern U. S. Data are available on the Fire Effects Information System website (Crane, 1990). In that species, the tops of plants are removed by fire and then plants regenerate from thick underground caudices, but seedlings did not appear for several years post-fire.

Over a 25-year period, the majority of natural ignitions within an area of approximately 55,000 acres around known populations of Arizona bugbane occurred from May to September. Prescribed fires have most commonly been implemented before May or after mid-September. Implementing prescribed fire at these times may produce stress on bugbane since adaptations likely relate to fires typically occurring between at the onset of lightning, which is generally in May and continues through September. However, only the Fry Fire and the Slide Fire are known to have burned into an Arizona bugbane population during May to September. Arizona bugbane often grows in rocky areas with poor soil where surface fuel may be discontinuous in and/or around the populations. One population on Bill Williams Mountain on the Kaibab National Forest is in mixed conifer forest, the type locality for this species. It is possible that fire did not burn though areas occupied by bugbane as often as it did though the surrounding area. Post-fire observations on the Fry Canyon population and some populations up the West Fork; suggest that at least some of the plants resprout after fire. It seems possible, then, that Arizona bugbane may be adapted to fire, although the fire frequency may be less than in the surrounding vegetated areas.

Number of fires USFS personnel responded to over a 25-year period within the area shown in Figure 18. In Figure 18, these fires are shown in lightning bolts.

Table 23. 25-Year Fire History in Project Area

Month	Number of fires
January	0
February	0
March	1
April	1
May	12
June	30
July	146
August	106
September	39
October	17
November	1
December	0
Total	**353**

Given the frequency of fire in the areas surrounding the populations, it seems unlikely that it would not have some adaptations. Even if separated from the frequent fire areas, there would be years when embers would spot near or in populations, an instance that is more likely in dry years, or between the end of the spring precipitation and the onset of monsoons.

Preliminary modelling data for Arizona bugbane indicates that it occurs primarily on a certain soil type, soil unit 555. This unit is composed of colluvium material and formed from sandstone and limestone. It tends to occupy a northern aspect, which provides cooler and moister conditions and has a severe erosion hazard. The dominant plant communities are composed of ponderosa pine and mixed conifer with gambel oak and various shrubs.

A second soil unit is also present in the area occupied by Arizona bugbane in the proposed study, Soil unit 549 is a colluvium soil of cherty bedrock. Dominant overstory species include ponderosa pine and gambel oak (USDA Forest Service, 1995).

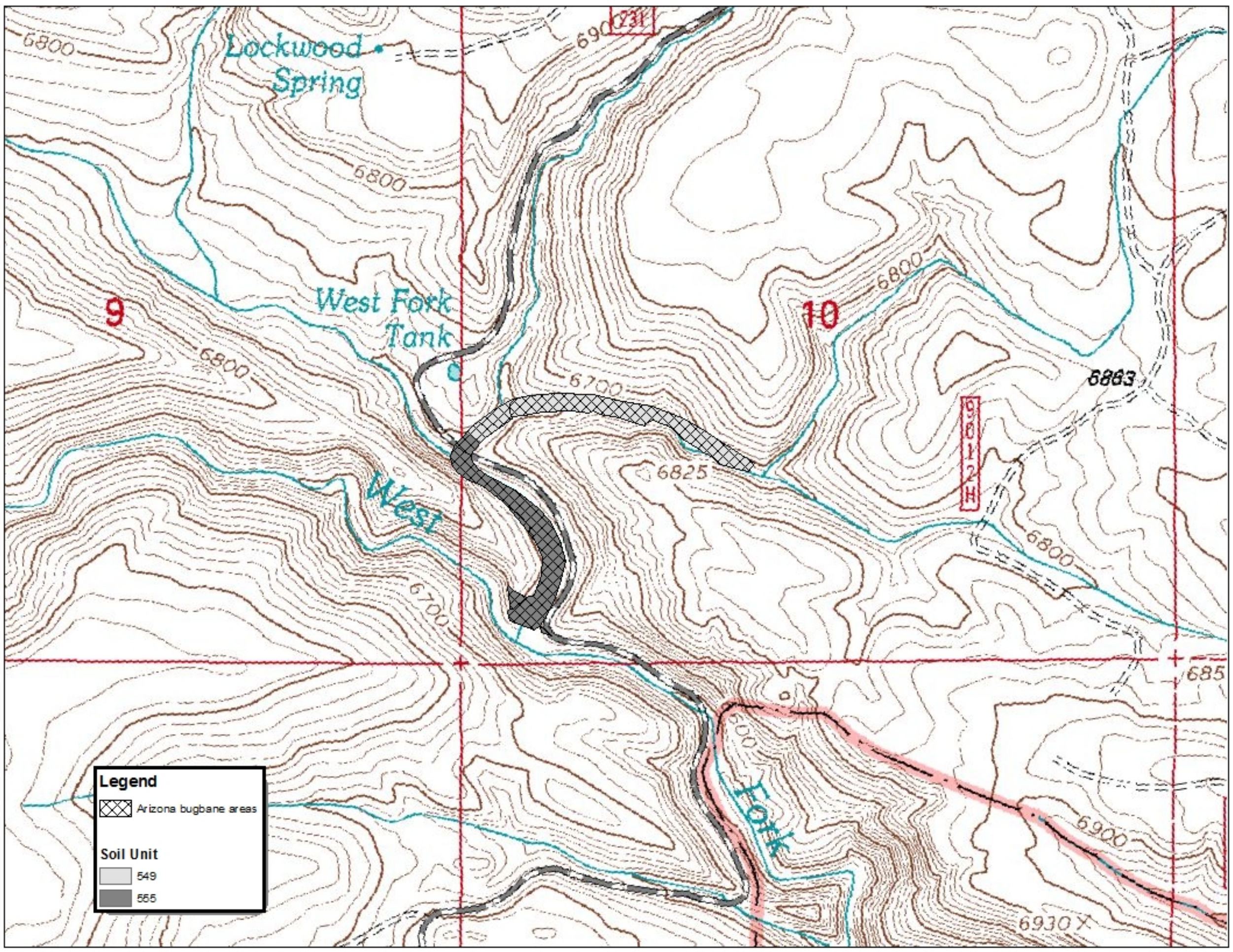

Figure 19. map showing soil units in Arizona bugbane areas to be treated.

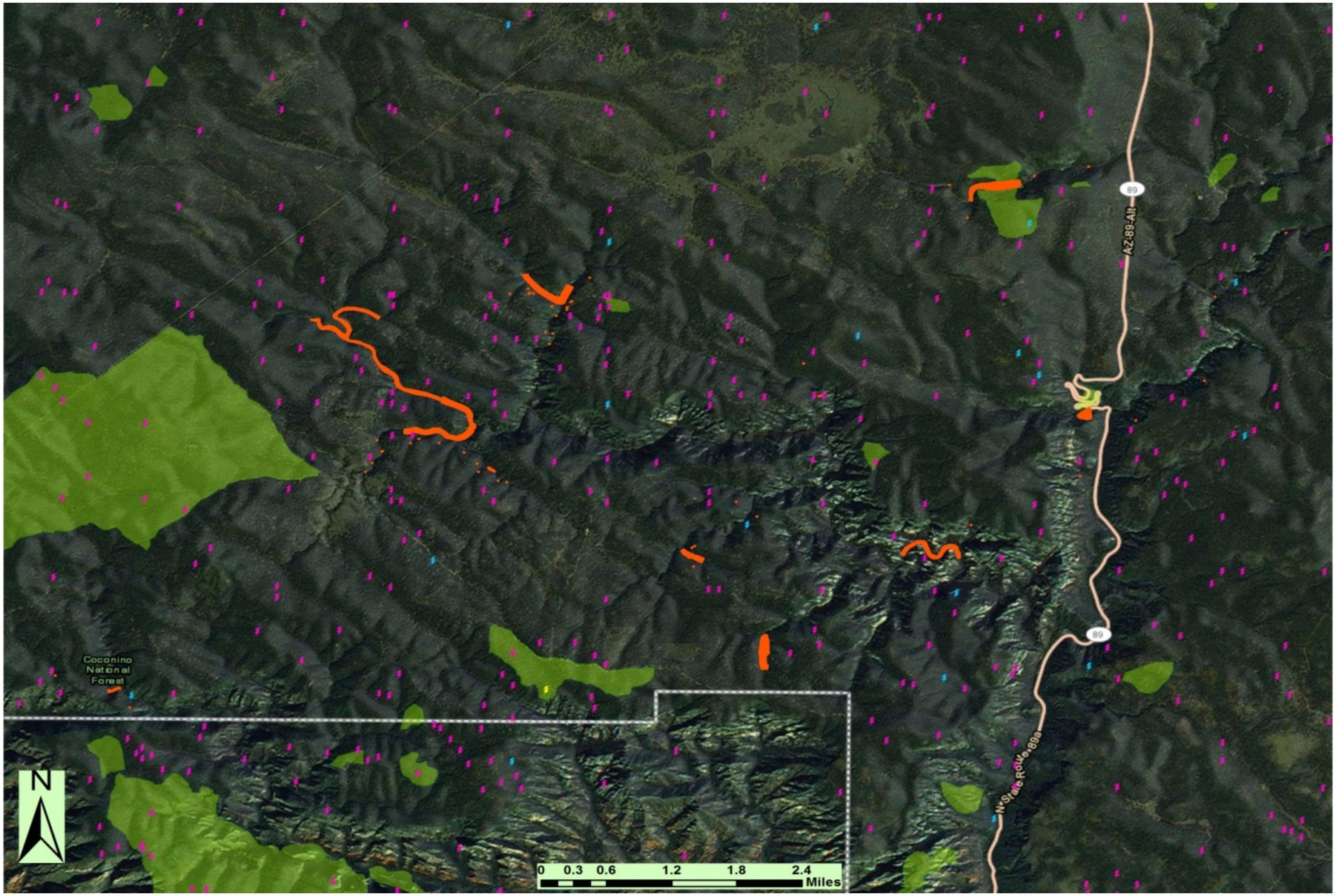

Figure 20. Arizona bugbane populations are shown in orange. Lightning fires locations are shown as: Yellow lightning bold = January through April; Pink lightning bolt = May through September; Blue lightning bolt = October through December. 2) Perimeters of lightning fires that grew to 10 acres or larger are in green.

Although we do not know the details of its fire adaptations, there is an unnaturally high surface fuel buildup in areas surrounding these populations and possibly within them as well. This raises concerns about the potential effects of a wildfire occurring under circumstances that could produce unnaturally high severity fire effects in and around populations of bugbane. Given this, it seems advisable to use prescribed fire in a manner that seems most likely to benefit the species, based on the limited information we currently have, and to document the effects for informing future management actions.

Study design

This monitoring/burning project was designed by Fire Ecologist, Mary Lata and Forest Botanist, Debra Crisp. We would coordinate with the FWS and a fire specialist in the selection of sites in the West Fork Area for study.

The proposed study area consists of stands within the Upper West Fork MSO PAC (**Table 24**). No bugbane test burning would occur in the core area. The Recovery Plan (USDI FWS 2012) does not recommend burning in MSO PACs during the breeding season (March 1 to August 31) except when non-breeding is confirmed or inferred that year. The area would be surveyed for MSO before implementation of the raking and burning treatments.

Table 24. Arizona bugbane locations and sites in the Upper West Fork PAC.

Restoration subunit	Date Collected	Location	Site	Alternative C
3-5	9/12/2012	167	33	Burn Only
3-5	9/12/2012	167	34	Burn Only
3-5	9/12/2012	176	3	Burn Only
3-5	9/1/1980	176	7	Burn Only
3-5	9/12/2012	176	10	Burn Only

The study would include 2 to 3 different treatments as follows:

1. Control (a population with characteristics and location as similar as possible to the one being treated, or a portion of a single large population if treated and untreated areas can be separated by at least 50 meters): The control area would not be burned although, as stated above, it would receive whatever mechanical treatments have been prescribed for the area, and would serve as a comparison for the other two treatments.
2. Prescribed fire (as stated above, this area would be at least 50 meters from a control, or as similar as possible to a control): This area would be subjected to a burning treatment as proposed for the location/site and already incorporated in this alternative. Fire within and adjacent to the bugbane population would be managed to produce only low severity effects.
3. Partial raking with no burning (a portion of the control population): The intent of this treatment is to mimic historical levels of litter and duff under characteristic fire levels without necessarily using fire as a treatment. It would be included in the design if

> there are sufficient populations or they are sufficiently large to accommodate additional treatments. If historically, these areas burned periodically, even if it was a lower frequency than surrounding areas (there are no site-specific, definitive data for fire frequency in Bugbane populations) it is likely that there would normally have been less litter and duff than is currently observed.

Fireline would be created as needed to aid in administering consistent fire treatments. Individual treatments including controls would be separated by at least 50 meters to minimize the risk of effects from adjacent controls.

The preferred time for conducting burn treatments would be between May and August, when fire would have been historically expected to burn in this area. However, since most areas containing bugbane are near or adjacent to Mexican Spotted Owl habitat, timing restrictions for MSO may take precedence over the burning treatment and a fall burning would be implemented. A fall burn would be expected to be less harmful than a spring burn because individual plants would have had the preceding growing season to produce and store energy. In addition, plants are emerging in the spring and allocating stored energy to growth and reproduction. Raking (if used) and fire line construction (if needed) would occur immediately prior to the ignition of fire to assure that there is no effect from timing of the raking or the fireline construction. The area to be burned will be on the downhill side (if there is a slope) in order to prevent overland flow from carrying nutrients from the burned area into one of the non-burned areas, potentially biasing results.

Unless safety concerns preempt it, the fire would be monitored during ignition and burning to document fire behavior (rate of spread, flame depth) as it burned through the bugbane. Scorch would be kept to less than five feet in and adjacent to bugbane populations.

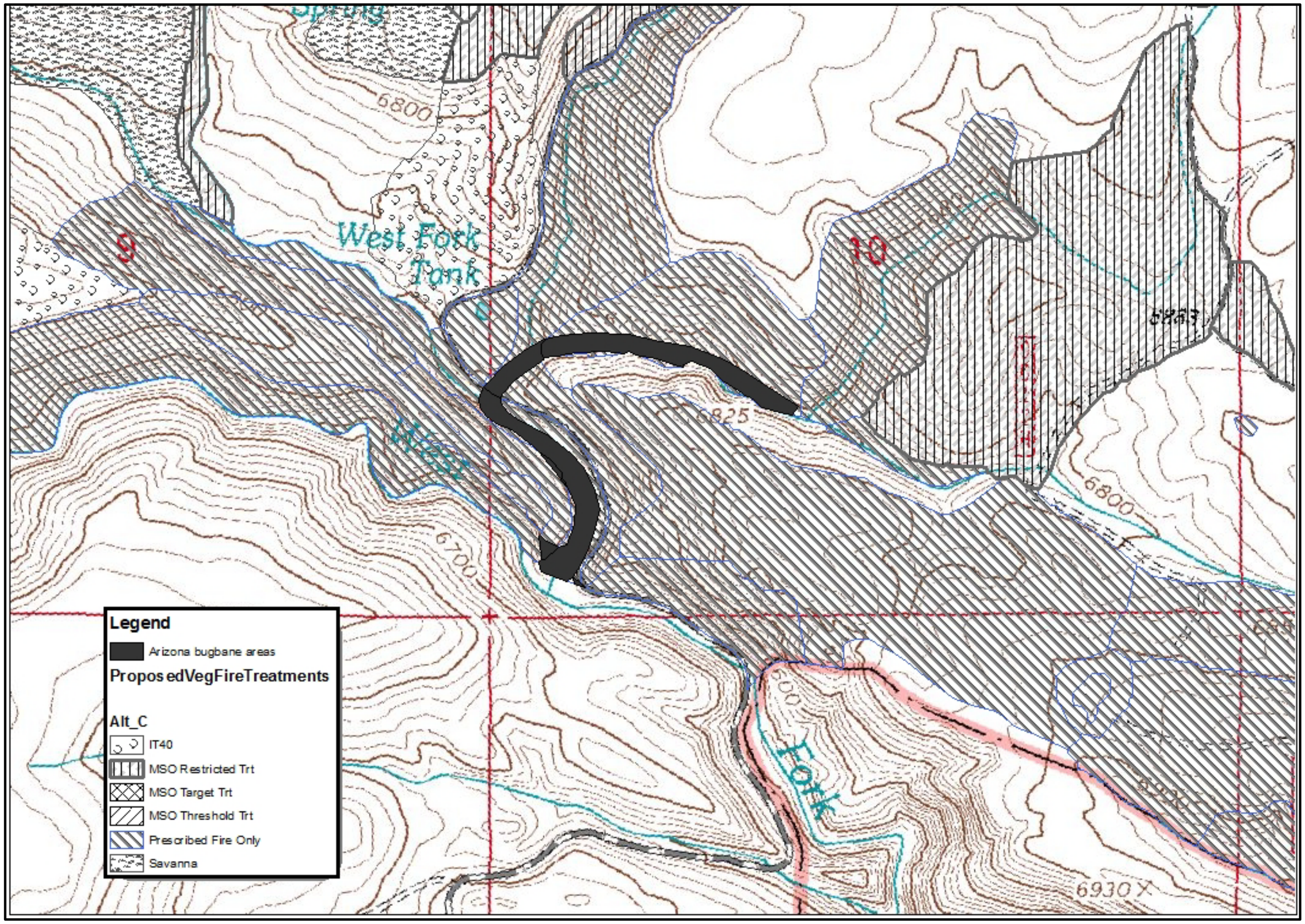

Figure 21. Map treatment areas. Arizona bugbane is shown in black.

Design Features

1. Implementation will require coordination between the Forest Botanist, District Wildlife Biologists, Fuels, Fire Ecologist and Wildlife Biologist, and the Fish and Wildlife Service.
2. If owls are not present in opportunity area (zones selected to allow burning during the nesting season), we would like to mimic what would likely fit the pattern of ecological evolution in this area and burn between May and August when natural fire would have been present in the plant community. If the presence of owls prohibits a summer burn, it would occur in the late/summer fall.
3. The area will be surveyed for MSO before implementation. If MSO presence is detected, the treatments will be conducted outside of the breeding season (after August 31).
4. Three or more replicates are needed. Areas outside of the current 4FRI analysis area can be considered for use as controls and possibly for burning. Consultation with district personnel should occur before treatment areas outside of 4FRI are selected.

Pre-treatment data

The following data would be collected before burning occurred. The data should be collected less than two weeks prior to treatment, but as close to the implementation of the burn as possible. Fuel moisture data must be collected within a few days of implementation, and not before a precipitation event preceding the fire.

Plant data

Collection of the plant data one year prior to the implementation of the treatment, within one week of the date of implementation one year after treatment and then three years after treatment. For example, if the prescribed fire is implemented on September 1st, data would be collected between August 25th and September 7th in years one and three following the burn.

1. **Stems per area**. Individual stems will be counted as opposed to clumps of plants to avoid the need to determine underground connectivity of the plants. The intent of this metric is to document changes in plant vigor by measuring changes in the number of stems per area
2. **Spatial area** occupied by the sample population. The intent of this metric is to document the expansion or contraction of the population over time.
3. Evidence of other activities at the site such as grazing by wildlife and/or cattle, recreation, etc.
4. Evidence of past natural events such as flooding, storm damage, insect mortality in the overstory, etc.
5. Canopy/shading including abiotic structures such as cliffs that may be providing shade to the bugbane groups being treated. We anticipate that canopy cover would be measured by a spherical densiometer or a similarly appropriate tool. The same type of instrumentation should be used for each visit.

6. Soil type should be recorded for each site.
7. These data should be collected for populations in each treatment (untreated, raking and burning).

Fire/fuel parameters

1. Surface fuel loading (litter, duff, downed woody material (pre and post)). This will be determined by establishing a Brown's fuel transect.
2. Exposed mineral soil (pre and post)
3. Timing of fire (season)
4. Fuel moisture (particularly litter and duff)
5. Rate of spread, flaming depth (used to determine residence time)
6. Fire weather at the site.
7. Precipitation on the site, gathered from the nearest reliable source.

Weather data

Weather data for the date of collection and the season prior should be noted in order to consider the effects of weather on plant growth at the treatment sites.

Fire parameters

Brown's lines should be read at each visit to the treatment population (untreated, raking, and burning), along with exposed mineral soil. Recent deadfall and tree mortality rates should also be recorded.

Reporting

Data sheets will be prepared and data recorded in a standard manner on each visit to assure data consistency. Data sheets and field notes will be entered electronically into the 2670 Arizona bugbane file in an area established and designated for the monitoring/study. Data will also be shared with the FWS, 4FRI monitoring coordinator and other interested parties.

Appendix H. Consistency with the Revised Kaibab National Forest Land and Resource Management Plan

The Revised Kaibab National Forest Land and Resource Management Plan (Revised KNF LRMP) becomes effective on April 6, 2014. Implementation of the Plan will begin on that date. It is therefore necessary to ensure that the proposed project is consistent with and conforms to the requirements of the Revised Plan, which includes desired conditions and management approaches for the botanical resources addressed in this document. This section therefore addresses consistency with the Revised Kaibab National Forest Land and Resource Management Plan.

Changes to the Garland Prairie Research Natural Area.

The revised plan would not provide for the establishment of a Research Natural Area in the Garland Prairie Area. In the revised plan, the area is designated as a Management Area consisting of 340 acres. Guidance for the management area is on pages 100-101 in the revised plan. Management is addressed through desired conditions, guidelines, objectives and management strategies for the area.

Desired Conditions for Garland Prairie Management Area

- The area serves as a reference for the study of ecologic changes and as a control to other similar habitats being manipulated for research or management purposes.
- Lightning fires are able to burn naturally within the area.

Guidelines for Garland Prairie Management Area

- The area should be protected from activities that directly or indirectly modify ecologic processes.

Management Approach for the Garland Prairie Management Area

The PNVT for the Garland Prairie Management Area is "montane/subalpine grassland." While Garland Prairie would not necessarily make a good RNA, the Kaibab NF recognizes it has continued value as a reference area and as high quality grassland habitat as it is known to support some of the highest fawn: doe ratios for pronghorn anywhere in the state of Arizona.

Consistency

A forest plan amendment to the KNF 1988 Forest Plan would have been needed to allow treatment in the proposed RNA in alternative C. No treatment would have occurred within the designated boundary of the RNA in any of the other alternatives and no amendment would have been needed. The 2014 plan removes this restriction and would allow treatment in the Garland Prairie Management Area. The desired conditions and guidelines apply to management in the area. All alternatives would move toward the desired conditions but the treatments in Alternative C would attain them more quickly than all other alternatives in this analysis.

Threatened, Endangered or Sensitive Plants

The revised plan establishes desired conditions, guidelines and management approaches for threatened, endangered and sensitive species. The guidance applies to both plants and animals. There are no threatened or endangered plants in the analysis area but several sensitive plant species are present. Several desired conditions and guidelines apply to TES plants and animals.

Only those relevant to plants are addressed here. Refer to pages 51-52 of the revised plan for the section related to TES species.

Desired Conditions for Threatened, Endangered, and Sensitive Species

- Threatened, endangered, and sensitive species have quality habitat, stable or increasing populations, and are at low risk for extirpation

Guidelines for Threatened, Endangered, and Sensitive Species

- Project activities and special uses should be designed and implemented to maintain refugia and critical life cycle needs of Forest Service Sensitive Species.

Management Approach for Threatened, Endangered, and Sensitive Species

- The Kaibab NF maintains strong partnerships between the State, other federal agencies, academia, and nongovernment organizations to provide for TES species. Emphasis is placed on the protection and replacement of key habitats that contain threatened, endangered, and/or sensitive species of plants and animals. The Kaibab NF works with the USFWS and other partners to develop conservation measures (e.g. public education to reduce human impacts) to prevent listing and to aid to in the recovery and delisting of federally listed species. For 10(j) species, such as the California condor, this applies inside and outside the designated experimental range.

Consistency

There are no conflicts between past and present guidance and no change is needed in the analysis.

Rare and Narrow Endemic Species

This category includes taxa that are limited in distribution to a certain geographical area. In some cases, the organism may be plentiful within its range but the total range of it is limited to a narrow geographical extent. The information below is from pages 52-53 of the revised plan. Additional guidance for narrow endemics is integrated in other portions of the revised plan in such areas as special habitat features and special management areas.

The information below is copied verbatim from the revised plan

Some species face threats simply by virtue of their relatively limited distribution. Species (or subspecies) are considered to have a restricted distribution if they are limited in extent in the Southwest. A species is considered a rare and narrow endemic if it has extremely limited distribution and/or habitat in northern Arizona. Due to limited distributions and potential susceptibility to perturbations, some species may require specific management considerations. On the Kaibab NF, there are currently 74 known species for which restricted distribution is considered a threat; of these, 48 are narrow endemics, some of which are on the Regional Forester’s sensitive species list.

Desired Conditions for Rare and Narrow Endemic Species

- Habitat and refugia are present for narrow endemics or species with restricted distributions and/or declining populations.

- Location and conditions of rare and narrow endemic species are known.

Guidelines for Rare and Narrow Endemic Species

- Project design should incorporate measures to protect and provide for rare and narrow endemic species where they are likely to occur.

Management Approach for Rare and Narrow Endemic Species

- Species-specific information and management recommendations can be found in the Kaibab NF endemic species guidebook, which is to be maintained as a living document. This guidebook will be updated with new species, information, and locations as they become available.

- See also "Wildlife," "Threatened, Endangered, and Sensitive Species," "Natural Waters," "Caves, Karsts, and Mines," "Cliffs and Rocky Features," "Pediocactus Conservation Area," and "Arizona Bugbane Botanical Area.

Consistency

Managing these special status species is a new challenge in project analysis. It will require a new approach in analysis, survey and implementation of all forest projects in the future. The Kaibab NF guidebook mentioned above in the management approach is not yet available so guidance on the ranges, locations and potential guidance of these species is not available at this time.

To mitigate this issue, we suggest consulting the guidebook as soon as it is available and incorporating these species into project survey and implementation. Mitigation for management actions area similar to those for Region 3 Sensitive Species so we are suggesting using those measures for the narrow endemic species as well.

Nonnative Invasive Species

These species are also referred to as noxious or invasive weeds in the analysis of effects. The revised plan includes certain undesirable animal species in this section of the plan such as bullfrogs and crayfish. Analysis of non-native animals is not included in this report. For more information, see pages 52-54 of the revised plan.

Desired Conditions for Nonnative Invasive Species

- Invasive species are contained and/or controlled so that they do not disrupt the structure or function of ecosystems or impact native wildlife.
- Visitor experiences are not adversely impacted by the presence of invasive species.

Guidelines for Nonnative Invasive Species

- All ground-disturbing projects should assess the risk of noxious weed invasion and incorporate measures to minimize the potential for the spread of noxious and invasive species. New populations should be detected early, monitored, and treated as soon as possible.
- Treatment approaches should use integrated pest management (IPM) practices to treat noxious and nonnative invasive species. IPM includes manual, biological, mechanical, and herbicide/pesticide treatments.
- Use of pesticides, herbicides, and biological control agents should minimize impacts on non-target flora and fauna.

Objectives for Nonnative Invasive Species

- Treat 2,000 to 3,000 acres invaded by nonnative invasive plants annually.

Management Approach for Nonnative Invasive Species

- Strategies to prevent the spread of nonnative invasive species include education, inventory, and control guidelines. Educational programs that increase awareness are critical to effectively manage nonnative invasives. Treatments focus on those species that have the potential to permanently alter historical fire regimes or pose the greatest threat to biological diversity and watershed condition. To effectively manage invasive species populations, it is important to coordinate with other agencies, grazing permittees, and adjacent landowners in efforts for prevention and control.

- While management that provides for interconnected habitats is desirable for many native wildlife species. In some circumstances such as springs, connectivity can also provide vectors for nonnative species to spread (e.g., water and vehicles used in fire suppression). The use of best management practices can minimize and prevent the spread of non-native invasive species.

Consistency

There are no conflicts between past and present guidance and no change is needed in the analysis.

Appendix I. Rare and endemic plants analysis

Rare and endemic species

Note: this section was added to the analysis after the completion of the DEIS. The Kaibab National Revised Forest Plan (2014) provides direction for management of rare and endemic species. Coconino NF Plan (under revision) will contain similar direction.

The Coconino NF is included in this analysis on the assumption that rare and endemic species will be addressed at the time of implementation and it is anticipated that the Coconino NF Revised Plan completed prior to implementation of at least part of the treatment units addressed in the 4FRI analysis. There is no direction that applies directly to rare and narrow endemic plants in the current Coconino NF Plan (1987) except for the direction that applies to threatened, endangered or sensitive species. Several of the Region 3 sensitive species addressed in the main body of this report including Rusbyi milkvetch (*Astragalus rusbyi*), Arizona bugbane [*Actaea* (*Cimicifuga*) *arizonica*], Arizona sneezeweed (*Helenium arizonicum*), Sunset Crater beardtongue (*Penstemon clutei*), Flagstaff beardtongue (*Penstemon nudiflorus*), Arizona phlox(*Phlox amabilis*), and Blumer's dock(*Rumex orthoneurus*) have restricted distribution or are narrow endemics. These are addressed in the Region 3 sensitive species and will not be addressed further in this section. The rest are rare or endemic and are not afforded any special protection by law, regulation and policy except as addressed in the Kaibab NF revised plan (2014) and the Coconino NF draft plan (2013).

This analysis is based on the following **assumptions**.

- The desired conditions and guidelines provided by the Kaibab NF (2014) plan will be incorporated into the project design and implementation as management in the affected areas is implemented.
- The desired conditions for endemic plant communities, plant species with restricted distributions and narrow endemics currently in the draft forest plan for Coconino NF (2013) will be carried forward into the final plan and these measures be incorporated into the project design and implementation as management in the affected areas is implemented.
- Surveys will be conducted as needed prior to implementation.

Desired condition for rare and endemic plants

Desired conditions in the Kaibab NF Plan (2014) are

- Habitat and refugia are present for narrow endemics or species with restricted distributions and/or declining populations.
- Location and conditions of rare and narrow endemic species are known.

Guidelines in the KNF (2014) plan include the direction below:

- Project design should incorporate measures to protect and provide for rare and narrow endemic species where they are likely to occur.

Desired conditions for management of rare plant species in the Coconino NF Draft Plan (2013) are incorporated into several areas of the plan. Frequently, the desired conditions are incorporated into other resources. The sections that directly address desired conditions for rare and endemic plants and their communities include fine scale features in the Desired Conditions for All Vegetation Types and in the Desired Conditions for Wildlife, Fish and Plants sections. These desired conditions apply forest-wide and to all vegetation types.

Desired conditions for rare and endemic plants in the Coconino NF draft plan (2013) are

- FW-Veg-All-DC, Fine Scale (10 acres or less) - Endemic rare plant communities are intact and functioning.
- Desired Conditions for Wildlife, Fish, and Plants FW-WFP-DC- Habitats throughout the Coconino NF include the microclimate or smaller scale elements needed for rare plants and animals. The structure and function of the PNVTs and associated microclimate or smaller scale elements (e.g., special features, rock piles, specific soil types, and wet areas) exist in adequate quantities to provide habitat and refugia for narrow endemics, species with restricted distributions, and Southwestern Region sensitive species.

There are currently no guidelines that directly focus on rare and narrow endemic plants in the Coconino NF draft plan (2013).

The Kaibab National Forest Revised Plan (2014) and Coconino Draft Plan (2013) address rare and narrow endemic species. These species were identified as part of the analyses for forest plan revision on each forest. Both plans recognized two categories for the analyses. A taxon was considered to have a restricted distribution if the occurred to a limited extent in the Southwest. It was also considered a narrow endemic if it has extremely limited distribution and/or habitat in northern Arizona. For the purposes of this analysis, these categories were combined. Table 25 below contains those species with documented locations in treatment units of the analysis area.

- Botany Specialist Report, Kaibab Forest Plan Revision FEIS (2014)
- Kaibab NF Revised Plan (2014)
- Supplemental Botany Specialist Report Coconino Forest Plan Revision DEIS (2013)
- SEINet database
- Coconino National Forest Ecological Sustainability Report (2009)

Analysis question to be answered

- How would proposed treatments affect rare and endemic plant species? The indicators used to evaluate environmental consequences are: (1) a qualitative evaluation of whether populations are known and protected during implementation. This issue would be addressed during implementation because the effects to these species from management actions has already been addressed NEPA analysis the Final Environmental Impact Statement for the Kaibab National Forest Land and Resource Management Plan (2014) and will be addressed in the final Coconino NF revised plan.

Existing Condition

To determine whether the species was in any of the areas to be treated in the current analysis area, we used the rare and endemic plant lists in the forest planning documents above, and then searched the SEINet database for locations by county using Yavapai and Coconino counties for the basis of our search. Counties were used because there is not a method for searching by forest in the database. If the species was present in the county, data were exported to GIS and intersected with the latest treatment layer for the 4FRI analysis. Using this method, we developed the table below. Known occurrences and brief narratives for each species are included below.

Table 25. Rare and narrow endemic plants with documented occurrences in 4FRI treatment units

Scientific-Name	Common-Name
Astragalus humistratus var. tenerrimus	Groundcover Milkvetch
Astragalus troglodytus	Creeping Milkvetch
Camissonia gouldii	Diamond Valley suncup
Draba asprella var. stelligera and D. asprella kaibabenesis *	Rough Whitlow-grass
Eriogonum jonesii	Jones' Wild Buckwheat
Lesquerella arizonica	Arizona Bladderpod
Mertensia macdougalii	Macdougal's Bluebells
Penstemon linariodes ssp. compactifolius	Toadflax beardtongue
Penstemon oliganthus	Apache beardtongue
Penstemon pseudoputus	Kaibab Beardtongue
Phacelia serrata	Serrate Phacelia
Potentilla crinita var. lemmonii	Bearded Cinquefoil
Potentilla thurberi var. sanguinea	Thurber’s cinquefoil
Ranunculus oreogenes	Oregon Buttercup
Sporobolus interruptus	Black Dropseed
Stachys rothrockii	Rothrock's Hedge-nettle
Triteleia lemmoniae	Oak Creek Triteleia

*These taxa have recently been combined into one entity in the SEINet database and will be addressed together.

Ground cover milkvetch (Astragalus humistratus var. tenerrimus)

Ground cover milkvetch is a perennial mat-forming plant and is the most common prostrate milkvetch in the local ponderosa pine forests. It is represented by five varieties including var. *tenerrimus* (Springer et al, 2009)

Table 26. Occurrences of ground cover milkvetch in treatment units

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Astragalus humistratus var. tenerrimus	groundcover milkvetch	702	3	UEA40	UEA40	UEA40	UEA40
Astragalus humistratus var. tenerrimus	groundcover milkvetch	4139	7	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Astragalus humistratus var. tenerrimus	groundcover milkvetch	4139	7	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Astragalus humistratus var. tenerrimus	groundcover milkvetch	4139	7	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only

Creeping Milk-vetch (*Astragalus troglodytes*)

Creeping milkvetch is a low herbaceous perennial that grows in ponderosa pine forests, pinyon/juniper chaparral mixture, and grasslands. Associated species include blue grama, Wright's wild buckwheat, Alligator juniper, *c*liff-rose, and shrub live oak. Individuals occur in local populations that are often widespread from one another. Creeping milkvetch is endemic to Coconino and Yavapai Counties, Arizona (AZGFD Heritage Database Abstract, 2004).

Table 27. Occurrences of creeping milkvetch in the treatment units

Scientific name	Common name	Location	Site	Alt B	Alt C	Alt D	Alt E
Astragalus troglodytes	Creeping milkvetch	139	1	UEA40	UEA40	UEA40	UEA40
Astragalus troglodytes	Creeping milkvetch	164	4	UEA40	UEA40	UEA40	UEA40
Astragalus troglodytes	Creeping milkvetch	173	1	MSO Target Trt	MSO Target Trt	MSO Target Trt	MSO Target Trt
Astragalus troglodytes	Creeping milkvetch	180	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Astragalus troglodytes	Creeping milkvetch	181	4	Savanna	Savanna	Savanna	UEA40

Scientific name	Common name	Location	Site	Alt B	Alt C	Alt D	Alt E
Astragalus troglodytes	Creeping milkvetch	277	3	UEA40	UEA40	UEA40	UEA40
Astragalus troglodytes	Creeping milkvetch	277	4	UEA40	UEA40	UEA40	UEA40
Astragalus troglodytes	Creeping milkvetch	354	18	SI40	SI40	SI40	SI40
Astragalus troglodytes	Creeping milkvetch	395	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Astragalus troglodytes	Creeping milkvetch	395	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Astragalus troglodytes	Creeping milkvetch	458	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Astragalus troglodytes	Creeping milkvetch	459	4	SI40	SI40	SI40	SI40
Astragalus troglodytes	Creeping milkvetch	1526	32	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Astragalus troglodytes	Creeping milkvetch	1558	6	UEA40	UEA40	UEA40	UEA40
Astragalus troglodytes	Creeping milkvetch	1559	21	UEA10	UEA10	UEA10	UEA10
Astragalus troglodytes	Creeping milkvetch	1580	6	Savanna	Savanna	Savanna	Prescribed Fire Only
Astragalus troglodytes	Creeping milkvetch	2277	24	Prescribed Fire Only - Operational	Grassland Mechanical	Prescribed Fire Only - Operational	Grassland Mechanical

Diamond Valley Suncup (*Camissonia gouldii*)

Diamond Valley suncup has been collected in the Sunset Crater Area and on several nearby cinder hills. Habitat for this species includes volcanic ash cones in pinyon-juniper and big sagebrush communities (Utah Native Plant Society, 2009) and volcanic scree or cinder flats (AZGFD Heritage Database Abstract, 2005e).

Table 28. Occurrences of Diamond Valley suncup in treatment units

Scientific name	Common name	Location	Site	Alt B	Alt C	Alt D	Alt E
Camissonia gouldii	Diamond Valley suncup	235	1	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Camissonia gouldii	Diamond Valley suncup	254	1	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only

Rough whitlow grass (Draba asprella var. stelligera and var. kaibabensis)

Note-these two taxa were combined in the database but are still separate in the NatureServe Explorer ranking system. Since the occurrence data re combined, they will be addressed together here.

Rough whitlow grass is a small perennial plant with basal leaves forming a rosette, growing in shaded habitats in pine forests. It is represented by three varieties in our local area including vars. asprella, stelligera and kaibabensis. Variety stelligera is the most commonly occurring one (Springer et al, 2009)

Table 29. Occurrences of rough whitlow grass in treatment units

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Draba asprella vars. stelligera and kaibabensis	Rough whitlow grass	130	21	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Draba asprella vars. stelligera and kaibabensis	Rough whitlow grass	130	42	Prescribed Fire Only	Prescribed Fire Only	No Proposed Treatments	Prescribed Fire Only
Draba asprella vars. stelligera and kaibabensis	Rough whitlow grass	131	12	Prescribed Fire Only	Prescribed Fire Only	No Proposed Treatments	Prescribed Fire Only
Draba asprella vars. stelligera and kaibabensis	Rough whitlow grass	469	4	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Draba asprella vars. stelligera and kaibabensis	Rough whitlow grass	4092	20	IT25	IT25	IT25	IT25

Jones' Wild Buckwheat (*Eriogonum jonesii*)

Jones' wild buckwheat is a perennial shrub or sub-shrub, endemic to northern Arizona. Its habitat is rocky limestone, sandstone or pumice washes, flats, and outcrops, saltbush, blackbrush, and sagebrush communities, pinyon-juniper woodlands. It is an endemic species, occurring mostly in Coconino County, with scattered populations just entering Mohave and Navajo counties. (Reveal, 2005).

Table 30. Occurrences of Jones' wild buckwheat in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Eriogonum jonesii	Jones' wild buckwheat	395	15	IT40	IT40	IT40	IT40

Lesquerella arizonica

Arizona bladderpod is a small perennial species. It forms mats with upright unbranched stems. Habitats include ponderosa pine forests, gambel oak, and sagebrush communities (Springer et al. 2009).

Table 31. Occurrences of Arizona bladderpod in treatment areas.

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D
Lesquerella arizonica	Arizona bladderpod	93	11	UEA40	UEA40	UEA40

Macdougal's bluebells (Mertensia macdougalii)

Macdougal's bluebells is endemic to Arizona where it grows in pine forests. Distinguishing features include basal leaves and alternate leaves along the stem. Flowers are blue and funnel shape, forming four nutlets (seeds) at maturity (Springer et al, 2009).

Table 32. Occurrences of Macdougal's bluebells in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Mertensia macdougalii	Macdougal's bluebells	180	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	181	4	Savanna	Savanna	Savanna	UEA40
Mertensia macdougalii	Macdougal's bluebells	186	13	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt
Mertensia macdougalii	Macdougal's bluebells	336	8	UEA40	UEA40	UEA40	UEA40
Mertensia macdougalii	Macdougal's bluebells	344	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	344	5	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Mertensia macdougalii	Macdougal's bluebells	354	20	UEA40	UEA40	UEA40	UEA40
Mertensia macdougalii	Macdougal's bluebells	354	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	370	3	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt
Mertensia macdougalii	Macdougal's bluebells	386	4	UEA40	UEA40	UEA40	UEA40
Mertensia macdougalii	Macdougal's bluebells	412	3	Savanna	Savanna	Savanna	UEA40
Mertensia macdougalii	Macdougal's bluebells	421	19	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	425	18	UEA40	UEA40	UEA40	UEA40
Mertensia macdougalii	Macdougal's bluebells	425	30	Prescribed Fire Only - Operational	Grassland Mechanical	Prescribed Fire Only - Operational	Grassland Mechanical

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Mertensia macdougalii	Macdougal's bluebells	454	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	458	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	458	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	459	4	SI40	SI40	SI40	SI40
Mertensia macdougalii	Macdougal's bluebells	459	7	UEA25	UEA25	UEA25	UEA25
Mertensia macdougalii	Macdougal's bluebells	461	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	469	4	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Mertensia macdougalii	Macdougal's bluebells	469	4	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Mertensia macdougalii	Macdougal's bluebells	470	3	UEA40	UEA40	UEA40	UEA40
Mertensia macdougalii	Macdougal's bluebells	470	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	476	10	SI40	SI40	SI40	SI40
Mertensia macdougalii	Macdougal's bluebells	497	12	No Proposed Treatments	Prescribed Fire Only - Core Area (18)	No Proposed Treatments	No Proposed Treatments
Mertensia macdougalii	Macdougal's bluebells	498	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Mertensia macdougalii	Macdougal's bluebells	701	13	Savanna	Savanna	Savanna	Prescribed Fire Only
Mertensia macdougalii	Macdougal's bluebells	1216	1	UEA40	UEA40	UEA40	UEA40

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Mertensia macdougalii	Macdougal's bluebells	4092	9	UEA25	UEA25	UEA25	UEA25
Mertensia macdougalii	Macdougal's bluebells	4139	6	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Mertensia macdougalii	Macdougal's bluebells	4139	7	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only

Toadflax beardtongue (Penstemon linariodes ssp. compactifolius)

Toadflax beardtongue is a perennial herbaceous to sub-shrub plant that is relatively small. It is similar to other small beardtongues in our area such as Thompson's beardtongue and mat beardtongue. All are smallish plants that are members of the ponderosa pine forests in our area (Springer et al, 2009).

Table 33. Occurrences of toadflax beardtongue in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Penstemon linariodes ssp. compactifolius	Toadflax beardtongue	290	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Penstemon linariodes ssp. compactifolius	Toadflax beardtongue	299	6	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only

Apache beardtongue (Penstemon oliganthus)

Apache beardtongue occurs in mountain meadows of northern Arizona (Springer et al, 2009). It has been detected or observed in such areas Brolliar Park and Pratt Park near the southern edge of the analysis area.

Table 34. Occurrences of Apache beardtongue in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Penstemon oliganthus	Apache beardtongue	501	25	Prescribed Fire Only - Operational	Grassland Mechanical	Prescribed Fire Only - Operational	Grassland Mechanical

Kaibab beardtongue (Penstemon pseudoputus)

Kaibab beardtongue is a perennial species that occurs in grasslands and ponderosa pine forests on the Colorado Plateau. Habitat includes Kaibab limestone and sandstone in open subalpine grassland meadows and sporadically in pine forests in disturbed areas (AZGFD Heritage Database Abstract, 1992).

Table 35. Occurrences of Kaibab beardtongue in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Penstemon pseudoputus	Kaibab beardtongue	60	30	PFA - UEA25	PFA - UEA25	PFA - UEA25	PFA - UEA25
Penstemon pseudoputus	Kaibab beardtongue	60	31	SI10	SI10	SI10	SI10
Penstemon pseudoputus	Kaibab beardtongue	239	2	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Penstemon pseudoputus	Kaibab beardtongue	2235	3	UEA10	UEA10	UEA10	UEA10

Serrate Phacelia (Phacelia serrata)

Serrate Phacelia is an endemic species that occurs on cinder soils in the Sunset Crater area. It was formerly considered a Region 3 sensitive species but was removed for the list. It is an annual or biennial species. It may complete its lifecycle in one season or form a rosette and overwinter, completing its growth in the next growing season. It typically occurs in large groups in areas where it occurs.

Table 36. Occurrences of serrate Phacelia in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Phacelia serrata	Serrate phacelia	229	23	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Phacelia serrata	Serrate phacelia	239	2	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only
Phacelia serrata	Serrate phacelia	240	8	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only	Prescribed Fire Only

Bearded Cinquefoil (*Potentilla crinita* var. *lemmonii*)

The habitat for the species is relatively dry meadows and open pinyon-juniper, ponderosa pine, gambel oak and aspen communities (Cronquist et al, 1997). The type locality is in Oak Creek Canyon, where it was described as occurring on vertical rocks.

Table 37. Occurrences of bearded cinquefoil in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Potentilla crinita var. lemmonii	Bearded cinquefoil	317	10	UEA40	UEA40	UEA40	UEA40
Potentilla crinita var. lemmonii	Bearded cinquefoil	2237	42	UEA40	AZGFD Trt	UEA40	AZGFD Trt
Potentilla crinita var. lemmonii	Bearded cinquefoil	2256	21	UEA40	AZGFD Trt	UEA40	AZGFD Trt

Thurber’s (Scarlet) cinquefoil (*Potentilla thurberi* var. *sanguinea*)

Scarlet cinquefoil is a rare taxon found in the Flagstaff area. A revision has been proposed, raising the variety *sanguinea* to species level (AZGFD Heritage Database abstract, 2008). Scarlet cinquefoil is differentiated from the more common *P. thurberi* by having different leaf structure and red-orange petals distally with darker centers. (AZGFD Heritage Database abstract, 2008).

Oregon buttercup (Ranunculus oreogenes)

Oregon buttercup is a small perennial plant occurring on moist slopes, seeps and depressions in ponderosa pine forests (Springer et al, 2009). Its' range includes Arizona, New Mexico, Colorado and Utah (USDA, NRCS 2014). In some references, it is combined with the more widespread *R. glabberimus*.

Table 38. Occurrences of Oregon buttercup in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Ranunulus oregonenes	Oregon buttercup	341	23	UEA25	UEA25	UEA25	UEA25
Ranunulus oregonenes	Oregon buttercup	341	35	Prescribed Fire Only - Operational	Grassland Mechanical	Prescribed Fire Only - Operational	Grassland Mechanical
Ranunulus oregonenes	Oregon buttercup	354	18	SI40	SI40	SI40	SI40
Ranunulus oregonenes	Oregon buttercup	363	13	Prescribed Fire Only - Operational	Grassland Mechanical	Prescribed Fire Only - Operational	Grassland Mechanical
Ranunulus oregonenes	Oregon buttercup	368	11	Prescribed Fire Only	Prescribed Fire Only	No Proposed Treatments	Prescribed Fire Only
Ranunulus oregonenes	Oregon buttercup	368	13	Prescribed Fire Only	Prescribed Fire Only	No Proposed Treatments	Prescribed Fire Only
Ranunulus oregonenes	Oregon buttercup	386	4	UEA40	UEA40	UEA40	UEA40
Ranunulus oregonenes	Oregon buttercup	411	16	IT40	IT40	IT40	IT40
Ranunulus oregonenes	Oregon buttercup	411	17	UEA25	UEA25	UEA25	UEA25
Ranunulus oregonenes	Oregon buttercup	411	29	UEA40	UEA40	UEA40	UEA40
Ranunulus oregonenes	Oregon buttercup	412	3	Savanna	Savanna	Savanna	UEA40
Ranunulus oregonenes	Oregon buttercup	425	18	UEA40	UEA40	UEA40	UEA40
Ranunulus oregonenes	Oregon buttercup	425	30	Prescribed Fire Only - Operational	Grassland Mechanical	Prescribed Fire Only - Operational	Grassland Mechanical
Ranunulus oregonenes	Oregon buttercup	426	9	UEA25	UEA25	UEA25	UEA25
Ranunulus oregonenes	Oregon buttercup	454	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Ranunulus oregonenes	Oregon buttercup	458	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Ranunulus oregonenes	*Oregon buttercup*	*459*	*12*	*UEA25*	*UEA25*	*UEA25*	*UEA25*
Ranunulus	*Oregon*	*469*	*4*	*Prescribed Fire*	*Prescribed*	*Prescribed Fire*	*Prescribed*

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
oregonenes	*buttercup*			*Only*	*Fire Only*	*Only*	*Fire Only*
Ranunulus oregonenes	*Oregon buttercup*	*476*	*10*	*SI40*	*SI40*	*SI40*	*SI40*
Ranunulus oregonenes	*Oregon buttercup*	*516*	*13*	*Savanna*	*Savanna*	*Savanna*	*UEA40*
Ranunulus oregonenes	*Oregon buttercup*	*4092*	*12*	*IT25*	*IT25*	*IT25*	*IT25*
Ranunulus oregonenes	*Oregon buttercup*	*4139*	*13*	*Prescribed Fire Only*	*Prescribed Fire Only*	*Prescribed Fire Only*	*Prescribed Fire Only*

Black Dropseed (*Sporobolus interruptus)*

Black dropseed is endemic to central Arizona where it grows on rocky slopes and in dry meadows of open ponderosa pine and oak-pine forests and pinyon-juniper woodlands. This species tends to be abundant in its narrow range.

Table 39. Occurrences of black dropseed in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Sporobolus interruptus	Black dropseed	181	4	Savanna	Savanna	Savanna	UEA40
Sporobolus interruptus	Black dropseed	181	4	Savanna	Savanna	Savanna	UEA40
Sporobolus interruptus	Black dropseed	181	6	UEA25	UEA25	UEA25	UEA25
Sporobolus interruptus	Black dropseed	354	20	UEA40	UEA40	UEA40	UEA40
Sporobolus interruptus	Black dropseed	354	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Sporobolus interruptus	Black dropseed	354	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Sporobolus interruptus	Black dropseed	375	10	SI25	SI25	SI25	SI25
Sporobolus interruptus	Black dropseed	395	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Sporobolus interruptus	Black dropseed	395	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Sporobolus	Black	395	4	MSO Restricted	MSO	MSO	MSO

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
interruptus	dropseed			Trt	Restricted Trt	Restricted Trt	Restricted Trt
Sporobolus interruptus	Black dropseed	480	7	UEA40	UEA40	UEA40	UEA40
Sporobolus interruptus	Black dropseed	502	33	Prescribed Fire Only - Operational	Grassland Mechanical	Prescribed Fire Only - Operational	Grassland Mechanical
Sporobolus interruptus	Black dropseed	702	3	UEA40	UEA40	UEA40	UEA40
Sporobolus interruptus	Black dropseed	2268	19	Prescribed Fire Only - Operational	Prescribed Fire Only - Operational	Prescribed Fire Only - Operational	Prescribed Fire Only - Operational

Rothrock's Hedge-nettle (*Stachys rothrockii*)

Rothrock's hedge-nettle is a perennial herb that grows in colonies from deep. Populations tend to occur on rocky, north, west, and east facing slopes and hilltops with substrates including basalt, gravel, clay loam and sand.

Table 40. Occurrences of Rothrock's hedge-nettle in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Stachys rothrockii	Rothrock's hedge-nettle	363	13	Prescribed Fire Only - Operational	Grassland Mechanical	Prescribed Fire Only - Operational	Grassland Mechanical
Stachys rothrockii	Rothrock's hedge-nettle	422	8	GL - Restoration	GL - Restoration	GL - Restoration	Prescribed Fire Only
Stachys rothrockii	Rothrock's hedge-nettle	468	2	UEA40	UEA40	UEA40	UEA40

Oak Creek Triteleia (*Triteleia lemmoniae*)

This species is endemic to Arizona, limited mostly to Oak Creek, Flagstaff and the Mogollon escarpment. The type locality is in Oak Creek Canyon. Habitats include ponderosa pine forests, along streams or wet areas and in open areas (AZGFD Heritage Database Abstract, 2004).

Table 41. Occurrences of Oak Creek tritelia in treatment areas

Scientific name	Common name	Location	Site	Alt. B	Alt. C	Alt. D	Alt. E
Tritelia lemmoniae	Oak Creek tritelia	354	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Tritelia lemmoniae	Oak Creek tritelia	458	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

Tritelia lemmoniae	Oak Creek tritelia	459	4	SI40	SI40	SI40	SI40
Tritelia lemmoniae	Oak Creek tritelia	519	5	UEA25	UEA25	UEA25	UEA25

Discussion

Rare and endemic plants are recognized as part of the forest planning process but do not require a "finding of effect". Therefore, this is not an "analysis" as would be done for threatened, endangered or sensitive species but is instead needed to comply with the current Kaibab NF plan (2014) and the anticipated provisions of the final Coconino NF plan that is currently under revision.

Alternative A

This discussion for rare and endemic plant species does not apply to this alternative, which is the no action alternative. Management actions would not occur and there would be no need to mitigate the effects of them or to determine the locations of these or other rare and endemic species.

Alternatives B, C, D and E

Many of the mitigations for Region 3 sensitive plant species in Table 4 of the main body of this report would also mitigate the effects of management actions to these species. Specifically, Mitigations 2 through 8 and 12 through 15 could be used to address and mitigate management effects to these species as needed.

We are suggesting the following:

- Review the rare and endemic species list in the Forest Plan and revise as needed depending on the area to be treated. It is unnecessary to incorporate features for a species if there is no reason to expect it occurs there. For example, Diamond Valley suncup occurs on cinder soils. If that soil type does not occur in the treatment area, there is no need to survey for it there or to mitigate management actions. Additionally, new information may require addition of other species.
- Incorporate surveys for these species into surveys for Region 3 sensitive plant and/or noxious or invasive weed species in areas where these rare and endemic species are known to occur to efficiently use survey resources.
- Apply mitigations 2 through 8 and 12-through 15 in table 4 as needed, depending on the species and area to mitigate the effects of management actions.
- Incorporate the management strategies that will be provided in the Rare Plant Guidebook to during survey and implementation. This document is an implementation guide and is incorporated into the Kaibab NF Plan (2014) by reference. It is designed to provide information such as identification aids and potential risks to rare and endemic plant species on both forests. It will be incorporated into the Coconino NF Plan as well.

These mitigations have been added to Table 4 of the main body of the report as mitigations 31 through 33.

Certification

Debra L. Crisp prepared the report considering the Best Available Science and locally gathered data.

My education includes experience includes a Master of Science of Forestry from Northern Arizona University in 2004. I have 10 years professional experience I my current position as the Forest Botanist for Coconino National Forest, and 32 years experience total with the U.S. Forest Service. I have prepared numerous Specialist's Reports for botanical resources as part of my participation on Interdisciplinary Teams on the Coconino National Forest.

Prepared by: /s/ ***Debra L. Crisp***

Date: July 18, 2014

Revised October 16, 2014

Debra L. Crisp

Forest Botanist

Coconino National Forest