USDA

United States
Department of
Agriculture

Forest
Service

January 2013

Botany Specialist Report

Four-Forest Restoration Initiative

Coconino and Kaibab National Forests

Coconino and Kaibab National Forests
Coconino, AZ

Legal Description if Applicable

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INTRODUCTION

The Four-Forest Restoration Initiative (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

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. Restoration activities would:

For details of these actions, see the Final Proposed Action (alternative B, as described in the DEIS (2012).

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, 1988 (as amended). 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.
- 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 Plan by Forest Plan Amendment 20 (2005) and into the Kaibab National Forest Plan by Amendment 7 (2005).
- Southwestern Region's Strategy for the Protection and Restoration of Native Plant Communities (USDA Forest Service, Regional Office 1999).
- 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 Planfor the Four Forest Restoration Initiativearea.

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 areFlagstaff pennyroyal, Flagstaff penstemon, and Arizona leatherflower.	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 activities through a biological assessment (FSM 2670) and conduct appropriate consultation (FSM 2670) when necessary. Provide	TES Plants

Coconino National Forest Plan (1987) plus amendments.		
MANAGEMENT AREAS (MA)	**DESCRIPTION**	**MANAGEMENT EMPHASIS**
	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 as a result 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 leatherflower, *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 Initiativearea.

Kaibab National Forest Plan (1988) plus amendments		
MANAGEMENT AREAS (MA)	**DESCRIPTION**	**MANAGEMENT EMPHASIS**
Chapter 4 management direction page 18	Improve habitats for listed threatened, endangered, or sensitive species of plants and animals and other species as they become threatened or endangered. Work toward recovery and de-listing of species.	TES Plants
Chapter 4 management direction page 18	Identify and protect areas that contain threatened, endangered, and sensitive species of plants and animals. Consult with the U. S. Fish and Wildlife Service when activities have the potential to impact protected species.	TES Plants
Forest-wide Standards page 38	Identify habitat management territories for threatened, endangered, or sensitive plant or animal species that are consistent with the conservation strategy and the recovery plan established for the species through on-the ground surveys or record searches. Habitat needs for Federally listed species would take precedence over unlisted species, endangered species take precedence over threatened species and sensitive species take precedence over non-sensitive species.	TES Plants
Goshawk standards page 28	Within the ranges of the Kaibab pincushion cactus, *Pediocactus paradinei*, and the Arizona leatherflower, *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	TES Plants

Kaibab National Forest Plan (1988) plus amendments		
MANAGEMENT AREAS (MA)	**DESCRIPTION**	**MANAGEMENT EMPHASIS**
	two species.	
Forest-wide standard page 34	Incorporate measures to control invasive species into project planning, implementation and monitoring.	Noxious or Invasive weeds
Forest-wide guideline page 34	Use the Appendix B "Design Features, Best Management Practices 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" (2004) 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 as a result of environmental analysis, Best Management Practices or Mitigation Measures are modified, document the reason(s) in a NEPA decision.	Noxious or Invasive weeds
Geographical Areas 2, 10, 13 standards page 38	Identify habitat management territories for threatened, endangered, or sensitive plant or animal species that are consistent with the conservation strategy and the recovery plan established for the species through on-the ground surveys or record searches. Habitat needs for Federally listed species would take precedence over unlisted species, endangered species take precedence over threatened species and sensitive species take precedence over non-sensitive species.	TES Plants
Geographical Areas 2, 10, 13 standards page 38	Formulate, design, and propose resource operations or improvements that contribute, over time, to the achievement or maintenance of	Improves outcomes of management decisions and benefits natural resources.

Kaibab National Forest Plan (1988) plus amendments		
MANAGEMENT AREAS (MA)	**DESCRIPTION**	**MANAGEMENT EMPHASIS**
	desired resource or ecological conditions in landscapes. Consult when applicable: a. Survey and inventory protocols for TE&S species. b. Recovery plans and conservation strategies for TE&S species. c. Formal Consultation Reports. d. Guidelines for resource operations and improvements. e. Intergovernmental agreements and memoranda of understanding. f. Forest Service Manuals and Handbooks. g. Management review and resource monitoring evaluation reports. h. Technical reports and bulletins, research papers, handbooks, monographs, and other documents in the literature. i. Tribal, state, and local government input. j. Public input.	
Geographical Areas 2, 10, 13 standards page 38	Prepare a biological assessment and evaluation (BA&E) to document the effect of the selected action on the habitat and on each individual in the population of threatened or endangered species. For selected actions that require preparation of an environmental analysis or environmental impact statement, prepare a biological assessment and evaluation (BA&E) to document the effect of the selected action on the viability of the population of the sensitive species in the EMA.	Threatened, endangered and sensitive species
Guidelines page 41	Guidelines for Rangeland Resource Operations and Improvements: Favor native species in all revegetation activities.	Native Plant Policy
Guidelines page 42	In other coniferous forest timberland:	Promotes healthy

Kaibab National Forest Plan (1988) plus amendments		
MANAGEMENT AREAS (MA)	**DESCRIPTION**	**MANAGEMENT EMPHASIS**
	• Encourage and promote oak and aspen • Encourage diversity of plant species in the overstory, understory, and ground cover.	native plant communities
Guidelines page 42	In seral grassland. Maintain existing openings and create additional openings with high forb composition (25 percent).	Promotes diversity and provides habitat for turkeys This guideline also helps promote healthy understory vegetation in areas where stands may be overstocked and growing space for understory plants is limited.
Management direction Page 95 Land Use Zone – Special Area 7 - Garland Prairie Research Natural Area	Garland Prairie Research Natural Area is discussed in the Plan but the formal process to designate the area was never completed. The intent of the designation was to preserve an area of grasslands for use as Research Natural Area. However, the area is currently forested.	Reintroduce natural processes such as fire into the area. This management would be complementary to Forest Service Manual Direction.

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 Special Area features for which the areas were designated? This applies to Garland Prairie Research Natural Area (Special Area 7

in KNF Plan), The indicators used to evaluate environmental consequences is: (1) a qualitative evaluation of compliance with the Kaibab NF direction and Forest Service policy

- A unit of measure for Research Natural Areas is to address relevant Kaibab NF Forest Plan and Forest Service Manual Guidance. This guidance was designed to preserve the intent of the RNA for research and preservation of natural processes

- 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 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 and Kaibab NF Plans, which incorporated 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.*

- There are **no measures** for **Threatened and Endangered plants**, because **none** occur 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 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. Restoration activities would:

- Mechanically cut trees on approximately 388,489 acres, including mechanically thinning up to 16 inch dbh within 18 MSO PACs and cutting 99 acres of trees by hand on slopes greater than 40 percent
- Prescribed burn approximately 587,923 acres, including prescribed burning within 72 MSO PACs (excluding nest areas) and on 99 acres of slopes greater than 40 percent
- Decommission 904 miles of roads
- Construct and decommission 517 miles of temporary road.

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

- Restore 74 springs and construct 4 miles of protective fencing
- Restore 39 miles of ephemeral streams
- Construct up to 82 miles of protective (aspen) fencing

Alternative C

Alternative C responds to comments and recommendations received during scoping concerning the conservation of large trees. Actions include adding key components from the large tree retention strategy to the project purpose and need and design features, adding acres of grassland treatments on the Kaibab NF, incorporating wildlife and watershed research on both forests, and adding both mechanical treatment and prescribed

burning to the proposed Garland Prairie Research Natural Area (RNA) on the Kaibab NF. This alternative also responds to having additional data on habitat conditions within Mexican spotted owl PACs. It proposes thinning up to 18 inches dbh in 18 Mexican spotted owl PACs and includes prescribed burning with 56 Mexican spotted owl PACs, including nest cores.

The Coconino and Kaibab National Forest would conduct restoration activities on approximately 593,211 acres over a period of 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 on the Forests. Treatment objectives and the methods used for mechanical treatment and prescribed burning are the same as described in alternative B

- Mechanically cut trees on approximateley 434,001 acres, including thinning up to 18 inch dbh within 18 Mexican spotted owl PACs and cutting trees by hand on 99 acres on slopes greater than 40 percent
- Prescribed burn approximately 593,211 including prescribed burning within 72 Mexican spotted owl PACs (of the 72 PACs, the nest areas within 56 PAC would be prescribed burned and the nest areas within the remaining 16 PACs would be excluded)
- Decommission 904 miles of roads
- Construct and decommission 517 miles of temporary road.
- 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 will be to improve roads to allow for haul (primarily widening corners to improve turn radiuses) and about 10 miles will relocate roads out of stream bottoms. Relocated roads will include rehabilitation of the moved road segment.
- Restore 74 springs and construct 4 miles of protective fencing
- Restore 39 miles of ephemeral channels
- Construct up to 82 miles of protective (aspen) fencing
- Construct up to 15 weirs and 20 weather stations (up to 3 total acres of disturbance) to support watershed research

Alternative C varies from all other alternatives by including treatments in the Garland Prairie Research Natural Area (RNA).

Alternative D

Alternative D responds to the issue of smoke, which was raised during scoping by decreasing the acres to be prescribed burned. In this alternative, prescribed burning is predominantly restricted to grassland vegetation and steep slopes where trees have been cut by hand.

The Coconino and Kaibab National Forests would conduct restoration activities on approximately 567,279 acres over a period of 10 years or until objectives are met. Approximately 20,000 to 30,000 acres of vegetation would be treated annually on the Forests. Treatment objectives and the methods used for mechanical treatment and

prescribed burning are the same as described in alternative B. Restoration activities would:

- Mechanically cut trees on approximately 388,489 acres, including mechanically thinning up to 16 inch dbh within 18 MSO PACs and cutting 99 acres of trees by hand on slopes greater than 40 percent
- Prescribed burn approximately 178,790 acres, including prescribed burning within 72 MSO PACs (excluding nest areas) and on 99 acres of slopes greater than 40 percent
- Decommission 904 miles of roads
- Construct and decommission 517 miles of temporary road.
- 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 will be to improve roads to allow for haul (primarily widening corners to improve turn radiuses) and about 10 miles will relocate roads[1] out of stream bottoms. Relocated roads will include rehabilitation of the moved road segment.
- Restore 74 springs and construct 4 miles of protective fencing
- Restore 39 miles of ephemeral streams
- Construct up to 82 miles of protective (aspen) fencing

1

Table 3. Comparison of Alternatives –

Proposed Activity	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D
Vegetation Mechanical Treatment (acres)	0	388,489	434,001	388,489
Prescribed Fire (acres)	0	587,923	593,211	178,790
MSO PAC Habitat Treatments	N/A	Mechanically thin up to 16-inch dbh in 18 PACs (excluding core areas), Prescribe burn 72 MSO PACs (excluding core areas	Mechanically thin up to 18-inch dbh in 18 PACs, Prescribe burn 56 MSO PACs including core areas, Prescribe burn 16 MSO PACs excluding core areas	Mechanically thin up to 16-inch dbh in 18 PACs (excluding core areas)
Springs/Seeps 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	

Proposed Activity	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative D
Road and Route Decommission* (miles)	0	904	Same as alternative B	
Temporary Road Construction and Decommission (miles)	0	517	Same as alternative B	
Road Reconstruction (miles)	0	40	Same as alternative B	

Mitigation Measures and design features

The following mitigation measures and design features 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 tables 1 and 2 above.

Table 4 Mitigation Measures Required for All Action Alternatives.

#	Mitigation	Why
1	Follow Forest Plan Guidance for activities in special areas such as Botanical Areas and Research Natural 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**	Mitigates effects to Arizona bugbane, a USFWS candidate species. Follows guidance of Conservation Assessment and Strategy and complies with Conservation Agreement with

#	Mitigation	Why
	preservation of shade and cool microsites for existing populations. This may require special attention in upland areas near canyon edges.	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 of mitigations include restrictions on distance for building temporary roads near existing populations.	Mitigates effects to Flagstaff pennyroyal Complies with Coconino National Forest Plan.
12	Defferals 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	Protects populations and habitat of Bebb's willow

#	Mitigation	Why
	plants and populations. Such mitigations may include avoiding plants, altering designs or including plants in enclosures.	
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 infestations and the spread of existing weeds	Reduces noxious or invasive weed infestations.
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	Provides guidance and mitigation for noxious or invasive weeds and complies with Coconino and Kaibab National Forest Plans

#	Mitigation	Why
	Yavapai Counties, Arizona (FEIS).	
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 Amendment 20 CNF plan and Amendment 7 KNF plan.
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 In 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 Plan (Amendment 20 of the Coconino National Forest Plan and Amendment 7 of the Kaibab National Forest Plan).
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	Provides opportunities to obtain knowledge on local species that are often poorly understood. Allows for

#	Mitigation	Why
	completed.	adaptive management in future treatments.

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.

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 the Garland Prairie Research Natural Area, 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 (1988) 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 thelikelihood 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.

Affected Environment and Environmental Consequences

Research Natural Area, Botanical Areas

There are two Botanical Areas within the analysis boundary, the Fern Mountain Botanical Area (CNF) and Arizona Bugbane Botanical Area (KNF). These areas were or are included in other analyses and will not be analyzed in this document. The Fern Mountain Botanical Area was analyzed in the Hart Prairie Fuels Reduction and Forest Health Project (2010). The Arizona Bugbane Botanical Area is currently included in a separate analysis on the Kaibab NF.

There is one Research Natural Area within the analysis area boundary, the Garland Prairie Research Natural Area (RNA) on the Kaibab NF.

Garland Prairie Research Natural Area (RNA)

Garland Prairie (RNA) was addressed in the current (1988) Kaibab National Forest Plan, 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. Additionally, the Forest did not include any provisions to designate this area as a Research Natural Area in the revised plan (2012)

According to the Kaibab NF plan, the area is contained 300 acres. The boundary for this area in GIS data layers provided by the forest contains 371 acres. The latter acreage will be carried forward as the acreage in this analysis.

This analysis is based on the assumption that management within the RNA follows Kaibab NF Forest Plan Direction (1988) and FSM direction guiding the establishment and use of Research Natural Areas. This discussion is framed as if the area were designated and managed as a Research Natural Area.

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

Existing condition for Garland Prairie RNA

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. The objectives of establishing Research Natural Areas as outlined in FSM 4063. 02 are to:

1. Maintain a wide spectrum of high quality representative areas that represent the major forms of variability found in forest, shrub land, grassland, alpine, and natural situations that have scientific interest and importance that, in combination, form a national network of ecological areas for research, education, and maintenance of biological diversity.

2. Preserve and maintain genetic diversity, including threatened, endangered, and sensitive species.

3. Protect against human-caused environmental disruptions.

4. Serve as reference areas for the study of natural ecological processes including disturbance.

5. Provide onsite and extension educational activities.

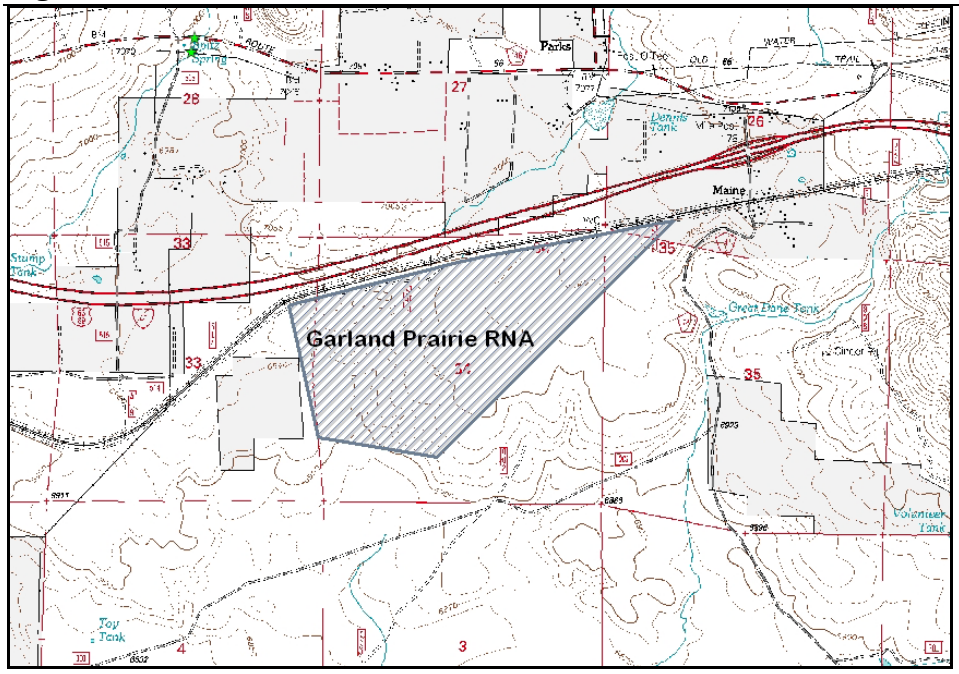
6. Serve as baseline areas for measuring long-term ecological changes.

7. Serve as control areas for comparing results from manipulative research.

8. Monitor effects of resource management techniques and practices.

All of these factors were considered during development of the plan. No threatened, endangered or sensitive plants are known to occur in the boundaries of the RNA.

Figure 1. Garland Prairie RNA, Kaibab NF



Desired condition for Garland Prairie RNA

Based on the 1988 Forest Plan the desired conditions for the Garland Prairie RNA are to reintroduce natural processes such as fire into the area while maintaining the objectives outlined for the development of the RNA. These include protection of the area from human caused disruptions such as uncharacteristic wildfire.

Alternatives A, B and D

These alternatives are lumped together because there is no treatment within the boundary of the RNA in any of them. The effects of Alternatives B and D are the same as no action.

Direct and Indirect Effects

There are no treatments proposed for the areas within the RNA 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, leaving the area more prone to uncharacteristic wildfire, which is not complementary to the FSM manual objective of providing a reference for natural processes. The RNA 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 RNA. Similarly, uncharacteristic wildfire originating in the RNA would increase the risk of damage to adjacent private property.

No treatment in the RNA may help serve as a baseline for measuring long-term changes, but not necessarily in the original intent of the RNA. No prescribed fire would occur and no trees would be removed, leaving the RNA as an example of past management practices of fire exclusion and silviculturally untreated areas. Theoretically, this area could serve as a comparison for treated areas but this need can be met in other areas of the project, where treatment is differed for various reasons.

In summary, if any of the above alternatives were selected, it would comply with the intent to establish and manage the area as a Research Natural Area by minimizing human disturbance within the proposed boundary of the RNA. There would be no timber harvesting or tree removal and human caused fires would be limited to one acre or less. However, under these alternatives, fire would not be allowed to play a natural role in the landscape, which is one of the objectives of the current Kaibab NF Plan (1988) as well as the intent of the Four Forest Restoration Initiative, which includes objectives to restore grasslands. Currently, many parts of the project area including the RNA contain treed areas that were historically grasslands (see understory discussion in Wildlife Report). Silvicultural prescriptions to restore these areas are described in the Silviculture Report.

The desired condition of reintroducing natural processes such as fire into the RNA would not be met. This would affect the short term and long-term resiliency of the area, making it more susceptible to losses by wildfire and other disturbances. Long-term resiliency would be lost because fire would not be reintroduced and tree densities in forested areas of the RNA would remain uncharacteristically high (see Silviculture Report), compromising the integrity of the grassland environment. Natural disturbances would be limited, reducing the probability and extent of early seral species that contribute to understory diversity (see Wildlife Report). This would cause a long-term irretrievable change in the grassland ecotone in the area, compromising the intent of the RNA designation and would not meet the project objectives for restoration of grasslands.

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 changewould 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 more open habitats.

Cumulative Effects

This analysis encompasses management actions in area of the RNA 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 4FRI 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 RNA 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 active research in the RNA.

Future foreseeable actions include the revision of the Kaibab National Forest Plan (ongoing) which would remove the area from consideration as a Research Natural Area, making it subject to the same management as the surrounding areas of the National Forest. This would be the most significant impact on the designated uses within the current boundary of the Research Natural Area, removing restrictions that theoretically exist in the current Forest Plan and Forest Service Manual Guidance for the area.

Alternative C

Alternative C proposes treatments within the boundary of the current Garland Prairie Research Natural 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 and include grassland restoration, savanna treatment uneven age 40. 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	Un-even age 40

Direct and Indirect Effects

Direct effect to the area 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.

Indirect effects include the reintroduction of natural processes such as fire into the area of the RNA. Reintroduction of fire into these areas is an objective of the current forest plan. The treatments in Alternative C would meet these objectives but some of the objectives stated in FSM 4063.02 would not be met. Specifically, if the treatments are implemented in the area it would no longer serve as a reference for the study of natural ecological processes including disturbance. It would not serve as a baseline for measuring long-term ecological changes or as a control area for comparing the results of manipulative research. Suitable areas occur elsewhere in the project area if there were a need to establish an area that would meet these criteria. There would be many untreated and deferred areas remaining within the boundary of the project area even after all treatments are completed.

The treatments proposed in Alternative C would benefit the understory vegetation community in the RNA by reintroducing natural processes and reducing competition from trees to grassland plants and would achieve the goal of restoring fire. Moore et al. (2006) concluded that the herbaceous understory should be a prime focus of land managers involved with forest restoration and conservation biology activities in southwestern ponderosa pine forests. The management actions in alternative C would move the area toward this condition, which would be complementary to the objectives of the Kaibab NF plan (1988) and the Four Forest Restoration Initiative.

In summary, if Alternative C is selected it would result in changing the nature of the area, making the area unacceptable for consideration as a Research Natural Area. This would be an adverse and irretrievable effect under most circumstances if the area had been officially designated as a Research Natural Area. However, since the area was never officially established and would be removed from consideration in the revised Forest Plan

(ongoing), there would be no adverse effect and the actions proposed for the area would move it closer to the desired condition.

This alternative is in conflict with the current Forest Plan but the analysis of this project would include an amendment to make the alternative compliant with the current plan.

Climate Change

The discussion for Alternatives A, B and D 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 the desired conditions of restoring the area to grassland and restoring natural processes such as fire. 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.

Federally Listed Threatened, Endangered,

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 4FRI.

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.

Region 3 sensitive species within the project area but not affected by management actions.

The two species in this section occur within the analysis area boundary but were dismissed from further consideration because there would be no direct or indirect effects

to them. Either they occur in habitats not generally affected by management actions are not within treatment units or there are not sufficient data to determine distribution.

Mt. Dellenbaugh Sandwort (*Arenaria aberrans*)

Mt. Dellenbaugh sandwort is endemic to northern and north-central Arizona. The type specimen is from Mount Dellenbaugh north of Grand Canyon. It is a perennial plant with a somewhat woody caudex from 2 to 5 inches tall. The leaves are mostly basal and linear in form but there may be one or more pairs of leaves on the stem. The inflorescence is a cyme, with most flowers occurring near the top of the stem. The habitat for this species is meadows within oak and pine forests at elevations between 5500 - 9000 feet.

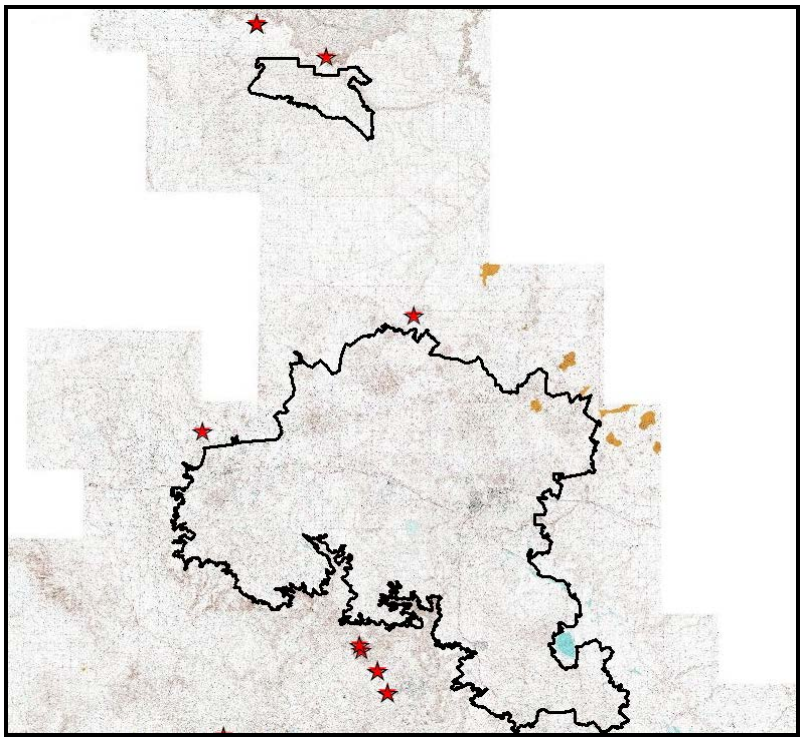
Existing condition for Mt. Dellenbaugh sandwort

Mt. Dellenbaugh sandwort was added to the Region 3 sensitive species list in 1999 and included again in the latest revision in 2007. Reasons for including it in the list were poor understanding of its abundance, habitat and distribution. The number of recorded occurrences since its initial listing in 1999 has increased from 16 known locations in 1999 to 37 locations at the present time. None of these locations is within the analysis boundary. Habitats for the Mt. Dellenbaugh sandwort as described in taxonomic literature indicate that it occurs in ponderosa pine habitats. Detection of this species during field surveys would be difficult and would require collection of plant material to distinguish it from related species. **Due to the poor understanding of this species and its habitat, area specific surveys are not recommended at this time**. This decision may be reviewed later and surveys recommended if further information on this species and its habitat needs become available.

Desired future conditions for Mt. Dellenbaugh sandwort

Maintain or enhance suitable habitat for Mt. Dellenbaugh sandwort within the project area. Mitigate impacts to meadow areas where the species may be present during project implementation.

Figure 2. Mt. Dellenbaugh sandwort locations near the analysis area.



Alternative A No Action

Direct and Indirect Effects

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 potential effects from management actions to Mt. Dellenbaugh sandwort because none is known to exist within the project area.

All Action Alternatives

Direct and Indirect Effects

There would be no direct effect to individuals of Mt. Dellenbaugh sandwort from management actions because none are known to occur in the project area. Due to the limited knowledge available on the distribution and habitat needs of the species, assessing any effects unique to the species is difficult but include effects such as loss of individuals due to direct actions such as crushing from tree removal or activities related to road reconstruction, maintenance or decommissioning or deaths of individual plants from burning. Indirect effects include changes to the habitat of the species. These changes are difficult to assess because so little is known about the habitat and distribution of this species throughout its range. Tree cutting and burning may benefit understory plants in general, including Mt. Dellenbaugh sandwort, by releasing nutrients and allowing more sunlight to reach the forest floor.

Four Forest Restoration Initiative would not affect individuals of Mt. Dellenbaugh sandwort *Arenaria aberrans* **because there are no known locations within the project area.** .

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.

Figure. 3. Picture of Cliff fleabane from SEINet taken by Max Licher

Table 6. Locations of cliff fleabane in treatment areas by action alternative. Plant locations are derived from SEINet.

Date	Location	Site	Slope> 40%	MSO PAC	Alt. B	Alt. C	Alt. D
08/29/2004	354	4	No	Kelly	Burn Only	Burn Only	No Treatment
06/05/1987	319	26	No	Fisher Point	No Treatment	No Treatment	No Treatment
07/29/1985	279	20	Yes		Burn Only	Burn Only	Burn Only

All alternatives

Locations for this species within treatment units are shown in Table 6 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. Areas where this species generally occurs are nearly vertical slopes. Even though, the areas are units in table 6 above are slated for burning, 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.**

Region 3 sensitive species with direct and indirect effects.

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 can be mitigated through the burning prescription.

Alternative A No Action

This discussion addresses the no action alternative for **Arizona bugbane, Rusby milkvetch, Arizona leatherflower, 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.

Maschinski and Whitham (1989) documented similar effects for Arizona leatherflower. (Also, refer to Understory Report for additional effects of no action).

Noxious or invasive weeds such as Dalmatian toadflax (Crawford et al, 2001; Collins et al, 2007) 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 populations of Region 3 sensitive plants. Example of this is the Hochderffer Fire (1996) (See Crawford, et al, 2001), and the Schultz Fire (2010)

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 8 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.

Alternatives B, C and D

The analysis of all action alternatives are combined in this discussion. The effects of management actions on these species are expected to be similar for all alternatives. Localized treatments may vary between alternatives.

Arizona Bugbane [(*Actaea* (*Cimicifuga*) *arizonica*)]

Arizona bugbane is an endemic species 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. Included in the Conservation Agreement is a monitoring schedule, which requires regular monitoring visits to known populations.

Arizona bugbane is endemic to northern and central Arizona. It 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 Gam and Fish Department, 2012).

Existing condition for Arizona bugbane

Arizona bugbane is an indicator species on the Kaibab National Forest. 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 (see current Kaibab National Forest Plan pages 92-93). 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) is 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.

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.

Figure 4. Map showing the occurrences of Arizona bugbane in or near the project area. The blue areas indicate the occurrences of Arizona bugbane

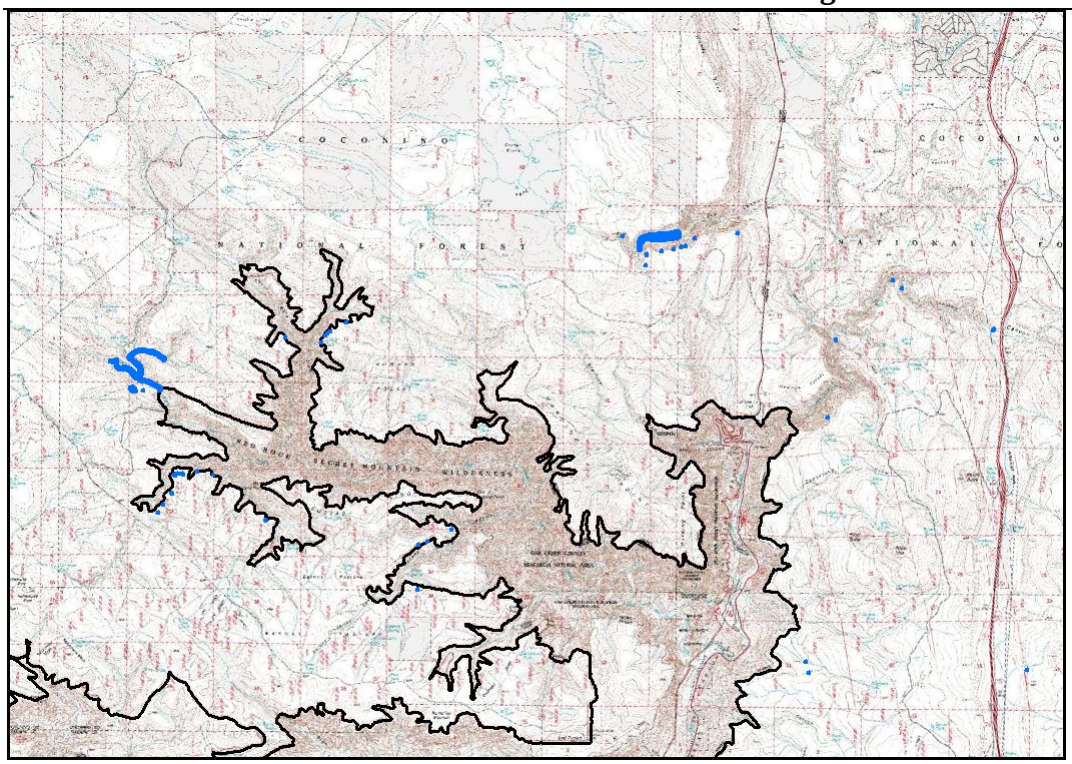


Table 7. Locations and treatments of Arizona bugbane. Locations marked with * indicate needs for field verification. If no plants are located, mitigations may be disregarded.

Scientific name	Date	Location	Site	Alternative B	Alternative C	Alternative D	MSO PAC
Arizona bugbane	8/4/1993	167	30	Not PIPO or Filtered	Burn Only - Core Area	Not PIPO or Filtered	Upper West Fork
Arizona bugbane	8/4/1993	167	33	Burn Only	Burn Only	Not PIPO or Filtered	Upper West Fork
Arizona bugbane	8/4/1993	167	34	Burn Only	Burn Only	Not PIPO or Filtered	Upper West Fork
Arizona bugbane	8/4/1993	176	3	Burn Only	Burn Only	Not PIPO or Filtered	Upper West Fork
Arizona bugbane	9/1/1980	176	7	Burn Only	Burn Only	Burn Only	
Arizona bugbane	8/4/1993	176	10	Burn Only	Burn Only	Not PIPO or Filtered	Upper West Fork
Arizona bugbane	8/15/1996	177	20	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	
Arizona bugbane	8/13/2002	178	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	
Arizona bugbane	8/13/2002	178	19	UEA10	UEA10	UEA10	
Arizona bugbane	8/5/1994	345	32	UEA25	UEA25	UEA25	
Arizona bugbane	9/16/2004	368	1	Not PIPO or Filtered	Burn Only - Core Area	Not PIPO or Filtered	James Canyon
Arizona bugbane	8/1/1997	368	2	Not PIPO or Filtered	Not PIPO or Filtered	Not PIPO or Filtered	James Canyon
Arizona bugbane	8/5/1994	368	13	Burn Only	Burn Only	Not PIPO or Filtered	Pumphouse Wash
Arizona bugbane	8/9/1995	382	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	
Arizona bugbane	9/7/1984	409	28	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt	
Arizona bugbane	9/8/2000	411	3	UEA40	UEA40	UEA40	

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

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 and D

The alternatives for treatment in areas containing this species vary by alternative (see table 7 above). This analysis is qualitative and does not focus on those specific differences. Instead, the effects will be discussed in general terms.

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. Short-term effects include mortality of individual plants. Long-term effects include the loss of shade from tree mortality. This can be mitigated by burning at intensities in all entries low enough to limit mortality to trees. The 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. It is unknown if the underground portion of the plants died as well. However, on a visit in 2004, Arizona bugbane plants were observed along the fire line near the canyon bottom. There was a variety of plant sizes and ages, 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. Data are available on the Fire Effects Information System website. 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. 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 5. 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 and to Forest Road 9469P. Forest Road 231 is one of the major forest roads accessing the southern portions of the Flagstaff Ranger District and the project area. This road has been in use for many years and its existence pre-dates the concern and conservation efforts for Arizona bugbane. The road has been used in the past as a haul route for several projects without incident. 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 7 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.

Monitoring for Arizona bugbane has occurred on the Coconino and Kaibab National Forests since 1993. 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 included fencing and monitoring. This has led to a reduction in these conflicts. Signs of domestic and wild grazers have been observed in the populations at 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 and into some populations of Arizona bugbane but did not appear to severely impact the Arizona bugbane populations in the 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. On subsequent visits after the fire, Arizona bugbane was observed growing along the fire line (see Figure 5).

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. It was harvested in 2010. 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 7 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 by steep slopes.

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 Gam 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.

The Rattle Fire in 1979 affected the upland areas above Arizona bugbane and resulted in a minor loss in potential habitat. The Fry and Taylor Fires mentioned above did not have the same effects because there was no major loss of the overstory components (trees) near the populations.

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 expected in 2012.

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

It is my determination that

> **Four Forest Restoration Initiative may impact individuals of Arizona bugbane** [(*Actaea* (*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. According to Barneby (1964), a noted expert on the genus *Astragalus*, Rusby milkvetch and some closely related species “vary in vigor and abundance in proportion to the amount and timing of summer rains.” 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 6 below and Table 8 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 analysed 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 6. 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.

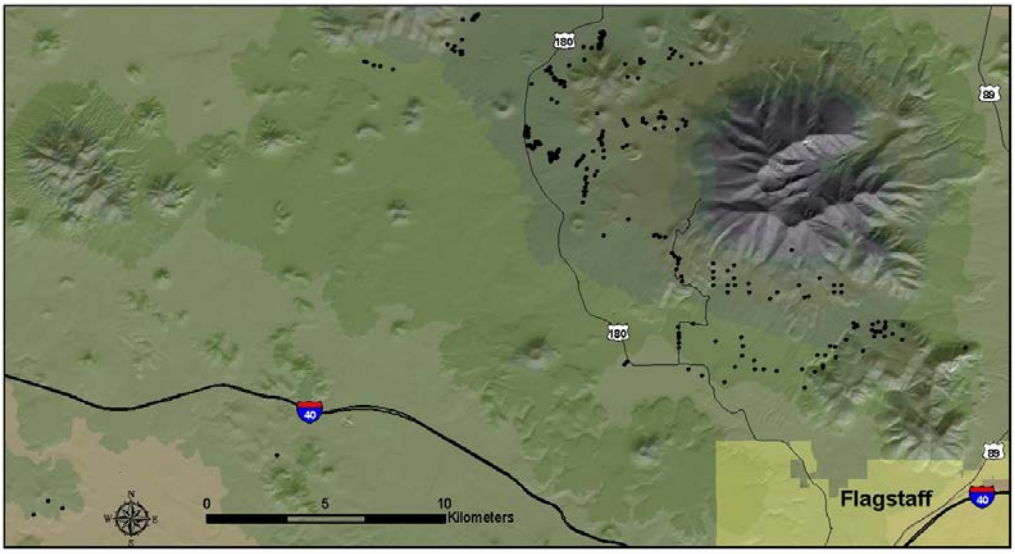


Table 8 below shows the treatment units containing Rusby milkvetch.

Table 8. 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
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	3	UEA25	UEA25	UEA25
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	15	PFA - UEA10	PFA - UEA10	PFA - UEA10
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	33	Operational Burn	Grassland Mechanical	Operational Burn
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	34	Aspen Treatment	Aspen Treatment	Aspen Treatment
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	35	Aspen Treatment	Aspen Treatment	Aspen Treatment
Astragalus rusbyi	Rusby's milkvetch	9/1/2008	41	50	Burn Only	Burn Only	Burn Only
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	76	3	IT10	IT10	IT10
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	83	1	IT25	IT25	IT25
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	83	5	UEA10	UEA10	UEA10
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	83	16	PFA - IT25	PFA - IT25	PFA - IT25
Astragalus rusbyi	Rusby's milkvetch	8/3/2011	90	3	Operational Burn	Grassland Mechanical	Operational Burn
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	4	Operational Burn	Grassland Mechanical	Operational Burn
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	6	IT40	IT40	IT40
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	7	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	8	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/3/2011	90	10	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	90	12	IT40	IT40	IT40
Astragalus rusbyi	Rusby's milkvetch	8/2/2011	90	13	SI40	SI40	SI40
Astragalus rusbyi	Rusby's milkvetch	8/3/2011	90	14	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/2/2011	90	15	Savanna	Savanna	Savanna
Astragalus rusbyi	Rusby's milkvetch	8/2/2011	90	16	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Astragalus rusbyi	Rusby's milkvetch	8/3/2011	90	17	SI10	SI10	SI10
Astragalus rusbyi	Rusby's milkvetch	8/10/2011	91	11	Burn Only	Burn Only	Burn Only
Astragalus rusbyi	Rusby's milkvetch	8/11/2011	92	2	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/11/2011	92	3	Savanna	Savanna	Savanna
Astragalus rusbyi	Rusby's milkvetch	8/11/2011	92	5	Operational Burn	Grassland Mechanical	Operational Burn
Astragalus rusbyi	Rusby's milkvetch	8/11/2011	92	7	UEA25	UEA25	UEA25
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	93	1	Burn Only	Burn Only	Burn Only
Astragalus rusbyi	Rusby's milkvetch	2/18/2009	93	2	IT25	IT25	IT25
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	95	1	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	95	6	Operational Burn	Grassland Mechanical	Operational Burn
Astragalus rusbyi	Rusby's milkvetch	8/4/2011	95	7	Operational Burn	Grassland Mechanical	Operational Burn
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	95	15	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	95	16	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/4/2011	95	17	WUI55	WUI55	WUI55
Astragalus rusbyi	Rusby's milkvetch	8/8/2011	96	11	IT25	IT25	IT25
Astragalus rusbyi	Rusby's milkvetch	7/29/2004	277	1	IT10	IT10	IT10
Astragalus rusbyi	Rusby's milkvetch	7/29/2004	277	2	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/17/2005	277	3	UEA40	UEA40	UEA40
Astragalus rusbyi	Rusby's milkvetch	8/17/2005	277	9	PFA - UEA25	PFA - UEA25	PFA - UEA25
Astragalus rusbyi	Rusby's milkvetch	8/17/2005	277	13	PFA - IT10	PFA - IT10	PFA - IT10
Astragalus rusbyi	Rusby's milkvetch	8/17/2005	277	15	PFA - UEA10	PFA - UEA10	PFA - UEA10
Astragalus rusbyi	Rusby's milkvetch	7/29/2004	277	35	IT10	IT10	IT10
Astragalus rusbyi	Rusby's milkvetch	8/17/2005	277	36	PFA - IT10	PFA - IT10	PFA - IT10
Astragalus rusbyi	Rusby's milkvetch	7/29/2004	279	20	Burn Only	Burn Only	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 and D

This analysis addresses all action alternatives. Treatments in any specific unit containing Rusby milkvetch may vary by alternative (see table 8 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 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 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

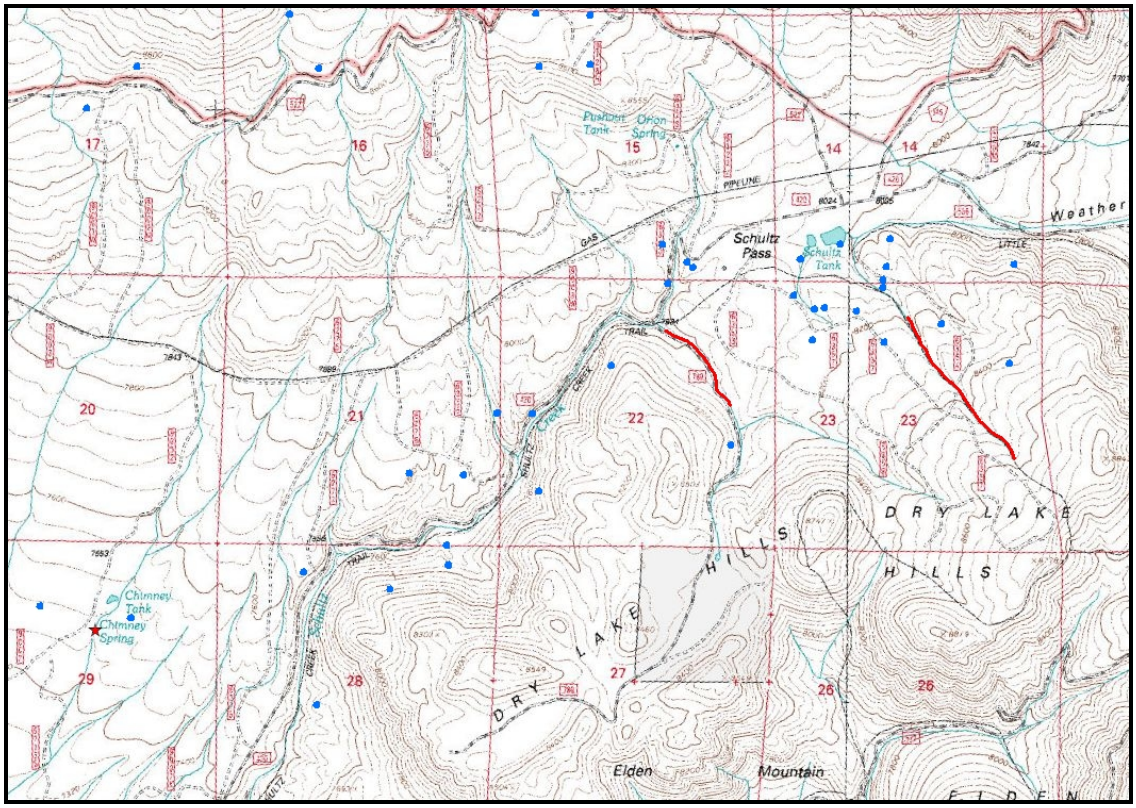
possible direct negative effect if the pile is placed in or near existing populations of Rusby milkvetch. These effects would be mitigated by avoiding placing slash piles directly on existing plants and by constructing piles at least 10 to 20 feet away from existing populations. Pile burning would create 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; Crisp, 2004); death or reduction of soil organisms on the pile sites (Raison, 1979; Ballard, 2000; Korb et al., 2004) and development of hydrophobic soil (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) 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 7. Spring and channel restoration in areas near Rusby milkvetch. 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, which 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 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..

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 DEIS) 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. Rusby milkvetch would be affected by some of these trails through impacts to individuals, but the project may also mitigate the effects to the species, especially in areas of user created trails. 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.

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 leatherflower (*Clematis hirsutissima* var. *hirsutissima*)

Arizona leatherflower 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 (Arizona

Game and Fish Abstracts, 1993). 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 leatherflower 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 leatherflower was added back to the Region 3 sensitive species list as variety *hirsutissima* in 2007 that includes locally occurring plants.

Existing condition for Arizona leatherflower

This taxon is addressed in the Coconino NF Plan on page 65-7 and in the Kaibab NF Plan 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 leatherflower would be exempt from the Goshawk Standards and Guidelines. In such instances, measures needed for the Arizona leatherflower would take precedence over Goshawk Standards and Guidelines.

Populations of Arizona leatherflower occur near Lower Lake Mary, in Skunk Canyon and in Fay Canyon. Arizona leatherflower also occurs on the Tusayan Ranger District of the Kaibab National Forest, near Ten X Tank (KNF). Habitat includes rocky hillsides with slopes from 12% to 40%, with aspects generally from 320º to 40º (Arizona Game and Fish Abstracts, 1993). 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 (Maschinski and others, 1997). In shading studies, Maschinski and others (1997) concluded that intermediate amounts (approximately 50%) of light and shade were the most beneficial conditions for Arizona leatherflower. 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. Table 9 below shows the occurences of Arizona leatherflower in treatment areas within the project.

Table 9. Treatment units containing Arizona leatherflower. Data are derived from NRIS TESP/Invasives.

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Clematis hirsutissima	Arizona leatherflower	6/13/1990	120	17	SI40	SI40	SI40
Clematis hirsutissima	Arizona leatherflower	12/1/1988	120	18	IT25	IT25	IT25
Clematis hirsutissima	Arizona leatherflower	6/1/1992	120	19	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	12/1/1988	120	20	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	6/13/1990	120	22	UEA25	UEA25	UEA25
Clematis hirsutissima	Arizona leatherflower	6/14/2000	317	1	UEA10	UEA10	UEA10
Clematis hirsutissima	Arizona leatherflower	9/27/1983	341	1	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	12/1/1988	341	3	SI40	SI40	SI40
Clematis hirsutissima	Arizona leatherflower	4/10/1989	341	4	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leatherflower	12/1/1988	341	5	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	4/12/1989	341	6	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	4/10/1989	341	8	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leatherflower	4/10/1989	341	9	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	4/10/1989	341	10	UEA25	UEA25	UEA25
Clematis hirsutissima	Arizona leatherflower	12/1/1988	341	11	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	4/10/1989	341	14	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	4/10/1989	341	15	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	8/14/1985	341	16	WUI55	WUI55	WUI55
Clematis hirsutissima	Arizona leatherflower	12/1/1988	341	17	SI25	SI25	SI25
Clematis hirsutissima	Arizona leatherflower	4/10/1989	341	20	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	6/4/1988	341	24	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	12/1/1988	341	26	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	4/10/1989	341	27	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	12/1/1988	341	28	Operational Burn	Grassland Mechanical	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Clematis hirsutissima	Arizona leatherflower	12/1/1988	341	29	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	12/1/1988	341	31	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	12/1/1988	341	37	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	12/1/1988	349	4	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	4/10/1989	349	5	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	12/1/1988	349	7	UEA40	UEA40	UEA40
Clematis hirsutissima	Arizona leatherflower	4/10/1989	349	8	UEA25	UEA25	UEA25
Clematis hirsutissima	Arizona leatherflower	4/10/1989	349	9	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leatherflower	12/1/1988	349	10	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leatherflower	6/17/2010	349	11	UEA25	UEA25	UEA25
Clematis hirsutissima	Arizona leatherflower	4/10/1989	349	13	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leatherflower	4/10/1989	349	15	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leatherflower	4/10/1989	349	16	SI40	SI40	SI40
Clematis hirsutissima	Arizona leatherflower	12/1/1988	349	17	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leatherflower	12/1/1988	349	20	UEA25	UEA25	UEA25
Clematis hirsutissima	Arizona leatherflower	4/10/1989	349	22	Savanna	Savanna	Savanna
Clematis hirsutissima	Arizona leatherflower	4/10/1989	349	23	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	6/17/2010	349	28	Operational Burn	Grassland Mechanical	Operational Burn
Clematis hirsutissima	Arizona leatherflower	12/15/2011	4060	14	Burn Only	Burn Only	Burn Only
Clematis hirsutissima	Arizona leatherflower	12/15/2011	4088	13	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40

Desired condition for Arizona leatherflower

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 leatherflower 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 and D

This analysis addresses all action alternatives. Treatments in any specific unit containing Arizona leatherflower 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 leatherflower 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 leatherflower could have positive or negative effects depending on the amount of change produced by management actions. High levels of 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 leatherflower populations. Surveys to locate plants will be necessary, as will such measures as avoidance containing Arizona leatherflower (see mitigation measure and design features12 and 17).

Burning could reduce the amount of litter present in populations of Arizona leatherflower. The presence of litter is important for Arizona leatherflower. 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).

Prescribed burning may occur in or near some populations of Arizona leatherflower. Short-term effects 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 leatherflower 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 leatherflower. Plants in the genus *Clematis* regenerate through underground rhizomes as well as through seeds, including Arizona leatherflower (Pringle 1997). Based on data in Pyke et al (2010) plants such as Arizona leatherflower the insulating properties of soil would allow plants to survive low intensity burns. 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 leatherflower 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 leatherflower on the Kaibab NF. There are two areas on the Coconino NF where channel restoration is proposed that are near or contain Arizona leatherflower (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, which is a short-term effect. Indirect effects include the alteration of habitat, which would be more long term. These effects can be mitigated by following the mitigation measures for sensitive plants mentioned above.

Figure 8. Locations of Arizona leatherflower and channel restorations in the Skunk Canyon area. Red lines represent the channels to be restored and blue dots are plant locations.

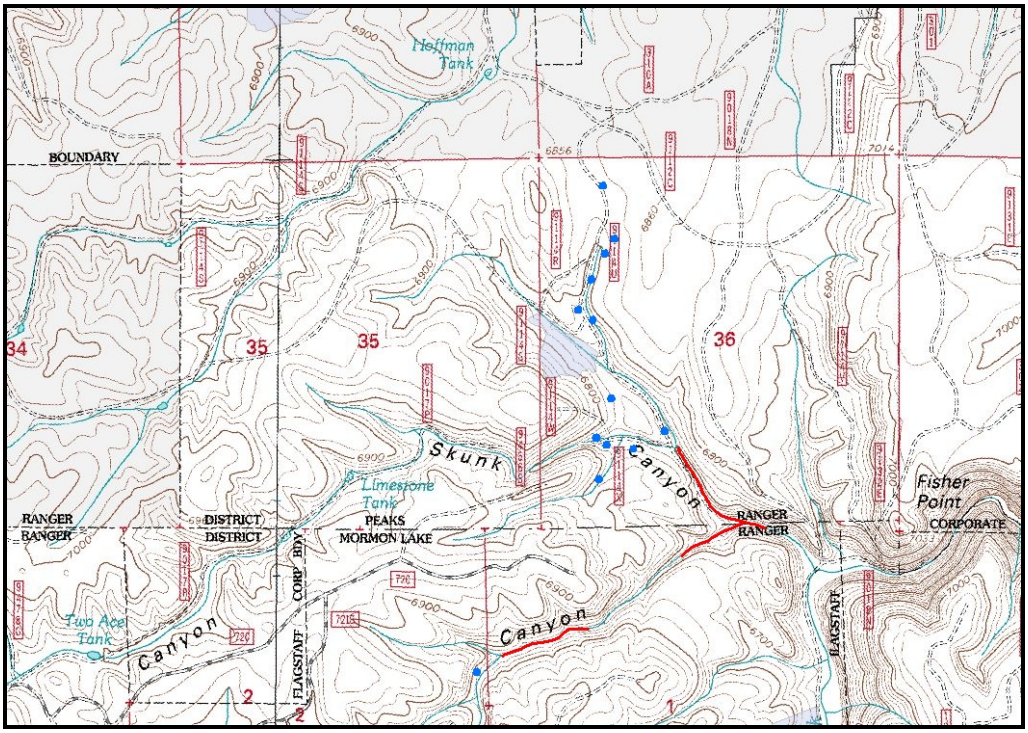
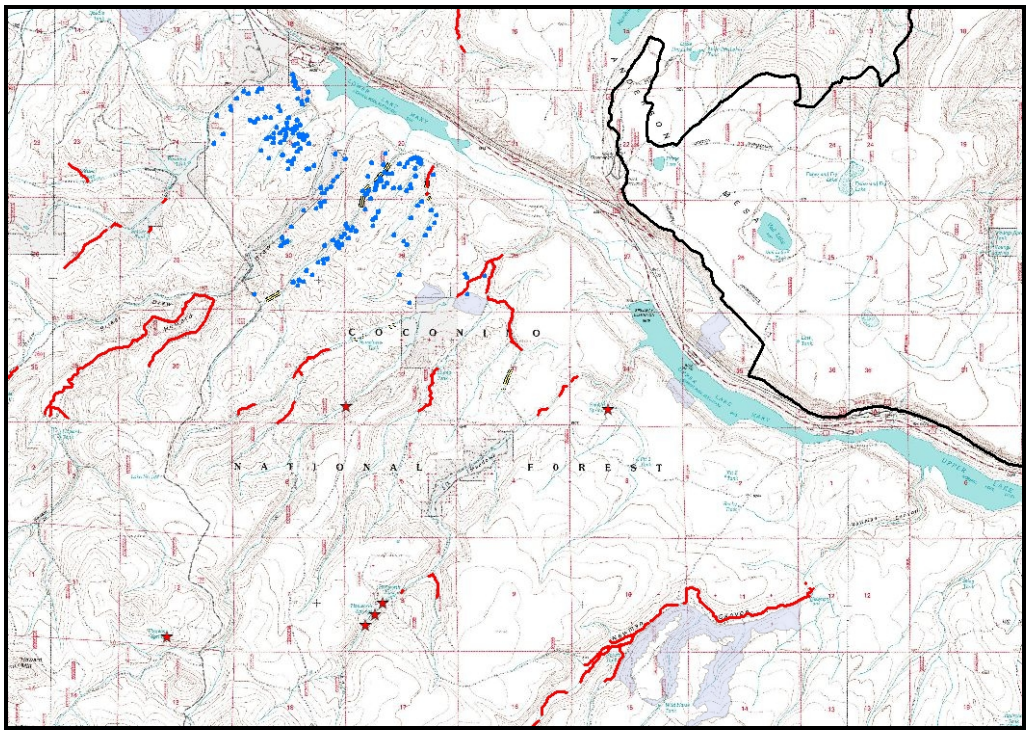


Figure 9. Locations of Arizona leatherflower and channel restorations in the Lower Lake Mary area. Red lines represent the channels to be restored and blue dots are plant locations.



Cumulative Effects

The time limit for this discussion includes past actions since Arizona leatherflower 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.

Records show there are two wildfires in or near the occupied habitat for Arizona leatherflower. 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 leatherflower 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 leatherflower are unknown. However, the two documented locations of Arizona leatherflower on the Tusayan Ranger District are within the fire boundary.

Actions on non-Forest lands have affected the occurrence and distribution of Arizona leatherflower 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 leatherflower. At least one population on private land was destroyed during a road realignment project

Additionally, because of its' unique appearance, the Arizona leatherflower 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 leatherflower. 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 sneezeweed.

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 leatherflower.

Implementation will continue in a prescribed fire project (Skunk RX burn Coconino NF) which is in the same area as Arizona leatherflower. The Arizona Trails System and Flagstaff Loop Trail are near known populations of Arizona leatherflower. 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.

It is my determination that

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

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 10. Flagstaff pennyroyal on dolomitic limestone substrate

Existing condition for Flagstaff pennyroyal

Flagstaff pennyroyal is closely tied to 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	Alternative B	Alternative C	Alternative D
Hedeoma diffusum	Flagstaff pennyroyal	6/12/1990	119	2	WUI55	WUI55	WUI55
Hedeoma diffusum	Flagstaff pennyroyal	9/2/1993	120	1	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	7/17/1984	120	6	Operational Burn	Grassland Mechanical	Operational Burn
Hedeoma diffusum	Flagstaff pennyroyal	7/1/1980	120	18	IT25	IT25	IT25
Hedeoma diffusum	Flagstaff pennyroyal	6/16/1986	120	23	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	120	24	SI40	SI40	SI40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	120	25	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	7/1/1980	120	26	Burn Only	Burn Only	Burn Only
Hedeoma diffusum	Flagstaff pennyroyal	7/1/1980	120	27	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	7/1/1980	120	38	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	6/12/1986	186	23	Burn Only	Burn Only	No Treatment
Hedeoma diffusum	Flagstaff pennyroyal	9/26/1989	314	1	Operational Burn	Operational Burn	No Treatment
Hedeoma diffusum	Flagstaff pennyroyal	9/26/1989	314	3	MSO Target Trt	MSO Target Trt	MSO Target Trt
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	4	UEA25	UEA25	UEA25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	5	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	6	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	7	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	11	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Hedeoma diffusum	Flagstaff pennyroyal	9/27/1989	314	12	Savanna	Savanna	Savanna
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	314	13	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	315	2	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	315	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	315	7	UEA10	UEA10	UEA10
Hedeoma diffusum	Flagstaff pennyroyal	10/3/1989	315	11	UEA25	UEA25	UEA25
Hedeoma diffusum	Flagstaff pennyroyal	9/25/1989	315	19	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	317	2	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	10/5/1983	340	22	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	340	23	UEA40	UEA40	UEA40
Hedeoma	Flagstaff	9/16/1983	340	26	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
diffusum	pennyroyal						
Hedeoma diffusum	Flagstaff pennyroyal	9/16/1983	340	27	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	340	28	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/15/1993	341	1	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	341	6	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	12/1/1988	341	7	SI40	SI40	SI40
Hedeoma diffusum	Flagstaff pennyroyal	9/2/1993	341	8	Savanna	Savanna	Savanna
Hedeoma diffusum	Flagstaff pennyroyal	10/13/1983	341	12	WUI55	WUI55	WUI55
Hedeoma diffusum	Flagstaff pennyroyal	9/2/1993	341	14	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/2/1993	341	15	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	10/13/1983	341	18	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	9/15/1983	341	22	UEA40	UEA40	UEA40
Hedeoma diffusum	Flagstaff pennyroyal	10/13/1983	341	27	Operational Burn	Grassland Mechanical	Operational Burn
Hedeoma diffusum	Flagstaff pennyroyal	10/13/1983	341	28	Operational Burn	Grassland Mechanical	Operational Burn
Hedeoma diffusum	Flagstaff pennyroyal	5/18/1983	349	1	UEA40	UEA40	UEA40

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

Desired 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 and D

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).

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 be found 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 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) 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 estimated at about 10% total historical range.

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.

The Kelly Trails system (Coconino NF) is currently being analyzed. 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 would be 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.

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 11 Arizona sneezeweed in field with squirrel tail grass (Elymus elemoides)

Existing condition for Arizona sneezeweed

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

Table 11 below 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	Alternative B	Alternative C	Alternative D
Helenium arizonicum	Arizona sneezeweed	8/17/2011	371	21	Operational Burn	Grassland Mechanical	Operational Burn
Helenium arizonicum	Arizona sneezeweed	8/17/2011	387	6	Operational Burn	Grassland Mechanical	Operational Burn
Helenium arizonicum	Arizona sneezeweed	8/17/2011	387	8	Operational Burn	Grassland Mechanical	Operational Burn
Helenium arizonicum	Arizona sneezeweed	8/15/2011	390	7	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/15/2011	390	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Helenium arizonicum	Arizona sneezeweed	8/3/2011	399	18	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	8/3/2011	400	1	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/3/2011	400	4	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/18/2011	400	13	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/18/2011	400	14	SI40	SI40	SI40
Helenium arizonicum	Arizona sneezeweed	8/17/2011	400	24	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	8/18/2011	400	25	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	8/3/2011	400	27	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical
Helenium arizonicum	Arizona sneezeweed	8/15/2011	401	15	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	7/25/2011	415	14	Operational Burn	Grassland Mechanical	Operational Burn
Helenium arizonicum	Arizona sneezeweed	8/18/2011	416	11	Operational Burn	Grassland Mechanical	Operational Burn
Helenium arizonicum	Arizona sneezeweed	8/16/2011	416	12	Operational Burn	Grassland Mechanical	Operational Burn
Helenium arizonicum	Arizona sneezeweed	8/16/2011	416	14	Operational Burn	Grassland Mechanical	Operational Burn
Helenium arizonicum	Arizona sneezeweed	8/18/2011	417	1	Operational Burn	Grassland Mechanical	Operational Burn
Helenium arizonicum	Arizona sneezeweed	8/18/2011	417	2	Operational Burn	Grassland Mechanical	Operational Burn
Helenium arizonicum	Arizona sneezeweed	8/16/2011	417	11	Savanna	Savanna	Savanna
Helenium arizonicum	Arizona sneezeweed	8/19/1985	427	3	MSO Target Trt	MSO Target Trt	MSO Target Trt
Helenium arizonicum	Arizona sneezeweed	8/19/1985	427	19	UEA40	UEA40	UEA40
Helenium arizonicum	Arizona sneezeweed	10/4/2000	496	2	PAC - Mechanical	PAC - Mechanical	PAC - Mechanical

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Helenium arizonicum	Arizona sneezeweed	10/4/2000	519	16	MSO Target Trt	MSO Target Trt	MSO Target Trt

Desired 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 and D

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 would 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 can 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; Crisp, 2004); death or reduction of soil organisms on the pile sites (Raison, 1979; Ballard, 2000; Korb et al. , 2004) and development of hydrophobic soil (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 slated for spring and channel restoration. This may be due in part to the nature of past surveys that are generally part of project planning and implementation. 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 21will 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 4FRI. 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 4FRI.

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 (Coconino NF) is currently being analyzed. 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 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.

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. A few 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. Data are derived from NRIS TESP/Invasives.

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Penstemon clutei	Sunset Crater beardtongue	10/1/2001	215	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/2/2001	215	5	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/2001	215	8	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	2/27/1995	221	2	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/25/1993	221	4	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/22/1993	221	10	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	2/27/1995	221	12	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/25/1993	221	13	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	10/12/1989	223	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/12/1989	223	2	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/12/1989	223	4	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/2/2001	223	7	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/24/1992	232	2	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	9/2/1994	232	11	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	2/1/2000	233	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/12/1989	233	5	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	235	5	Operational Burn	Grassland Mechanical	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	235	6	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	5/16/1995	239	2	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	2/1/2000	240	8	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	2/1/2000	241	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	241	3	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	241	4	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/9/1993	241	9	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	2/1/2000	241	10	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/22/1993	248	9	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	4/1/1992	249	2	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/24/1992	249	13	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	250	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/9/1993	250	7	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	11/9/1993	251	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	4/1/1992	251	3	Operational Burn	Grassland Mechanical	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	252	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	4/1/1992	252	5	Operational Burn	Grassland Mechanical	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	4/1/1992	252	6	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	253	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	253	3	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	6/12/1996	253	4	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	8/19/1998	253	5	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	6/12/1996	254	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	262	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	262	10	Operational Burn	Grassland Mechanical	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	262	15	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	263	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	7/1/1979	263	4	Operational Burn	Burn Only	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	7/1/1979	263	7	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	264	8	Operational Burn	Operational Burn	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	265	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	265	2	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	4	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	5	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	7/1/1979	272	7	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	10	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	11	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	272	12	Operational Burn	Grassland Mechanical	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	273	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	273	2	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	273	5	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	274	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	274	4	Operational Burn	Operational Burn	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	9/13/1990	274	6	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	274	7	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	275	1	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	275	2	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	282	1	Operational Burn	Grassland Mechanical	Operational Burn
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	282	2	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	283	3	Burn Only	Burn Only	Burn Only
Penstemon clutei	Sunset Crater beardtongue	10/1/1992	284	1	Burn Only	Burn Only	Burn Only

Desired 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 and D

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 is thought to be 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 this study, prescribed burning in did not appear to favor increases in Sunset Crater beardtongue numbers. The study also included a trenching experiment where underground competition from roots 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 of the species is anticipated.

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 or maintenance or temporary road construction because none would occur.

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 can 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 is not known to 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 were 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. 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 include noxious or invasive weed invasion and continued disturbance of the habitat.

Favorable responses to burning because of the Schultz Fire have been observed by L. Moser and survey crews in recent months. 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. Impacts from off-highway vehicles, which are legally permitted in the area, may include 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) would redirect floodwaters on Forest Service lands west of private lands affected by the Schultz Fire to reduce flooding to private property. This would be a source of indirect effects to Sunset Crater beardtongue by redirecting floodwaters to the Cinder Hills area, 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 in fuels reduction projects have resulted or are anticipated to result in 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

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 Project (Mogollon Rim Ranger District) and in the Rocky Park Project (Mormon Lake Ranger District). It has been observed in several locations including the Wild Steer Mesa area along Forest Road 108 near the Hat Ranch area.

Existing condition for Flagstaff Beardtongue

There are several locations of Flagstaff beardtongue in the project area. See table 13 for documented locations

Table 13. Treatment Units containing Flagstaff beardtongue. Data are derived from NRIS TESP/Invasives.

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

Desired 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 and D

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 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

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 populations 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.

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 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; Crisp, 2004); death or reduction of soil organisms on the pile sites (Raison, 1979; Ballard, 2000; Korb et al., 2004) and development of hydrophobic soil (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 can 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 populations

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 Mormon Lake Basin Fuel Reduction Project (2005),Munds Park Fuels Reduction (2009), and Marshall Mesa (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

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.

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**.

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 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 and D

This analysis addresses all three 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 should not be totally dismissed and 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 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. 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 designed to reduce the risks of uncharacteristic wildfire and restoring 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 populations

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 can 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 populations 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.

The Coronado National Forest prepared a Management Plan for this species in 1991 and Conservation Strategy in 1993. The level of concern there has since diminished because it

is more common in that area than initially believed. The species is more common there than in the project area.

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.

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 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 is not on the Kaibab National Forest sensitive species list.

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 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 slated 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 would be surveyed before implementation and mitigation measures and design features (see mitigation #2) would be incorporated as

needed. This discussion is also 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 community that exists there (high elevation riparian) 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 operated 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 and D

This analysis addresses all action alternatives. Treatments in any specific unit containing Bebb's willow may vary by alternative (see table 4) 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. 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 populations 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 may 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 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. Plants outside the enclosures are subjected to grazing and browsing. 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. Mitigation for this is to survey the area before activities begin.

Sedimentation and channel cutting are threats to this species. Spring and channel restoration would reduce those risks by improving degraded watershed conditions. 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 willow, and represents a unique riparian community". The adjoining Hart Prairie Preserve owned and operated 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, discovered 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. The Conservancy has collaborated with Coconino NF for several beneficial actions. These include construction of two enclosures constructed to protect cohorts of Bebb's willow seedlings that regenerated from seed. These cohorts are monitored annually. The Conservancy and personnel from the Coconino National Forest mapped all individuals within the Bebb's willow community.

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 land 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. This project included thinning and burning. These actions are documented in the Hart Prairie Restoration EA (2001).

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 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.

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). These actions are particularly important to endemic species including the species above (except Bebb's willow).

Noxious or invasive weeds

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
- All treatments will occur as analyzed in the various specialists reports
- Areas to be treated will be surveyed noxious or invasive weeds before 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.

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 forest lands and provides best management practices to help prevent the spread of noxious or invasive weeds. The FEIS was incorporated into the forest plans by amendment 20 to the Coconino National Forest Plan and amendment 7 to the Kaibab National Forest Plan. The rankings in table 14 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 usually combined with eradication to allow for elimination of spot populations as they arise. Eradication means attempting to totally 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.

Table 14. Noxious or invasive weeds within the treatment units of Four Forest Restoration Initiative.

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.

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.	tamarisk	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	17	Prevent/	N*

Species*	Common Name	Species Rank	Objective	Known to occur in treatment areas (Y/N)
	cinquefoil		Eradicate	
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*), tamarisk (*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.

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.

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.

Direct and Indirect Effects

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 may have been part of the Four Forest Restoration Initiative project for noxious or invasive weeds would not occur. As a result, weed infestations that might 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 done. As a result, weed infestations within the treatment units of Four Forest Restoration Initiative would not be done unless the locations are included in another project area or are treated by a cooperating agency. For example, treatments along highways or roadways by various agencies would continue in coordination other agencies but would not expand outside of highway right of ways. The continued treatment of leafy spurge, 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 in recently analyzed or future projects not included in the Four Forest Restoration Initiative analysis where weed treatments are included as part of the project would continue as would surveys for other projects that are not part of the Initiative. It is not anticipated that these areas would cover as much area as that being analyzed under Four Forest Restoration Initiative.

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 on the Coconino National Forest. 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/INPA) 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, 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 forest lands, therefore providing a management tool not previously available to forest managers. The document and its provisions were incorporated into the Coconino NF and Kaibab NF by amendments 20 (CNF) and 7(KNF).

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 success of these treatments is not fully known at this time. However, the objective is to decrease the density, areal extent and reproductive capacity of the targeted weeds within the forest. These biological control agents would not completely eliminate the targeted noxious or invasive weed species but would 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, which is adjacent to the

Kaibab NF, has an active weed treatment program, but the areas and acreages treated are unknown.

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 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.

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 lost (USDA Forest Service 2010).

Alternatives B, C and D

Direct and Indirect Effects

The alternatives for treatment in areas containing this species vary by alternative (see table 14 above). This analysis is qualitative and does not focus on those specific differences. Instead, the effects will be 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 assuming an alternative treatment for slash is initiated.

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).

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 can be more easily invaded than in 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 mitigations, best management practices and noxious or invasive weed treatments for 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. It is expected that 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. However, in some situations prescribed fire may result in higher severity (McGlone and Egan, 2009). In these cases moderate to high severity may occur. 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 can 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*.

Amendments 7 of the Kaibab NF Plan and 20 of the Coconino NF Plan require treatment of noxious or invasive weeds within all scheduled projects as part of project implementation. The FEIS provides a variety of treatments 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 decomissioning include disturbance and increased risks of dispersal of existing weed species and populations and introduction of new species. These can be mitigated by following the mitigation measures and design features above. Roads that would be 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 help 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) and Amendment 20 of the Coconino NF Plan and Amendment 7 of the Kaibab NF Plan. 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 can be mitigated by following the mitigation measures and design features in the section above.

Cumulative effects

Past actions

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 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 on the Coconino National Forest. 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.

Since 1997, noxious or invasive weed surveys were generally conducted on forest projects that would have management actions associated with soil disturbance. However, until the adoption of the FEIS management actions for noxious or invasive weeds were generally limited to incorporation of best management practices or to manual control of certain weed populations.

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 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* that 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 forest lands, therefore providing a management tool not previously available to forest managers. The document and its provisions were incorporated into the Coconino NF and Kaibab NF by amendments 20 (CNF) and 7(KNF).

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.

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.

Beginning in 2004, the Forests have released numerous biological control insects on Dalmatian toadflax, diffuse knapweed and leafy spurge in certain areas. The success of these treatments is not fully known at this time. However, the objective is to decrease the density, areal extent and reproductive capacity of the targeted weeds within the forest. These biological control agents would not completely eliminate the targeted noxious or invasive weed species but would 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.

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 forest lands, therefore providing a management tool not previously available to forest managers. The document and its provisions were incorporated into the Coconino and Kaibab NF Plans by amendment.

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 consideration 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 as a result 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 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 the Cumulative Effects document.

Implementation continues on numerous projects that have analyzed in the past (See tables 8 and 9 of the cumulative effects document). 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.

Reasonably foreseeable actions are listed in table 9 of the Cumulative Effects document and include a variety of projects including fuels reduction and forest health projects with effects similar to those discussed for this project.

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 infections 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 forest lands 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.

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 lost (USDA Forest Service 2010).

Species Groups

This section is arranged in groupings based on lifestyle characteristics for the species occurring in the treatment areas. The sections discuss long-lived perennial species, followed by non-native thistles, then diffuse and spotted knapweed, cheatgrass, tamarisk and Mediterranean sage. The discussions of direct, indirect and cumulative effects for the no action alternative and alternatives B, C and D apply to these groups.

Long-lived perennials

This section includes some of the most problematic species to control. These species are typically able to regenerate from both seeds and roots and often have extensive root systems below the soil.

Leafy spurge (Euphorbia esula)

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 can be 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 occurs on the Flagstaff and Mogollon Rim Ranger Districts. 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. Infestations occur in the Tinney Springs and Apache Maid grazing allotments, adjacent to the Windmill Allotment, although leafy spurge has not been located on the Windmill allotment to date. 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. Most of the infestations occur in the Beaver Creek watershed, with one exception in the Oak Creek watershed. To date there are approximately 56 detected populations on the forest totaling roughly 208 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 and C. The forest has treated these infestations using herbicides during the years 2008, 2009 and 2010. Due to the persistent nature of this species, monitoring and additional treatment would likely be needed.

Table 15. Occurrences of leafy spurge and planned treatments within the project area.

Scientific name	Common name	Date collected	Site	Locations	Alternative B	Alternative C	Alternative D
Euphorbia esula	leafy spurge	8/15/2010	501	4	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	9/1/2001	501	7	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	9/17/2008	501	8	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	6/15/2010	501	11	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	8/15/2010	501	12	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	8/15/2010	501	13	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	501	14	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	501	15	IT10	IT10	IT10
Euphorbia esula	leafy spurge	6/15/2010	501	19	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	8/15/2010	501	25	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	6/15/2010	501	28	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	6/15/2010	502	7	PFA - SI40	PFA - SI40	PFA - SI40
Euphorbia esula	leafy spurge	9/17/2008	502	8	PFA - IT40	PFA - IT40	PFA - IT40
Euphorbia esula	leafy spurge	9/17/2008	502	11	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	6/15/2010	502	14	IT25	IT25	IT25
Euphorbia esula	leafy spurge	6/15/2010	502	18	IT10	IT10	IT10
Euphorbia esula	leafy spurge	6/15/2010	502	20	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/15/2010	502	21	IT40	IT40	IT40
Euphorbia esula	leafy spurge	5/28/2009	502	22	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	7/17/1999	502	28	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/15/2010	502	31	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	7/17/1999	502	33	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	9/17/2008	502	38	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	5/10/2011	502	39	Operational Burn	GL - Restoration	Operational Burn

Scientific name	Common name	Date collected	Site	Locations	Alternative B	Alternative C	Alternative D
Euphorbia esula	leafy spurge	5/10/2011	502	40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	6/1/1999	515	12	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/1/1999	516	2	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	9/1/2001	516	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Euphorbia esula	leafy spurge	9/15/2008	526	5	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	6/15/2010	526	6	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	8/15/2010	526	10	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	6/15/2010	526	11	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	6/15/2010	526	29	IT10	IT10	IT10
Euphorbia esula	leafy spurge	7/10/2009	527	1	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	5/10/2011	527	5	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	7/10/2009	527	18	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	19	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	20	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	21	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	7/10/2009	527	23	IT25	IT25	IT25
Euphorbia esula	leafy spurge	8/15/2010	527	24	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	8/15/2010	527	25	IT40	IT40	IT40
Euphorbia esula	leafy spurge	8/15/2010	527	26	IT25	IT25	IT25
Euphorbia esula	leafy spurge	8/15/2010	527	29	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	30	IT40	IT40	IT40
Euphorbia esula	leafy spurge	5/28/2009	527	37	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	7/7/2007	528	3	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/6/2006	528	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Euphorbia esula	leafy spurge	6/6/2006	528	9	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	11/30/2009	4140	4	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date collected	Site	Locations	Alternative B	Alternative C	Alternative D
Euphorbia esula	leafy spurge	11/30/2009	4140	8	Burn Only	Burn Only	Burn Only

Desired Condition

See the desired condition above for noxious or invasive weeds

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.

Figure 12. Leafy spurge growing in a stand of gambel oak.

Direct and indirect effects

Direct effects to leafy spurge include disturbance from management activities within or near existing locations. This could lead to disturbance and additional spread of the infestation into surrounding areas. For that reason, it is important to mark these locations and use caution or avoid them during management activities. All known locations within the project area have been treated using one or more 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. If pretreatment and avoidance are not possible, then the locations and sites containing leafy spurge should be **avoided**.

The effects of management actions, especially those of fire on leafy spurge are of particular concern. Leafy spurge is one of the highest priorities for treatment in the *Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive*

Weeds. 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 (Fire Effects Information System, 2007)

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.

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, numerous “outliers” have been detected by various surveyors, some several miles from the initial sites. The Flagstaff 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 have surveyed portions of the forest near the district boundary between Mogollon Rim and Mormon Lake Ranger Districts from 2004 to present as part of the Upper Beaver Creek Watershed Fuel Reduction Project.

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 management actions.

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 were allowed to graze 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 trucked 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 biocontrol agents. It was determined that these insects did not cause significant damage to native plants. 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 area is scheduled for survey this field season.

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 insect herbivory on native vegetation and 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 to occur 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 as part of the noxious or invasive weed programs of the forests. 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. The treatments proposed for sites containing leafy spurge in this project are in table 15 above. 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.

White top (Cardaria draba)

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 thought to be an early seral species due to its 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 13. 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. 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 open conditions. The risk of spread can 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 and a licensed applicator would be needed 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 and 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. This species is widespread elsewhere and can cause significant degradation of the plant community in which it exists, but occurs on a very limited basis in our area. Its' effects to the ecosystem and native plant community in our area is currently very limited. Vigilance, treatment and mitigation will assure that the occurrence of species remains limited or is eliminated.

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.

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 below-ground 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 for locations).

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

The direct and indirect effects to camelthorn are similar to those of white top. Both of these species are deep-rooted perennials with the ability to regenerate from perennating root buds and seeds. Both are generally found in open, disturbed sites.

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 these infestations, so no effects from those activities would occur.

There are no spring or channel restoration sites near these locations so there are no effects from management activities that would be associated with those activities.

Cumulative effects

Some of the locations recorded for this species are within Sunset Crater National Monument and are subject to control actions by that entity. 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 road vehicle use in the current forest plan. Heavy 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)

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 3 acres. However, control is important due to the ability of this species to expand rapidly after disturbance.

The documented locations for this species within the treatment units are found in Appendix B.

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 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 would be a source of disturbance that would lead to more disturbances and would in turn 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.

There are no known populations of this species 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 can 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.

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, most 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 even be promoted by fire, especially if other species are reduced. The post fire environment is well suited to toadflax establishment by seed (Zouhar, 2003).

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. 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. 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 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.

Burning would be a source of disturbance that would lead to more disturbances and would in turn 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.

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 can 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.

Non-native thistles

Three species are included in this section, musk thistle Scotch thistle and bull thistle. These species share similar life traits. All are considered biennial species. These species arise solely from seed, germinating and growing into rosettes during the first growing season of life where they remain in that state through the winter and then resume growth the second year when they bolt, flower and die (Beck, 1999).

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 may 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)

See Appendix B for locations and treatments.

Scotch thistle (Onopordum acanthium)

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.

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. Bull thistle is a stout biennial thistle with purple flowers. Regeneration is solely from short-lived seed

Various control methods are available to control these 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 these 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 would be a source of disturbance that would lead to more disturbances and would in turn 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.

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 can 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. Like Dalmatian toadflax, these 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 and spotted knapweed

Existing Condition

These two species are grouped together based on their similarities in lifecycle traits. Treatments for these two species are generally identical.

These two species belong to the genus *Centaurea* that rapidly evolved after the last major glaciation event in the eastern Mediterranean area about 10, 000 years ago. Knapweeds were able to adapt to living in the disturbed soils left behind by the glacial event, becoming early seral, weedy species. These factors coupled with human settlement and agricultural use in the area provided conditions that allowed knapweeds to become pre-adapted to disturbed conditions (Roche and Roche, 1999).

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. These plants or plant fragments can be carried to new locations by wind or dragged along by vehicles to new locations. Seeds can also be spread as the spiny bracts attach to animal fur, clothing, and vehicles and can be 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. This species poses serious threat to restoration efforts because of its high rates of expansion and ability to outcompete native vegetation.

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). There are three documented infestations in treatment units. There are in location 85 site 11, location 91 site 11 and location 349 site 26.

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

Knapweeds are early seral species and can be expected 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 these 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.

In a local study, germination of 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 in these severely burned sites.

Effects to these 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 would be a source of disturbance that would lead to more disturbances and would in turn 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.

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 can 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.

Cheatgrass (Bromus tectorum)

Cheatgrass is an erect winter and spring annual grass from Europe, but is now found 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 the areas are covered by other surveys.

This portion of the analysis also addresses a public comment submitted during the scoping period. The entirety of the comment and response are included below in the cumulative effects section. The comment expresses concern for the expansion of cheatgrass as a result 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 (2009) 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 conditions that are more open. These actions would result in more open conditions for species such 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. (2009) 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 shrubland environments.

The comment and response below are included in the cumulative effects analysis because it seems the most appropriate location for it in this discussion. It focuses on the general effects of cheatgrass in the project area.

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.

Response to comment: Occurrences of cheatgrass within the 4 FRI Initiative Areas are not well documented. Areas likely to contain cheatgrass infestations include severely disturbed areas such as recent wildfires. The 4FRI Initiative will restore the structure and processes of the ponderosa pine forest throughout northern Arizona. By doing this, it will reduce the risk of uncharacteristic wildfires such as the recent Schultz Fire (2010).

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. At the time of completion, the extent of cheatgrass infestations and their distributions on the forests was unknown. The FEIS provided for treatment of cheatgrass in certain areas, focusing mainly on some severe infestations on the North Kaibab Ranger District, Kaibab National Forest, which were in the habitat of a rare plant of concern on the forest. Since then, the Forests have recognized the severity of cheatgrass. At the time of the preparation of the FEIS, most scientific studies on cheatgrass focused on grassland and shrub land habitats. Recent studies such as those by McGlone and his co-authors will provide valuable insight into the effects of cheatgrass in forested ecosystems.

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.

In the other publication by McGlone and others published in Forest Ecology and Management, titled *Can pine forest restoration promote a diverse and abundant understory and simultaneously resist nonnative invasion?*, he discusses the issue of cheatgrass invasion on the same study area. In that publication, he mentions that 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.

In a review article by McGlone and Egan (2009), titled *Role of Fire in the Establishment and Spread of Nonnative Plants*, the authors review wildfires and prescribed fire in ponderosa pine forests in northern Arizona. In this review, they discuss the same restoration treatment area as in the articles above. They mention the cheatgrass invasion but go on to state "Fuel loads at the time of burn were heavy, often resulting in high-severity fires. While many factors were involved in the spread of cheatgrass across the landscape, nonnative invasion on this site was higher than others of similar design". Therefore, while the commenter's point on cheat grass is duly noted, the basis of the comparison may be overstated. One of the objectives of the 4 FRI restoration is to promote industry to promote utilization of biomass from the treated areas. This would likely reduce the fuel loading in the treated areas and would be substantially lower than on the Mount Trumbull area. Therefore, fire severity in treated areas will be reduced and the risk of cheatgrass infestations may be reduced as well. One of the factors influencing weed populations in general is introductions new areas. The noxious weed FEIS (2005) provides mitigations to reduce the risks of new introductions such as vehicle cleaning and the use of certified weed free products. Additionally, forest plans for the Coconino and Kaibab National Forests have incorporated the direction of the FEIS, requiring noxious or invasive weeds to be considered in analysis project design and implementation

Tamarisk (Tamarix spp.)

Tamarisk is found in many riparian areas throughout the West. It was introduced into the U. S. as early as the 1800's. There have been multiple introductions of this species for use as an ornamental and for erosion control. Since the escape of tamarisk from cultivation, it has spread into wildland areas throughout the western U. S. at a rapid rate, particularly in riparian areas. Tamarisk communities are frequently associated with past disturbances and/or changes in historic disturbance regimes (Zouhar, 2003).

Tamarisk 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 tamarisk 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 tamarisk 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 tamarisk 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 tamarisk in the Saint George, Utah area and 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 tamarisk 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 tamarisk 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, causing them to eat other species, contributing to the invasion. In its native range of Mediterranean sage is considered an early to mid-seral species, occupying disturbed habitats. Various methods of control have been used for the 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 could winters which 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.

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 details. .

Desired Condition

See the desired condition above for noxious or invasive weeds

Direct and Indirect Effects

See the general discussion above,

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. The partners have developed a watch list for weed species. These species are currently not known to fall within the areas slated 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 are found 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 are found bordering 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 promoted for windbreaks and erosion control. It has been planted extensively in areas throughout northern Arizona where 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 serious impact 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 have been found 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 has also been used widely as an ornamental species. t 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 forest lands within the forests but there are no documented occurrences in treatment areas. Like other woody invasives, it can invade riparian areas and have negative effects on structure and function in these systems.

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 and the area around the base of the mature plant becomes bare ground as the rosette dies. This area provides an excellent “nursery” for the next generation. 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 treatment areas.

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. There are no known populations on the national forests but it has been found in some landscaped areas in Flagstaff. There are no documented occurrences in treatment areas.

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 treatment areas.

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. Therefore, there would be no concern for these species in the Four Forest Restoration Initiative process. Treatment would continue in other projects where these species are located but would not be as comprehensive as would be available in the Four Forest Restoration Initiative. The risk of these species 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 would still be potential events that 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 as other management actions are conducted in the area.

Alternatives B, C and D

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 treatment units. These species were included in the discussion due to concerns brought forward by the partners. 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 treatment units. Surveying treatment areas (mitigation #18) would be the best current strategy for these species. If infestations are detected during survey, they will then be treated the same as the other noxious or invasive weed species were discussed above. These effects can 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 16. Monitoring requirements.

Requirement	Timing	Purpose
Review and apply the	Implementation	Assures compliance with

mitigation measures and design features in this document		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 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.	Implementation	Avoids loss of plant populations.
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 wed management.

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Appendix A. Region 3 Sensitive Plant Species List for the Four Forest Restoration Initiative First EIS

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		
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		
Lyngholm's Brakefern, *Pellaea lyngholmii*	--	SNR	Sen	X		
Sunset Crater beardtongue, *Penstemon clutei*		S2	Sen		X	
Flagstaff beardtongue, *Penstemon nudiflorus*		S2S3	Sen		X	X
Alcove Bog Orchid, *Platanthera zothecina*	--	S2	Sen	X		
Hualapai Milkwort, *Polygala rusbyi*	--	S3	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						

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 June 2012

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

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Euphorbia esula	leafy spurge	6/15/2010	502	31	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	7/17/1999	502	33	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	9/17/2008	502	38	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	5/10/2011	502	39	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	5/10/2011	502	40	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	6/1/1999	515	12	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/1/1999	516	2	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	9/1/2001	516	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Euphorbia esula	leafy spurge	9/15/2008	526	5	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	6/15/2010	526	6	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	8/15/2010	526	10	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	6/15/2010	526	11	UEA25	UEA25	UEA25
Euphorbia esula	leafy spurge	6/15/2010	526	29	IT10	IT10	IT10
Euphorbia esula	leafy spurge	7/10/2009	527	1	Savanna	Savanna	Savanna
Euphorbia esula	leafy spurge	5/10/2011	527	5	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	7/10/2009	527	18	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	19	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	20	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	21	UEA40	UEA40	UEA40
Euphorbia esula	leafy spurge	7/10/2009	527	23	IT25	IT25	IT25
Euphorbia esula	leafy spurge	8/15/2010	527	24	UEA10	UEA10	UEA10
Euphorbia esula	leafy spurge	8/15/2010	527	25	IT40	IT40	IT40
Euphorbia esula	leafy spurge	8/15/2010	527	26	IT25	IT25	IT25
Euphorbia esula	leafy spurge	8/15/2010	527	29	IT40	IT40	IT40
Euphorbia esula	leafy spurge	7/10/2009	527	30	IT40	IT40	IT40
Euphorbia esula	leafy spurge	5/28/2009	527	37	Operational Burn	GL - Restoration	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Euphorbia esula	leafy spurge	7/7/2007	528	3	IT40	IT40	IT40
Euphorbia esula	leafy spurge	6/6/2006	528	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Euphorbia esula	leafy spurge	6/6/2006	528	9	Operational Burn	GL - Restoration	Operational Burn
Euphorbia esula	leafy spurge	11/30/2009	4140	4	Burn Only	Burn Only	Burn Only
Euphorbia esula	leafy spurge	11/30/2009	4140	8	Burn Only	Burn Only	Burn Only
Cardaria draba	whitetop	6/22/2009	335	14	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	7/12/1999	222	1	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	7/12/1999	222	5	Operational Burn	Operational Burn	Operational Burn
Alhagi maurorum	camelthorn	8/5/1999	223	5	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	8/16/1999	234	3	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	7/7/1999	239	1	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	7/29/1999	241	1	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	8/16/1999	241	3	Burn Only	Burn Only	Burn Only
Alhagi maurorum	camelthorn	8/12/1999	241	9	Operational Burn	Operational Burn	Operational Burn
Alhagi maurorum	camelthorn	6/23/1999	251	1	Burn Only	Burn Only	Burn Only
Acroptilon repens	Russian knapweed	10/7/2010	38	15	Operational Burn	GL - Restoration	Operational Burn
Acroptilon repens	Russian knapweed	10/7/2010	38	18	Savanna	Savanna	Savanna
Acroptilon repens	Russian knapweed	10/7/2010	38	19	UEA40	UEA40	UEA40
Acroptilon repens	Russian knapweed	6/15/1998	99	9	Operational Burn	GL - Restoration	Operational Burn
Acroptilon repens	Russian knapweed	8/15/2001	405	5	Operational Burn	GL - Restoration	Operational Burn
Acroptilon repens	Russian knapweed	5/28/2002	2261	27	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/11/2011	27	10	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/11/2011	27	14	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/11/2011	28	25	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/11/2011	28	26	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	37	4	UEA25	UEA25	UEA25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	11/30/2009	37	5	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	11/30/2009	37	6	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/21/2008	40	8	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/21/2008	40	10	Aspen Treatment	Aspen Treatment	Aspen Treatment
Linaria dalmatica	Dalmatian toadflax	8/21/2008	40	11	Aspen Treatment	Aspen Treatment	Aspen Treatment
Linaria dalmatica	Dalmatian toadflax	8/21/2008	48	6	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/28/2001	52	12	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	65	24	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	6/19/2008	76	2	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	7/2/1999	78	8	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	7/2/1999	78	11	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	7/26/2001	78	14	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/29/2004	83	2	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	6/11/2011	83	5	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	10/21/1999	84	7	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	84	30	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	5/28/2002	84	32	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	5/28/2002	84	33	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	84	41	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/8/1999	85	3	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	7/31/1997	85	11	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/7/1999	85	15	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	8/11/2009	86	1	PFA - IT25	PFA - IT25	PFA - IT25
Linaria dalmatica	Dalmatian toadflax	6/8/1999	86	8	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/8/1999	86	12	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	5/28/2002	86	20	Operational Burn	GL - Restoration	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	6/8/1999	86	26	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	6/7/1999	86	29	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/9/2011	90	1	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/3/2011	90	2	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	8/4/2011	90	3	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/8/2011	90	6	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/9/2011	90	8	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	8/9/2011	90	9	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/9/2011	90	10	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/9/2011	90	11	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	8/8/2011	90	12	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/8/2011	90	13	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	8/8/2011	90	14	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/4/2011	90	15	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/9/2011	90	16	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/9/2011	90	17	SI10	SI10	SI10
Linaria dalmatica	Dalmatian toadflax	9/12/2002	91	5	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/2/2002	91	11	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/12/2002	92	1	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/10/2011	92	2	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/10/2011	92	3	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	9/12/2002	92	4	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	8/10/2011	92	5	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/10/2011	92	7	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	8/10/2011	92	7	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	8/10/2011	92	7	UEA25	UEA25	UEA25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	8/10/2011	92	8	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	9/12/2002	92	11	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/12/2002	92	12	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/12/2002	92	19	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	7/29/2004	93	1	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	7/29/2004	93	2	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	7/29/2004	93	3	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	7/29/2004	93	5	PFA - SI25	PFA - SI25	PFA - SI25
Linaria dalmatica	Dalmatian toadflax	5/1/2009	93	9	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	5/1/2009	93	10	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/1/2009	93	12	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	94	4	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	5/28/2002	94	6	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	94	7	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/28/2002	94	8	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/28/2002	94	12	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	5/28/2002	94	14	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/9/2011	95	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/4/2011	95	2	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	10/20/1999	95	4	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	8/9/2011	95	6	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/4/2011	95	7	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/4/2011	95	13	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	8/4/2011	95	14	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	8/9/2011	95	15	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	8/9/2011	95	16	WUI55	WUI55	WUI55

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	8/9/2011	95	17	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	10/20/1999	95	20	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	8/11/2011	96	3	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	8/11/2011	96	5	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	8/11/2011	96	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/11/2011	96	8	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/11/2011	96	11	PFA - IT25	PFA - IT25	PFA - IT25
Linaria dalmatica	Dalmatian toadflax	8/11/2011	96	12	PFA - IT25	PFA - IT25	PFA - IT25
Linaria dalmatica	Dalmatian toadflax	8/11/2011	96	13	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	8/11/2011	96	18	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	10/20/1999	99	1	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	5/28/2002	99	13	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	10/20/1999	100	21	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	9	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	10	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	11	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	12	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	13	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	14	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	15	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	16	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	17	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	18	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	19	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	20	Operational Burn	GL - Restoration	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	21	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	22	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	23	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	24	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	120	25	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/1/2000	137	10	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/14/2002	138	14	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/2/2002	138	15	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	7/20/2010	151	4	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/13/2010	155	6	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/20/2010	157	9	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	7/20/2010	157	11	UEA40	AZGFD Trt	UEA40
Linaria dalmatica	Dalmatian toadflax	7/20/2010	157	15	UEA40	AZGFD Trt	UEA40
Linaria dalmatica	Dalmatian toadflax	7/13/2010	162	4	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	7/13/2010	162	5	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	7/13/2010	162	7	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	7/13/2010	162	8	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	7/20/2010	163	1	UEA40	AZGFD Trt	UEA40
Linaria dalmatica	Dalmatian toadflax	7/20/2010	163	4	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	7/20/2010	163	5	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	7/13/2010	163	6	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/16/2011	173	8	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	8/16/2011	173	11	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	8/16/2011	181	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/1/2000	181	3	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/26/1997	181	4	Savanna	Savanna	Savanna

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	8/16/2011	181	13	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/9/2011	220	4	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	8/15/2011	220	6	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	7/9/1999	221	5	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	7/13/1999	221	12	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	7/9/1999	222	6	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	7/9/1999	222	7	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/9/2011	229	1	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/9/2011	229	2	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/9/2011	229	9	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/9/2011	229	10	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/9/2011	229	14	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/18/2008	229	19	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/9/2011	229	20	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/18/2008	229	21	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/11/2011	229	22	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/15/2005	229	23	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/9/2011	229	24	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	7/7/1999	239	1	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	7/13/2000	239	2	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/23/1999	240	1	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	2/1/2000	248	10	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/17/1999	248	14	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/10/1999	248	17	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/23/1999	249	2	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/10/1999	249	6	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	8/10/1999	249	13	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/16/1999	250	5	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/10/1999	250	7	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/20/2011	261	4	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/10/1999	261	10	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/11/2000	271	4	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/6/2010	277	1	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	7/29/2004	277	2	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/6/2010	277	3	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/6/2010	277	4	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/6/2010	277	9	PFA - UEA25	PFA - UEA25	PFA - UEA25
Linaria dalmatica	Dalmatian toadflax	7/29/2004	277	10	PFA - IT25	PFA - IT25	PFA - IT25
Linaria dalmatica	Dalmatian toadflax	7/29/2004	277	12	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	7/29/2004	277	13	PFA - IT10	PFA - IT10	PFA - IT10
Linaria dalmatica	Dalmatian toadflax	7/29/2004	277	15	PFA - UEA10	PFA - UEA10	PFA - UEA10
Linaria dalmatica	Dalmatian toadflax	7/29/2004	277	16	PFA - UEA10	PFA - UEA10	PFA - UEA10
Linaria dalmatica	Dalmatian toadflax	10/6/2010	277	35	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	7/29/2004	277	36	PFA - IT10	PFA - IT10	PFA - IT10
Linaria dalmatica	Dalmatian toadflax	7/29/2004	277	37	PFA - UEA10	PFA - UEA10	PFA - UEA10
Linaria dalmatica	Dalmatian toadflax	9/9/2011	279	3	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/9/2011	279	19	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	8/11/2004	279	21	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/11/2004	279	22	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/11/2004	279	24	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/18/2009	279	24	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	7/19/1999	284	1	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	7/29/2004	286	5	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	7/29/2004	286	6	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	7/29/2004	286	7	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	7/29/2004	286	8	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/11/2004	286	15	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/11/2004	286	19	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/11/2004	289	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/18/2009	290	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/11/2004	290	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/18/2009	290	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/11/2004	290	5	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/11/2004	290	9	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	10/16/2000	294	6	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	10/16/2000	294	7	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/11/2004	297	3	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/11/2004	297	10	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/17/2004	297	12	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/11/2004	299	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/11/2004	299	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/11/2004	299	4	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	1	Operational Burn	Operational Burn	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	3	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	4	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	5	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	6	UEA25	UEA25	UEA25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	7	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	9	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	11	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	12	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	13	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	14	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	15	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	16	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	7/15/2004	314	18	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/30/2000	315	13	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	7/15/2004	315	21	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	7/15/2004	317	1	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	7/15/2004	317	2	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	317	3	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	317	4	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	4/12/2005	317	5	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/15/2004	317	9	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	317	10	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	318	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	318	2	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	318	3	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	318	4	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/15/2004	318	7	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/14/2002	325	16	PFA - IT40	PFA - IT40	PFA - IT40
Linaria dalmatica	Dalmatian toadflax	6/26/2009	335	14	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	8/16/2011	336	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/16/2011	336	2	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	7/20/2011	336	6	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/16/2011	336	22	WUI55	WUI55	WUI55
Linaria dalmatica	Dalmatian toadflax	8/19/2002	340	23	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/5/2000	341	10	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	8/12/2002	341	14	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/19/2002	341	15	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/5/2000	341	24	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/15/2001	341	35	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/15/2001	341	36	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/16/2011	344	5	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/16/2011	344	14	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/16/2011	344	21	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/16/2011	344	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	12/2/2002	345	35	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/18/2000	349	4	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/17/2010	349	6	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/17/2010	349	11	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	7/13/2000	349	15	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	10/17/2000	349	16	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	7/13/2000	349	17	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	7/13/2000	349	18	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/15/2001	349	26	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/14/2003	350	3	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	7/14/2003	350	9	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	7/14/2003	350	10	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	6/18/2008	350	25	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	6/18/2008	350	29	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/16/2011	354	10	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/1/2000	354	17	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	363	13	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/15/2001	364	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	365	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/19/2008	366	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2011	371	20	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/15/2011	371	21	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/8/2002	372	2	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	6/17/2002	372	4	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	6/27/2000	375	15	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/15/2001	375	17	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	376	24	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/19/2008	377	25	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/19/2008	378	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/20/2000	378	2	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	10/20/2000	378	5	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	6/19/2008	378	14	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	6/15/2001	385	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2011	386	10	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/15/2001	386	14	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/8/2002	387	2	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	8/8/2002	387	4	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	8/15/2011	387	6	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/15/2011	387	8	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/8/2002	387	9	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2011	387	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/8/2002	388	13	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/8/2002	388	14	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/15/2011	397	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2011	397	6	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2011	397	15	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/16/2010	399	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2011	400	4	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2011	400	7	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2011	400	21	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/15/2011	400	24	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2011	400	25	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2011	402	13	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2001	405	5	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	11/6/2000	405	8	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	405	9	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	8/15/2001	405	12	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	405	18	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	6/19/2008	405	33	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	11/2/2000	406	1	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	7/25/2011	414	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2011	415	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2011	415	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

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Linaria dalmatica	Dalmatian toadflax	8/15/2011	416	5	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/15/2011	416	10	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	420	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2001	420	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/19/2008	421	3	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	421	16	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	421	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/19/2008	421	18	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/15/2001	421	19	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/18/2008	421	20	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/18/2008	421	29	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/18/2008	421	30	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/18/2008	422	4	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	6/19/2008	422	8	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	6/18/2008	422	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/15/2001	428	7	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/25/2011	429	6	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	435	3	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/15/2001	435	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2001	435	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/27/2000	435	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2001	435	12	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	5/13/2008	436	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/19/2008	436	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	5/13/2008	436	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2001	436	14	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

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Linaria dalmatica	Dalmatian toadflax	8/15/2001	436	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	5/13/2008	436	20	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/15/2001	454	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/15/2001	466	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	10/3/2000	472	1	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	10/3/2000	472	7	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/3/2000	472	8	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/3/2000	472	10	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	10/3/2000	473	2	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	6/24/2009	480	21	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	8/15/2001	490	1	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	8/15/2001	490	3	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	6/13/2008	490	4	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	6/13/2008	490	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/13/2008	490	12	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	6/13/2008	491	3	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	6/24/2009	491	9	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/13/2008	491	10	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	10/12/2000	495	12	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/17/2009	502	29	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/13/2008	503	9	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	6/13/2008	503	11	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	6/24/2009	503	13	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	6/13/2008	504	1	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	6/17/2009	504	2	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2001	504	4	Savanna	Savanna	Savanna

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Linaria dalmatica	Dalmatian toadflax	8/15/2001	504	16	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/13/2008	505	1	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	6/24/2009	505	10	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	6/13/2008	505	12	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/13/2008	505	13	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	10/2/2000	508	15	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/2/2000	510	1	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/2/2000	510	7	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/2/2000	510	14	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/2/2000	510	17	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	10/4/2000	511	4	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	10/4/2000	511	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	10/12/2000	511	9	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/2/2000	511	13	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	10/3/2000	512	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/4/2000	512	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	10/5/2000	512	10	IT25	IT25	IT25
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	1	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	2	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	3	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	5	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	7	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	10	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	16	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	18	UEA40	UEA40	UEA40

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Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	20	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/4/2000	519	22	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	10/5/2000	520	4	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	10/4/2000	520	6	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	10/5/2000	521	8	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	10/4/2000	522	1	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/23/2005	522	3	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	10/5/2000	522	4	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/17/2011	522	7	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/5/2002	523	7	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	8/17/2011	523	9	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	9/3/2002	523	10	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	9/3/2002	523	11	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	8/5/2002	523	13	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Linaria dalmatica	Dalmatian toadflax	8/6/2002	523	17	Not PIPO or Filtered	Burn Only - Core Area (18)	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/6/2002	523	18	Not PIPO or Filtered	Burn Only - Core Area (18)	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/23/2005	524	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/23/2005	524	2	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/23/2005	524	3	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/23/2005	524	4	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/18/2011	524	6	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/18/2011	524	7	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	6/23/2005	524	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	8/16/2011	524	9	MSO Target Trt	MSO Target Trt	MSO Target Trt
Linaria dalmatica	Dalmatian toadflax	8/16/2011	524	10	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/16/2011	524	11	Burn Only	Burn Only	Not PIPO or Filtered

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Linaria dalmatica	Dalmatian toadflax	10/14/2011	524	12	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/23/2005	524	15	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/17/2011	524	16	Operational Burn	Operational Burn	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/15/2011	525	9	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/15/2011	525	13	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/20/2005	526	6	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	7/31/2006	526	7	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/21/2005	526	8	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/21/2005	526	15	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/21/2005	526	16	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/21/2005	526	22	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/21/2005	526	23	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/21/2005	526	24	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/20/2005	527	28	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	6/13/2008	528	7	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	8/15/2001	528	10	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/13/2008	528	11	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/13/2008	529	2	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	6/13/2008	529	9	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	8/16/2011	532	1	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/18/2011	532	2	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/18/2011	532	3	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/16/2011	532	28	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/23/2005	532	34	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/18/2011	532	35	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/16/2010	533	51	Burn Only	Burn Only	Not PIPO or Filtered

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Linaria dalmatica	Dalmatian toadflax	6/13/2008	540	8	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/13/2008	540	34	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	8/15/2011	542	21	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/18/2011	542	22	Burn Only	Burn Only	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	8/16/2011	542	23	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	6/24/2009	545	1	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	6/13/2008	545	7	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/13/2008	545	9	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	10/5/2000	937	7	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/24/2009	1513	24	PFA - UEA40	PFA - UEA40	PFA - UEA40
Linaria dalmatica	Dalmatian toadflax	6/24/2009	1513	25	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/24/2009	1513	26	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/13/2009	1524	11	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt
Linaria dalmatica	Dalmatian toadflax	5/28/2002	1534	6	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/13/2009	1534	43	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/13/2009	1534	44	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	1534	48	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	6/3/2010	1550	12	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/22/2009	1556	48	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/22/2009	1556	49	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	5/28/2002	1566	62	Operational Burn	Operational Burn	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	1566	65	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	1566	79	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/16/2011	2218	6	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/16/2011	2218	11	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2218	25	UEA25	UEA25	UEA25

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Linaria dalmatica	Dalmatian toadflax	5/24/2010	2218	26	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	8/31/2009	2218	30	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/16/2011	2218	33	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/16/2011	2218	38	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2218	41	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2232	5	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2232	6	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	8/1/2011	2233	4	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/1/2011	2233	5	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2233	12	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2233	13	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2233	14	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2233	15	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2233	16	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2233	17	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2233	20	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2233	21	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2233	22	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	2	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	3	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	4	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	5	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	6	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	7	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	8	IT40	IT40	IT40

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Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	9	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	10	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	11	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	12	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	13	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	15	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	16	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/11/2011	2234	17	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	18	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	19	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2234	20	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2235	1	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2235	2	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2235	3	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2235	11	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2235	39	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2235	58	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2236	1	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2236	2	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2236	3	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2236	14	SI25	SI25	SI25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2236	16	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2236	17	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2237	10	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2237	12	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2237	12	UEA10	UEA10	UEA10

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2237	13	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2237	14	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2237	15	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2237	17	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2237	18	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2237	19	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2237	20	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2237	26	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2237	27	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2237	28	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2237	30	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2237	33	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2237	45	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2237	48	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2238	20	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	7/6/2009	2245	42	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	7/1/2009	2246	31	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	6/18/2009	2248	15	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/18/2009	2248	16	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/18/2009	2248	17	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	10/22/2009	2254	55	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2254	56	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	6/1/2010	2254	67	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2255	9	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	6/1/2010	2256	72	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/26/2009	2257	4	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	6/24/2010	2258	9	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/24/2010	2258	11	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/26/2009	2258	17	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2258	53	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2258	62	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	12/27/2010	2259	35	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/26/2009	2260	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2260	6	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2260	16	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2260	17	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2260	19	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2260	38	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	3	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	5	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	6	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	7	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Linaria dalmatica	Dalmatian toadflax	9/23/2009	2261	21	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	27	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	28	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	7/20/2010	2261	35	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	51	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	63	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	64	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	65	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2261	73	UEA25	UEA25	UEA25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2262	15	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/26/2009	2262	30	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2262	36	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2262	38	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2262	41	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2262	48	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	6/23/2009	2263	5	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	10/14/2009	2263	22	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	10/14/2009	2263	25	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/10/2009	2263	47	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	11/10/2009	2263	48	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	11/10/2009	2263	49	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/10/2009	2263	52	IT10	IT10	IT10
Linaria dalmatica	Dalmatian toadflax	11/10/2009	2263	59	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	11/10/2009	2264	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Linaria dalmatica	Dalmatian toadflax	6/18/2009	2264	27	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2264	41	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2264	42	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	6/18/2009	2264	53	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2264	56	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2265	2	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2265	14	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2265	15	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2265	23	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2265	24	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2265	26	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2266	22	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2266	39	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2266	40	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2266	41	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2266	44	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/31/2009	2266	48	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/31/2009	2266	49	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	6/18/2009	2266	51	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	5/26/2009	2267	28	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	5/26/2009	2267	71	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2268	7	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2268	8	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2268	27	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2268	30	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2268	31	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2270	37	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	8/1/2000	2272	40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2273	7	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2273	11	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2273	14	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2273	15	GL - Restoration	GL - Restoration	GL - Restoration
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	4	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	5	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	6	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	7	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	12	UEA10	UEA10	UEA10

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	13	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	14	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	34	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	37	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	40	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	41	SI40	SI40	SI40
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	42	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	43	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	44	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/21/2009	2274	55	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2275	9	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2275	19	IT40	IT40	IT40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2276	13	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2276	23	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	9/23/2009	2276	37	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	9/23/2009	2276	42	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2278	2	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	9/23/2009	2278	5	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	9/23/2009	2278	6	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	9/23/2009	2278	23	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2300	13	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2300	21	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2303	1	UEA40	UEA40	UEA40
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2303	5	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	8/1/2011	2318	6	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	8/1/2011	2318	13	Burn Only	Burn Only	Burn Only

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Linaria dalmatica	Dalmatian toadflax	11/30/2009	2318	24	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2318	44	UEA10	UEA10	UEA10
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2318	45	UEA25	UEA25	UEA25
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2318	47	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2318	48	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	2318	49	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	5/24/2010	2318	55	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/6/2009	2320	10	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/6/2009	2320	11	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/6/2009	2320	12	Savanna	Savanna	Savanna
Linaria dalmatica	Dalmatian toadflax	5/28/2002	2320	46	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	7/1/2011	2321	2	Operational Burn	GL - Restoration	Operational Burn
Linaria dalmatica	Dalmatian toadflax	11/30/2009	4027	1	Burn Only	Burn Only	Burn Only
Linaria dalmatica	Dalmatian toadflax	11/30/2009	4027	2	WUI PJ Trt	WUI PJ Trt	WUI PJ Trt
Linaria dalmatica	Dalmatian toadflax	11/30/2009	4057	3	PineSage	PineSage	PineSage
Linaria dalmatica	Dalmatian toadflax	11/30/2009	4058	1	PineSage	PineSage	PineSage
Carduus nutans	Musk thistle	9/12/2002	91	5	Savanna	Savanna	Savanna
Carduus nutans	Musk thistle	7/24/2000	341	35	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	5	1	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	5	3	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	6	4	Operational Burn	Operational Burn	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	6	5	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	10	20	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	10	22	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	10	24	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	10	25	Operational Burn	GL - Restoration	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Onopordum acanthium	Scotch thistle	12/30/2008	10	26	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	10	27	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	10	34	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	10	36	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	17	1	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	17	2	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	17	4	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	17	11	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	17	16	GL - Restoration	GL - Restoration	GL - Restoration
Onopordum acanthium	Scotch thistle	12/30/2008	17	17	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	17	18	GL - Restoration	GL - Restoration	GL - Restoration
Onopordum acanthium	Scotch thistle	12/30/2008	17	19	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	17	20	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	17	22	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	17	23	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	18	1	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	18	2	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	18	5	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	18	12	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	18	14	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	18	17	PFA - UEA40	PFA - UEA40	PFA - UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	18	18	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	18	21	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	18	22	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	23	2	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	23	9	PFA - UEA40	PFA - UEA40	PFA - UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Onopordum acanthium	Scotch thistle	12/30/2008	23	11	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	23	12	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	23	13	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	23	15	PFA - UEA40	PFA - UEA40	PFA - UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	23	16	PFA - IT40	PFA - IT40	PFA - IT40
Onopordum acanthium	Scotch thistle	12/30/2008	23	17	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	23	22	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	23	27	PFA - UEA40	PFA - UEA40	PFA - UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	30	30	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	30	31	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	30	32	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	30	33	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	12/30/2008	30	34	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	35	1	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	35	4	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	35	5	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	35	6	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	36	26	IT10	IT10	IT10
Onopordum acanthium	Scotch thistle	12/30/2008	36	27	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	38	4	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	38	5	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	38	6	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	38	7	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	12/30/2008	38	47	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	39	16	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	12/30/2008	39	39	Operational Burn	GL - Restoration	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Onopordum acanthium	Scotch thistle	12/30/2008	39	47	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	39	52	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	12/30/2008	39	54	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	39	55	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	39	63	UEA25	UEA25	UEA25
Onopordum acanthium	Scotch thistle	12/30/2008	39	65	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	39	66	IT25	IT25	IT25
Onopordum acanthium	Scotch thistle	12/30/2008	40	1	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	45	6	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	45	7	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	12/30/2008	45	8	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	45	11	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	12/30/2008	45	12	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	45	14	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	7/7/1995	45	35	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	12/30/2008	45	37	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	53	1	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	53	4	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	53	5	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	53	7	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	12/30/2008	53	8	IT10	IT10	IT10
Onopordum acanthium	Scotch thistle	12/30/2008	53	9	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	53	10	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	53	12	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	53	17	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	53	18	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Onopordum acanthium	Scotch thistle	12/30/2008	53	19	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	12/30/2008	53	21	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	53	30	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	12/30/2008	53	31	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	7/7/1995	53	32	UEA40	AZGFD Trt	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	60	10	UEA40	AZGFD Trt	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	60	11	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	12/30/2008	60	13	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	12/30/2008	60	14	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	60	15	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	60	16	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	60	61	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	12/30/2008	60	62	Aspen Treatment	Aspen Treatment	Aspen Treatment
Onopordum acanthium	Scotch thistle	12/30/2008	60	63	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	8/20/2009	92	2	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	8/20/2009	92	3	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	8/20/2009	93	9	UEA25	UEA25	UEA25
Onopordum acanthium	Scotch thistle	8/20/2009	93	10	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	12/30/2008	93	11	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	8/20/2009	93	12	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	5/28/2002	94	6	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	5/28/2002	94	7	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	5/28/2002	94	8	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	7/7/1995	95	1	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	6/15/1998	99	9	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	8/1/2000	137	10	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Onopordum acanthium	Scotch thistle	8/1/2000	248	17	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	8/26/1997	344	18	Burn Only	Burn Only	Not PIPO or Filtered
Onopordum acanthium	Scotch thistle	7/7/1995	349	26	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	5/21/2009	1513	5	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	9/24/2009	1513	6	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	5/21/2009	1513	9	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	7/9/1997	1618	23	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	9/24/2009	1618	27	GL - Restoration	GL - Restoration	GL - Restoration
Onopordum acanthium	Scotch thistle	5/21/2009	1618	59	GL - Restoration	GL - Restoration	GL - Restoration
Onopordum acanthium	Scotch thistle	5/21/2009	1618	60	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	9/24/2009	2255	9	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	2/2/2002	2261	70	IT40	IT40	IT40
Onopordum acanthium	Scotch thistle	9/24/2009	2262	1	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	7/9/1998	2265	12	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	7/9/1998	2265	16	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	7/9/1998	2265	27	Burn Only	Burn Only	Burn Only
Onopordum acanthium	Scotch thistle	7/16/1997	2267	53	UEA25	UEA25	UEA25
Onopordum acanthium	Scotch thistle	7/16/1997	2267	54	Operational Burn	Operational Burn	Operational Burn
Onopordum acanthium	Scotch thistle	2/2/2002	2269	48	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	7/6/2009	2273	14	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	5/21/2009	2274	4	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	5/21/2009	2274	5	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	5/21/2009	2274	6	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	5/21/2009	2274	7	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	7/6/2009	2274	8	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	6/15/1998	2274	11	GL - Restoration	GL - Restoration	GL - Restoration

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Onopordum acanthium	Scotch thistle	5/21/2009	2274	12	UEA10	UEA10	UEA10
Onopordum acanthium	Scotch thistle	5/21/2009	2274	13	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	5/21/2009	2274	14	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	7/9/1998	2274	16	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	7/9/1998	2274	21	Operational Burn	GL - Restoration	Operational Burn
Onopordum acanthium	Scotch thistle	5/21/2009	2274	34	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	5/21/2009	2274	37	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	5/21/2009	2274	40	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	5/21/2009	2274	41	SI40	SI40	SI40
Onopordum acanthium	Scotch thistle	5/21/2009	2274	42	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	5/21/2009	2274	43	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	5/21/2009	2274	44	Savanna	Savanna	Savanna
Onopordum acanthium	Scotch thistle	5/21/2009	2274	55	UEA40	UEA40	UEA40
Onopordum acanthium	Scotch thistle	6/15/2010	2321	2	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	8/27/1997	18	12	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/27/1997	18	20	SI40	SI40	SI40
Cirsium vulgare	bull thistle	7/29/1997	22	4	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/29/1997	22	6	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	7/29/1997	22	17	PFA - UEA40	PFA - UEA40	PFA - UEA40
Cirsium vulgare	bull thistle	8/19/1997	22	36	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/29/1997	22	43	PFA - IT40	PFA - IT40	PFA - IT40
Cirsium vulgare	bull thistle	8/19/1997	22	45	PFA - UEA40	PFA - UEA40	PFA - UEA40
Cirsium vulgare	bull thistle	7/29/1997	23	18	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/29/1997	23	29	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	5/24/2010	27	1	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	5/24/2010	27	2	PFA - IT25	PFA - IT25	PFA - IT25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	6/15/2010	27	3	PFA - UEA25	PFA - UEA25	PFA - UEA25
Cirsium vulgare	bull thistle	6/15/2010	27	4	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/18/2000	27	6	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	9/14/2000	27	12	Burn Only	Burn Only	Not PIPO or Filtered
Cirsium vulgare	bull thistle	9/14/2000	27	14	Burn Only	Burn Only	Not PIPO or Filtered
Cirsium vulgare	bull thistle	7/18/2000	28	5	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	7/18/2000	28	6	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	6/15/2010	28	7	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	6/15/2010	28	8	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	9/14/2000	28	18	IT40	IT40	IT40
Cirsium vulgare	bull thistle	9/14/2000	28	20	IT40	IT40	IT40
Cirsium vulgare	bull thistle	6/15/2010	28	25	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	6/15/2010	28	26	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	6/15/2010	28	27	IT25	IT25	IT25
Cirsium vulgare	bull thistle	9/14/2000	29	3	IT40	IT40	IT40
Cirsium vulgare	bull thistle	8/11/1997	30	30	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	37	4	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	11/30/2009	37	5	Burn Only	Burn Only	Not PIPO or Filtered
Cirsium vulgare	bull thistle	11/30/2009	37	6	Burn Only	Burn Only	Not PIPO or Filtered
Cirsium vulgare	bull thistle	8/1/2000	39	65	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/20/1997	60	36	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/20/1997	60	55	IT40	IT40	IT40
Cirsium vulgare	bull thistle	8/20/1997	60	58	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	10/21/1999	65	21	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	10/21/1999	65	28	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	8/20/1997	67	3	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	8/8/1997	67	6	UEA40	AZGFD Trt	UEA40
Cirsium vulgare	bull thistle	8/3/2009	67	10	IT40	IT40	IT40
Cirsium vulgare	bull thistle	8/8/1997	77	15	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	10/21/1999	77	18	PFA - UEA10	PFA - UEA10	PFA - UEA10
Cirsium vulgare	bull thistle	10/21/1999	77	19	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/20/1997	78	2	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/2/1999	78	8	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	7/2/1999	78	11	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/8/1997	78	17	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	8/8/1997	78	19	PFA - IT25	PFA - IT25	PFA - IT25
Cirsium vulgare	bull thistle	10/21/1999	84	1	IT40	IT40	IT40
Cirsium vulgare	bull thistle	10/21/1999	84	5	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	10/21/1999	84	7	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	10/21/1999	84	15	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	10/21/1999	84	16	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	10/21/1999	84	18	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	10/21/1999	84	29	IT40	IT40	IT40
Cirsium vulgare	bull thistle	6/8/1999	85	3	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	5/24/1999	85	15	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	8/11/2009	86	1	PFA - IT25	PFA - IT25	PFA - IT25
Cirsium vulgare	bull thistle	8/11/2009	86	2	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	7/7/1999	86	3	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	8/11/2009	86	4	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	6/8/1999	86	26	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	5/13/1999	86	27	PFA - IT10	PFA - IT10	PFA - IT10
Cirsium vulgare	bull thistle	8/20/1997	87	1	UEA10	UEA10	UEA10

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	7/7/1999	87	6	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/7/1999	87	13	IT25	IT25	IT25
Cirsium vulgare	bull thistle	6/30/1999	87	18	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	6/30/1999	87	19	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	6/30/1999	87	20	IT40	IT40	IT40
Cirsium vulgare	bull thistle	6/30/1999	87	21	IT40	IT40	IT40
Cirsium vulgare	bull thistle	7/7/1999	87	23	IT25	IT25	IT25
Cirsium vulgare	bull thistle	6/30/1999	87	24	SI40	SI40	SI40
Cirsium vulgare	bull thistle	6/30/1999	87	28	SI10	SI10	SI10
Cirsium vulgare	bull thistle	8/4/2011	90	9	IT40	IT40	IT40
Cirsium vulgare	bull thistle	8/9/2011	90	10	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/7/1999	90	11	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	8/8/2011	90	14	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/2/2011	90	15	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/2/2011	90	16	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	8/4/2011	90	17	SI10	SI10	SI10
Cirsium vulgare	bull thistle	7/7/1995	90	19	IT25	IT25	IT25
Cirsium vulgare	bull thistle	8/20/1997	91	17	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/7/1995	95	1	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/7/1995	95	2	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	10/20/1999	95	4	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/7/1995	95	13	IT10	IT10	IT10
Cirsium vulgare	bull thistle	7/7/1995	95	14	IT25	IT25	IT25
Cirsium vulgare	bull thistle	10/20/1999	95	20	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	8/11/2011	96	3	IT25	IT25	IT25
Cirsium vulgare	bull thistle	8/11/2011	96	11	IT25	IT25	IT25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	8/11/2011	96	12	IT25	IT25	IT25
Cirsium vulgare	bull thistle	8/11/2011	96	13	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	10/20/1999	99	1	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/6/1999	100	15	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	10/20/1999	100	21	WUI55	WUI55	WUI55
Cirsium vulgare	bull thistle	8/2/2002	138	15	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	8/16/2011	173	4	MSO Target Trt	MSO Target Trt	MSO Target Trt
Cirsium vulgare	bull thistle	7/10/2000	181	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	6/29/2000	181	3	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	8/16/2011	181	4	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/16/2011	181	13	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	8/15/2001	341	35	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	8/16/2011	344	4	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	8/16/2011	344	5	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	8/16/2011	344	6	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	8/16/2011	344	19	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	6/14/2000	344	20	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/16/2011	344	21	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/16/2011	344	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/15/2001	349	26	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	7/29/1999	349	36	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	8/15/2001	350	25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	6/15/2000	354	11	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	10/15/1999	354	19	Burn Only	Burn Only	Not PIPO or Filtered
Cirsium vulgare	bull thistle	10/15/1999	354	26	Burn Only	Burn Only	Not PIPO or Filtered
Cirsium vulgare	bull thistle	6/15/2000	354	35	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	8/15/2001	363	13	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	8/15/2001	364	1	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/13/2000	368	12	Burn Only	Burn Only	Not PIPO or Filtered
Cirsium vulgare	bull thistle	9/2/1997	383	14	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	7/24/2000	411	16	IT40	IT40	IT40
Cirsium vulgare	bull thistle	6/17/1999	430	7	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Cirsium vulgare	bull thistle	10/3/2000	475	11	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Cirsium vulgare	bull thistle	9/22/1997	485	10	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Cirsium vulgare	bull thistle	9/22/1997	485	15	Operational Burn	Pot PAC GL Trt	Not PIPO or Filtered
Cirsium vulgare	bull thistle	9/22/1997	499	16	IT40	IT40	IT40
Cirsium vulgare	bull thistle	9/22/1997	500	10	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Cirsium vulgare	bull thistle	9/22/1997	501	15	IT10	IT10	IT10
Cirsium vulgare	bull thistle	9/22/1997	501	25	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	9/3/1997	505	4	IT40	IT40	IT40
Cirsium vulgare	bull thistle	10/4/2000	520	2	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	10/5/2000	520	4	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	10/4/2000	522	7	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/16/2011	532	2	Burn Only	Burn Only	Not PIPO or Filtered
Cirsium vulgare	bull thistle	9/17/2009	705	3	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	9/17/2009	705	4	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	9/17/2009	705	5	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	9/24/2009	1513	6	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	5/13/2009	1524	11	MSO Threshold Trt	MSO Threshold Trt	MSO Threshold Trt
Cirsium vulgare	bull thistle	8/4/1997	1524	24	MSO Target Trt	MSO Target Trt	MSO Target Trt
Cirsium vulgare	bull thistle	7/15/1997	1526	29	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/4/1997	1534	9	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	8/4/1997	1534	26	SI40	SI40	SI40
Cirsium vulgare	bull thistle	5/13/2009	1534	58	IT25	IT25	IT25
Cirsium vulgare	bull thistle	8/4/1997	1535	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	5/13/2009	1535	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/4/1997	1535	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/13/1997	1536	2	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	7/14/1997	1536	13	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/27/2010	1536	27	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/14/1997	1536	109	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/13/1997	1538	4	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/13/1997	1538	6	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/4/1997	1540	11	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	7/25/2011	1541	31	MSO Target Trt	MSO Target Trt	MSO Target Trt
Cirsium vulgare	bull thistle	7/25/2011	1541	32	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/25/2011	1541	33	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	8/4/1997	1541	37	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	7/25/2011	1541	130	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/27/2010	1542	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	7/14/1997	1550	20	IT25	IT25	IT25
Cirsium vulgare	bull thistle	7/14/1997	1550	24	IT40	IT40	IT40
Cirsium vulgare	bull thistle	8/4/1997	1551	222	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/25/2011	1552	2	IT40	IT40	IT40
Cirsium vulgare	bull thistle	7/25/2011	1552	3	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/10/2006	1552	31	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/10/2006	1552	36	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/10/2006	1554	1	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	8/10/2006	1554	8	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/9/1997	1565	1	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/14/1997	1573	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	7/14/1997	1573	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	7/14/1997	1573	30	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	9/24/2009	1618	7	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	9/24/2009	1618	11	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	9/24/2009	1618	16	GL - Restoration	GL - Restoration	GL - Restoration
Cirsium vulgare	bull thistle	9/24/2009	1618	27	GL - Restoration	GL - Restoration	GL - Restoration
Cirsium vulgare	bull thistle	9/24/2009	1618	28	GL - Restoration	GL - Restoration	GL - Restoration
Cirsium vulgare	bull thistle	8/31/2009	2212	34	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	5/16/2011	2218	6	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	5/16/2011	2218	11	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	8/31/2009	2218	14	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/29/1997	2218	21	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/31/2009	2218	25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	8/31/2009	2218	26	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	8/31/2009	2218	29	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	8/31/2009	2218	30	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	5/16/2011	2218	32	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	5/16/2011	2218	33	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	5/16/2011	2218	36	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	5/16/2011	2218	38	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	8/31/2009	2218	40	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	9/25/2009	2219	48	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	6/4/2010	2220	6	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	7/29/1997	2220	30	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/29/1997	2220	37	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/21/1997	2221	42	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	6/1/2007	2223	10	IT40	IT40	IT40
Cirsium vulgare	bull thistle	6/1/2007	2223	12	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	6/1/2007	2223	13	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	11/24/2009	2224	5	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	11/24/2009	2224	10	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	11/24/2009	2225	52	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	11/24/2009	2225	54	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	11/24/2009	2225	56	PFA - UEA40	PFA - UEA40	PFA - UEA40
Cirsium vulgare	bull thistle	11/24/2009	2225	59	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/24/2009	2229	1	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	7/24/2011	2230	52	IT40	IT40	IT40
Cirsium vulgare	bull thistle	7/24/2011	2230	53	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/24/2011	2230	57	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/24/2011	2230	60	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/24/2011	2230	62	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/24/2011	2230	63	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/24/2011	2230	64	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/24/2011	2230	67	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	10/5/2009	2231	25	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	9/16/2009	2231	29	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/21/1997	2232	1	PFA - UEA10	PFA - UEA10	PFA - UEA10
Cirsium vulgare	bull thistle	7/21/1997	2232	3	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2232	5	UEA25	UEA25	UEA25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	11/30/2009	2232	6	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/25/2011	2233	12	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	7/29/1997	2233	13	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	5/24/2010	2233	14	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	7/25/2011	2233	16	SI40	SI40	SI40
Cirsium vulgare	bull thistle	8/31/2009	2233	17	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/25/2011	2233	20	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	5/24/2010	2233	21	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	11/30/2009	2234	2	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	11/30/2009	2234	3	IT10	IT10	IT10
Cirsium vulgare	bull thistle	11/30/2009	2234	4	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	11/30/2009	2234	5	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2234	6	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2234	7	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered
Cirsium vulgare	bull thistle	11/30/2009	2234	8	IT40	IT40	IT40
Cirsium vulgare	bull thistle	11/30/2009	2234	10	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	11/30/2009	2234	11	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2234	12	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	11/30/2009	2234	13	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	11/30/2009	2234	15	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	11/30/2009	2234	16	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered
Cirsium vulgare	bull thistle	11/30/2009	2234	17	IT10	IT10	IT10
Cirsium vulgare	bull thistle	11/30/2009	2234	18	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2234	20	Not PIPO or Filtered	Burn Only - Core Area Draft	Not PIPO or Filtered
Cirsium vulgare	bull thistle	11/30/2009	2235	1	IT40	IT40	IT40
Cirsium vulgare	bull thistle	11/30/2009	2235	2	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	11/30/2009	2235	3	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	11/30/2009	2235	4	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2235	6	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/21/1997	2235	7	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	11/30/2009	2235	11	IT40	IT40	IT40
Cirsium vulgare	bull thistle	11/30/2009	2235	39	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	11/30/2009	2235	58	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2236	1	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	11/30/2009	2236	2	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	11/30/2009	2236	3	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	11/30/2009	2236	7	Aspen Treatment	Aspen Treatment	Aspen Treatment
Cirsium vulgare	bull thistle	11/30/2009	2236	14	SI25	SI25	SI25
Cirsium vulgare	bull thistle	11/30/2009	2236	16	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	11/30/2009	2236	17	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	11/30/2009	2236	18	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	7/21/1997	2236	19	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	11/30/2009	2237	10	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	11/30/2009	2237	12	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	11/30/2009	2237	13	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2237	14	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	11/30/2009	2237	15	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2237	17	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	11/30/2009	2237	18	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	7/30/1997	2237	20	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/30/1997	2237	25	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/30/1997	2237	26	SI40	SI40	SI40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	10/21/2009	2237	28	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	10/21/2009	2237	31	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	11/30/2009	2237	33	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	7/30/1997	2237	41	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	10/5/2009	2237	47	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2238	20	IT10	IT10	IT10
Cirsium vulgare	bull thistle	10/5/2009	2238	25	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/24/2011	2241	18	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/24/2011	2241	19	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/24/2011	2241	20	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/24/2011	2241	22	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/24/2011	2241	23	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/24/2011	2241	32	IT25	IT25	IT25
Cirsium vulgare	bull thistle	7/22/1997	2245	14	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/22/1997	2245	15	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/6/2009	2245	27	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/16/1997	2245	28	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/22/1997	2245	36	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/22/1997	2245	42	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/6/2009	2245	43	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/22/1997	2246	6	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/6/2009	2246	9	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/22/1997	2246	11	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/22/1997	2246	12	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/22/1997	2247	1	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/22/1997	2247	4	UEA10	UEA10	UEA10

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	7/22/1997	2247	29	IT10	IT10	IT10
Cirsium vulgare	bull thistle	8/18/1997	2248	7	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/18/1997	2248	13	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/18/1997	2248	14	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/18/1997	2248	15	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/18/1997	2248	17	IT40	IT40	IT40
Cirsium vulgare	bull thistle	12/27/2010	2248	18	IT40	IT40	IT40
Cirsium vulgare	bull thistle	12/27/2010	2253	11	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	12/27/2010	2254	72	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	7/30/1997	2256	21	UEA40	AZGFD Trt	UEA40
Cirsium vulgare	bull thistle	7/30/1997	2256	38	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/30/1997	2256	47	IT40	IT40	IT40
Cirsium vulgare	bull thistle	7/30/1997	2256	74	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	7/30/1997	2256	90	IT40	IT40	IT40
Cirsium vulgare	bull thistle	7/30/1997	2258	3	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	11/30/2009	2258	53	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/18/1997	2261	26	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/18/1997	2261	102	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Cirsium vulgare	bull thistle	9/23/2009	2262	26	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	10/14/2009	2263	4	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	10/14/2009	2263	5	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	10/14/2009	2263	19	PFA - IT40	PFA - IT40	PFA - IT40
Cirsium vulgare	bull thistle	10/14/2009	2263	26	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	10/14/2009	2263	27	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	11/10/2009	2263	29	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	11/10/2009	2263	31	IT40	IT40	IT40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	10/14/2009	2263	48	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	10/14/2009	2263	49	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	10/14/2009	2263	52	IT10	IT10	IT10
Cirsium vulgare	bull thistle	11/10/2009	2263	59	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/18/1997	2264	1	IT40	IT40	IT40
Cirsium vulgare	bull thistle	6/18/2009	2264	27	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	6/11/2010	2266	3	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	12/27/2010	2267	1	IT40	IT40	IT40
Cirsium vulgare	bull thistle	7/22/1997	2267	49	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/22/1997	2267	51	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/16/1997	2267	53	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/16/1997	2267	54	Operational Burn	Operational Burn	Operational Burn
Cirsium vulgare	bull thistle	7/16/1997	2267	68	IT25	IT25	IT25
Cirsium vulgare	bull thistle	8/31/2009	2272	5	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	5/12/2009	2274	4	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	5/12/2009	2274	5	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	5/12/2009	2274	6	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	5/12/2009	2274	7	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	5/12/2009	2274	12	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	5/12/2009	2274	13	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	5/12/2009	2274	14	Operational Burn	GL - Restoration	Operational Burn
Cirsium vulgare	bull thistle	5/12/2009	2274	34	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	5/12/2009	2274	37	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	5/12/2009	2274	40	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	5/12/2009	2274	41	SI40	SI40	SI40
Cirsium vulgare	bull thistle	5/12/2009	2274	42	Savanna	Savanna	Savanna

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	5/12/2009	2274	43	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	5/12/2009	2274	44	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	5/12/2009	2274	55	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/5/1997	2284	6	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/5/1997	2284	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/5/1997	2284	28	Savanna	Savanna	Savanna
Cirsium vulgare	bull thistle	8/5/1997	2284	29	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/5/1997	2285	39	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/5/1997	2285	47	IT40	IT40	IT40
Cirsium vulgare	bull thistle	8/5/1997	2285	52	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/5/1997	2285	53	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/5/1997	2285	55	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/6/1997	2285	58	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	9/23/2009	2295	16	SI40	SI40	SI40
Cirsium vulgare	bull thistle	8/13/1997	2296	9	IT40	IT40	IT40
Cirsium vulgare	bull thistle	8/13/1997	2296	19	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	8/13/1997	2296	21	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	8/13/1997	2296	27	IT40	IT40	IT40
Cirsium vulgare	bull thistle	8/13/1997	2298	24	UEA40	UEA40	UEA40
Cirsium vulgare	bull thistle	8/13/1997	2298	26	IT40	IT40	IT40
Cirsium vulgare	bull thistle	7/14/1997	2299	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Cirsium vulgare	bull thistle	7/27/2010	2318	5	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	6/23/2011	2318	6	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	6/23/2011	2318	8	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	6/23/2011	2318	12	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	6/23/2011	2318	13	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Cirsium vulgare	bull thistle	6/23/2011	2318	13	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2318	24	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/25/2011	2318	29	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	7/25/2011	2318	30	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/25/2011	2318	32	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2318	44	UEA10	UEA10	UEA10
Cirsium vulgare	bull thistle	11/30/2009	2318	45	UEA25	UEA25	UEA25
Cirsium vulgare	bull thistle	7/29/1997	2318	47	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/30/2009	2318	49	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	7/29/1997	2318	55	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/6/2009	2320	10	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/6/2009	2320	11	Burn Only	Burn Only	Burn Only
Cirsium vulgare	bull thistle	11/9/2009	4025	28	PineSage	PineSage	PineSage
Cirsium vulgare	bull thistle	11/9/2009	4139	3	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	84	14	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	84	30	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	12/30/2008	84	31	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	84	33	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	12/30/2008	85	11	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	8/6/2009	91	26	dPFA - IT25	dPFA - IT25	dPFA - IT25
Centaurea diffusa	diffuse knapweed	8/6/2009	91	27	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	8/6/2009	91	28	SI10	SI10	SI10
Centaurea diffusa	diffuse knapweed	9/29/2009	92	2	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/29/2009	92	3	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	9/29/2009	93	9	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/29/2009	93	10	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Centaurea diffusa	diffuse knapweed	9/29/2009	93	12	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	12/30/2008	94	7	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	12/30/2008	94	14	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	99	1	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	12/30/2008	99	2	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	12/30/2008	99	4	SI25	SI25	SI25
Centaurea diffusa	diffuse knapweed	12/30/2008	99	9	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	99	13	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	12/30/2008	99	15	IT25	IT25	IT25
Centaurea diffusa	diffuse knapweed	12/30/2008	99	20	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	12/30/2008	100	13	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	137	10	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	138	15	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	173	5	Burn Only	Burn Only	Not PIPO or Filtered
Centaurea diffusa	diffuse knapweed	9/28/2009	173	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	9/28/2009	173	10	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	173	12	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	173	14	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	181	3	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	181	4	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	9/28/2009	181	5	IT10	IT10	IT10
Centaurea diffusa	diffuse knapweed	9/28/2009	181	6	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	12/30/2008	220	4	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	6/17/2008	221	3	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	221	6	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	221	7	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Centaurea diffusa	diffuse knapweed	6/17/2008	221	16	Operational Burn	Operational Burn	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	229	8	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	7/15/2005	229	23	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	7/15/2005	229	24	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	4/30/2012	232	1	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	4/30/2012	232	11	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/16/1999	234	3	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	239	1	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	239	3	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	239	5	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	239	6	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	239	7	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	4/30/2012	239	11	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	239	13	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/16/1999	241	1	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	247	22	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	247	25	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	247	26	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	248	1	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	248	2	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	12/30/2008	248	4	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	4/28/2011	248	7	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/6/2009	248	8	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	8/6/2009	248	17	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	4/28/2011	249	2	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/1/2000	249	3	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Centaurea diffusa	diffuse knapweed	8/10/1999	249	6	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/10/1999	249	7	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/6/2009	249	13	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/16/1999	249	25	Operational Burn	Operational Burn	Operational Burn
Centaurea diffusa	diffuse knapweed	8/6/2009	250	2	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/6/2009	250	4	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	4/28/2011	250	5	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/6/2009	250	7	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	5/17/2012	261	2	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	5/17/2012	261	3	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	5/17/2012	261	4	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	5/17/2012	261	5	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	4/28/2011	261	10	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	5/17/2012	261	11	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	8/6/2009	271	4	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	7/12/1999	271	14	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	325	13	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	9/28/2009	325	16	PFA - IT40	PFA - IT40	PFA - IT40
Centaurea diffusa	diffuse knapweed	9/28/2009	325	19	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	9/28/2009	335	1	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	335	2	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	335	4	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	335	6	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	9/28/2009	335	7	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	335	8	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	9/28/2009	335	9	Burn Only	Burn Only	Burn Only

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Centaurea diffusa	diffuse knapweed	9/28/2009	335	10	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	9/28/2009	335	11	IT10	IT10	IT10
Centaurea diffusa	diffuse knapweed	9/28/2009	335	12	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	335	13	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	9/28/2009	335	14	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	335	15	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	9/28/2009	335	16	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	9/28/2009	335	19	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	335	20	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	335	22	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	336	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	9/28/2009	336	2	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	9/28/2009	336	22	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	9/28/2009	336	23	WUI55	WUI55	WUI55
Centaurea diffusa	diffuse knapweed	9/28/2009	344	1	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	9/28/2009	344	14	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	344	15	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	344	18	Burn Only	Burn Only	Not PIPO or Filtered
Centaurea diffusa	diffuse knapweed	9/28/2009	344	19	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	344	22	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	9/28/2009	344	23	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	344	24	Burn Only	Burn Only	Not PIPO or Filtered
Centaurea diffusa	diffuse knapweed	9/28/2009	345	1	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	345	19	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	7/13/2011	345	20	Burn Only	Burn Only	Not PIPO or Filtered
Centaurea diffusa	diffuse knapweed	7/19/2011	345	21	SI25	SI25	SI25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Centaurea diffusa	diffuse knapweed	9/28/2009	345	32	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	7/19/2011	345	33	SI25	SI25	SI25
Centaurea diffusa	diffuse knapweed	7/13/2011	345	34	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	9/28/2009	345	35	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	345	36	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	7/13/2011	345	37	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	345	43	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	7/13/2011	345	49	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	7/20/2011	354	2	IT10	IT10	IT10
Centaurea diffusa	diffuse knapweed	7/20/2011	354	5	Burn Only	Burn Only	Not PIPO or Filtered
Centaurea diffusa	diffuse knapweed	9/28/2009	354	10	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	10/15/1999	354	14	Burn Only	Burn Only	Not PIPO or Filtered
Centaurea diffusa	diffuse knapweed	9/28/2009	354	15	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	9/28/2009	354	16	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	354	17	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	354	18	SI40	SI40	SI40
Centaurea diffusa	diffuse knapweed	9/28/2009	354	20	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	5/1/2009	354	21	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	354	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	5/1/2009	354	30	UEA10	UEA10	UEA10
Centaurea diffusa	diffuse knapweed	9/28/2009	354	34	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	7/20/2011	354	35	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	355	1	SI25	SI25	SI25
Centaurea diffusa	diffuse knapweed	9/28/2009	355	2	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	368	3	MSO Target Trt	MSO Target Trt	MSO Target Trt
Centaurea diffusa	diffuse knapweed	10/15/1999	368	11	Burn Only	Burn Only	Not PIPO or Filtered

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Centaurea diffusa	diffuse knapweed	9/28/2009	368	31	MSO Target Trt	MSO Target Trt	MSO Target Trt
Centaurea diffusa	diffuse knapweed	9/28/2009	368	32	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	369	1	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	9/28/2009	369	15	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	7/26/2011	378	1	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	6/15/2010	378	2	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	9/28/2009	383	18	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	9/28/2009	384	1	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	384	14	GL - Restoration	GL - Restoration	GL - Restoration
Centaurea diffusa	diffuse knapweed	9/28/2009	394	25	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	9/28/2009	394	26	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	395	14	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	6/20/2010	405	5	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	11/6/2000	405	8	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Centaurea diffusa	diffuse knapweed	7/26/2011	406	1	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	6/20/2010	406	2	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	6/15/2010	406	4	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	6/15/2010	406	5	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	6/15/2010	406	15	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/20/2011	410	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	9/20/2011	410	6	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	9/20/2011	410	9	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	7/19/2011	410	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	7/19/2011	410	21	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	7/19/2011	410	22	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	9/20/2011	410	23	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Centaurea diffusa	diffuse knapweed	9/28/2009	410	24	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	7/19/2011	410	25	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/20/2011	410	27	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	410	28	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	7/19/2011	410	34	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/20/2011	410	35	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	411	1	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	9/28/2009	411	2	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	4/2/2002	411	3	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	6/7/2010	411	16	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	7/19/2011	411	20	SI40	SI40	SI40
Centaurea diffusa	diffuse knapweed	7/19/2011	411	21	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	411	23	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	7/19/2011	411	29	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	6/7/2010	424	27	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	6/7/2010	424	28	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	7/19/2011	425	25	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	7/19/2011	425	26	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	425	27	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	7/19/2011	425	29	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	8/6/2009	459	7	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	459	10	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	5/18/2011	468	2	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	470	13	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	471	3	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	8/6/2009	471	5	PFA - IT40	PFA - IT40	PFA - IT40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Centaurea diffusa	diffuse knapweed	9/28/2009	471	10	Savanna	Savanna	Savanna
Centaurea diffusa	diffuse knapweed	9/28/2009	472	1	IT40	IT40	IT40
Centaurea diffusa	diffuse knapweed	9/28/2009	472	2	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	472	3	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	472	5	SI40	SI40	SI40
Centaurea diffusa	diffuse knapweed	9/28/2009	472	6	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	472	7	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	472	10	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	472	15	SI40	SI40	SI40
Centaurea diffusa	diffuse knapweed	9/28/2009	473	18	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	473	21	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	475	16	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/1/1999	480	3	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	495	12	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	509	1	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	509	5	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	510	1	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	510	21	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	511	4	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	511	10	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	511	11	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	511	12	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	511	13	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	512	1	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	512	2	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	512	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Centaurea diffusa	diffuse knapweed	9/28/2009	512	9	Burn Only	Burn Only	Burn Only
Centaurea diffusa	diffuse knapweed	9/28/2009	519	1	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	519	2	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	519	23	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	9/28/2009	520	1	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	520	5	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	520	11	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	9/28/2009	520	12	UEA25	UEA25	UEA25
Centaurea diffusa	diffuse knapweed	9/28/2009	1216	1	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	12/27/2010	1618	6	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	12/27/2010	1618	23	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/27/2010	2255	9	Operational Burn	GL - Restoration	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	2261	44	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Centaurea diffusa	diffuse knapweed	12/30/2008	2300	8	Operational Burn	Operational Burn	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	2300	10	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	12/30/2008	2300	11	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	12/30/2008	2300	13	UEA40	UEA40	UEA40
Centaurea diffusa	diffuse knapweed	12/30/2008	2300	19	Operational Burn	Operational Burn	Operational Burn
Centaurea diffusa	diffuse knapweed	12/30/2008	2300	22	Operational Burn	Operational Burn	Operational Burn
Centaurea diffusa	diffuse knapweed	7/22/1997	4057	3	PineSage	PineSage	PineSage
Centaurea maculosa	spotted knapweed	11/2/2002	91	11	Burn Only	Burn Only	Burn Only
Centaurea maculosa	spotted knapweed	7/26/2011	349	26	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	65	18	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	65	23	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	65	24	IT25	IT25	IT25
Bromus tectorum	cheatgrass	5/28/2002	84	14	Operational Burn	GL - Restoration	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	5/28/2002	84	30	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	5/28/2002	84	32	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	5/28/2002	84	33	IT40	IT40	IT40
Bromus tectorum	cheatgrass	5/28/2002	84	41	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	8/9/2011	90	1	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	8/8/2011	90	4	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	8/8/2011	90	6	IT40	IT40	IT40
Bromus tectorum	cheatgrass	8/9/2011	90	11	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	8/8/2011	90	12	IT40	IT40	IT40
Bromus tectorum	cheatgrass	8/2/2011	90	15	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	8/8/2011	90	16	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	8/10/2011	92	5	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	8/10/2011	92	7	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/28/2002	94	7	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	94	8	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	94	14	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	8/9/2011	95	14	IT25	IT25	IT25
Bromus tectorum	cheatgrass	8/11/2011	96	3	IT25	IT25	IT25
Bromus tectorum	cheatgrass	8/11/2011	96	5	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	8/11/2011	96	11	IT25	IT25	IT25
Bromus tectorum	cheatgrass	8/11/2011	96	12	PFA - IT25	PFA - IT25	PFA - IT25
Bromus tectorum	cheatgrass	8/11/2011	96	13	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	8/11/2011	96	18	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	7/13/2010	155	6	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	7/13/2010	162	1	IT10	IT10	IT10
Bromus tectorum	cheatgrass	7/13/2010	162	27	IT40	IT40	IT40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	7/13/2010	163	6	IT40	IT40	IT40
Bromus tectorum	cheatgrass	10/17/2011	167	16	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	7/13/1999	221	5	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/13/1999	221	7	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/13/1999	221	12	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/13/1999	221	16	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	7/7/1999	222	7	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/27/1999	232	1	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/25/1999	232	2	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/7/1999	239	1	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/30/1999	248	6	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/16/1999	248	8	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	2/1/2000	248	10	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/30/1999	248	12	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	6/17/1999	248	14	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	4/12/2005	317	5	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	8/16/2011	336	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/16/2011	344	14	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	8/16/2011	344	19	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	8/16/2011	344	20	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	7/7/2003	350	3	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	7/7/2003	350	9	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	7/7/2003	350	10	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	7/7/2003	350	19	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	8/15/2001	350	25	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	8/15/2001	364	1	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	8/15/2001	375	17	IT40	IT40	IT40
Bromus tectorum	cheatgrass	10/19/2000	378	2	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	10/20/2000	378	5	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	7/31/2003	389	11	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Bromus tectorum	cheatgrass	7/31/2003	390	3	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	7/31/2003	390	6	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Bromus tectorum	cheatgrass	7/31/2003	399	8	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Bromus tectorum	cheatgrass	7/31/2003	399	19	Pot PAC Trt	Pot PAC Trt	Pot PAC Trt
Bromus tectorum	cheatgrass	8/15/2001	405	5	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	8/15/2001	405	9	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	8/15/2001	405	12	IT40	IT40	IT40
Bromus tectorum	cheatgrass	8/15/2001	405	18	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	10/19/2000	406	1	IT40	IT40	IT40
Bromus tectorum	cheatgrass	8/15/2001	420	1	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	420	2	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	421	3	SI40	SI40	SI40
Bromus tectorum	cheatgrass	8/15/2001	421	3	SI40	SI40	SI40
Bromus tectorum	cheatgrass	8/15/2001	421	16	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	8/15/2001	421	17	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	421	18	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	8/15/2001	421	19	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	421	20	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	8/15/2001	421	29	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	435	3	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	8/15/2001	435	5	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	435	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	8/15/2001	435	12	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	436	4	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	436	14	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	436	15	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	454	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	466	3	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	8/15/2001	490	1	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	8/15/2001	490	3	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	8/15/2001	490	4	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	8/15/2001	490	12	SI25	SI25	SI25
Bromus tectorum	cheatgrass	8/15/2001	503	11	IT40	IT40	IT40
Bromus tectorum	cheatgrass	8/15/2001	504	1	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	8/15/2001	504	2	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	8/15/2001	504	4	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	8/15/2001	504	16	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	10/2/2000	510	14	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	9/3/2002	525	9	Burn Only	Burn Only	Not PIPO or Filtered
Bromus tectorum	cheatgrass	8/15/2001	528	10	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	8/15/2001	528	11	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	1504	81	PFA - UEA40	PFA - UEA40	PFA - UEA40
Bromus tectorum	cheatgrass	5/18/2009	1526	29	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/18/2009	1526	30	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	11/30/2009	1528	22	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	11/30/2009	1528	36	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	5/18/2009	1532	18	IT40	IT40	IT40
Bromus tectorum	cheatgrass	5/18/2009	1532	79	Operational Burn	Operational Burn	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	5/28/2002	1534	6	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	12/1/2009	1534	27	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	12/1/2009	1535	8	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	5/13/2009	1540	1	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	8/27/2010	1554	6	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	6/10/2010	1559	3	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/10/2010	1559	5	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/10/2010	1559	8	IT40	IT40	IT40
Bromus tectorum	cheatgrass	6/10/2010	1559	19	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	6/10/2010	1559	21	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	6/10/2010	1559	22	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/10/2010	1559	23	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	6/10/2010	1559	39	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	6/10/2010	1560	1	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/10/2010	1560	2	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/10/2010	1560	3	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/10/2010	1560	4	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/10/2010	1560	12	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	6/10/2010	1560	13	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/10/2010	1560	14	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	5/28/2002	1566	62	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	1566	65	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	1566	79	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/28/2002	1569	34	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/28/2002	1573	18	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	5/28/2002	1573	21	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	6/22/2009	1577	7	MSO Restricted Trt	MSO Restricted Trt	MSO Restricted Trt
Bromus tectorum	cheatgrass	6/22/2009	1579	5	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/3/2012	1580	1	IT10	IT10	IT10
Bromus tectorum	cheatgrass	5/3/2012	1580	4	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/3/2012	1580	6	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/3/2012	1580	7	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/3/2012	1580	9	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/3/2012	1580	10	IT40	IT40	IT40
Bromus tectorum	cheatgrass	5/3/2012	1580	11	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/3/2012	1580	12	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/3/2012	1580	13	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/3/2012	1580	14	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/10/2010	1580	19	IT40	IT40	IT40
Bromus tectorum	cheatgrass	5/3/2012	1580	20	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/3/2012	1580	21	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/3/2012	1580	22	SI40	SI40	SI40
Bromus tectorum	cheatgrass	5/3/2012	1580	23	IT40	IT40	IT40
Bromus tectorum	cheatgrass	5/3/2012	1580	24	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/3/2012	1580	26	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/10/2010	1580	31	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	6/10/2010	1580	43	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	6/1/2010	2216	7	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/1/2010	2218	6	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/1/2010	2218	11	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	8/31/2009	2218	29	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	8/31/2009	2218	31	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	6/1/2010	2218	33	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/1/2010	2218	36	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/1/2010	2218	38	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/4/2010	2219	6	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	8/31/2009	2219	7	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/1/2010	2219	18	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/1/2010	2219	40	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	6/1/2010	2219	47	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/4/2010	2220	6	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/4/2010	2220	10	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/1/2010	2220	37	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/28/2002	2221	8	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2221	42	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2222	23	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2224	18	WUI55	WUI55	WUI55
Bromus tectorum	cheatgrass	5/28/2002	2230	52	IT40	IT40	IT40
Bromus tectorum	cheatgrass	5/28/2002	2231	1	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2231	5	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2231	30	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2231	31	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2231	32	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2232	8	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	8/31/2009	2233	21	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2238	5	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/28/2002	2238	29	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/28/2002	2238	47	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	5/28/2002	2243	35	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2244	31	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2245	1	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/28/2002	2253	11	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2254	1	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/28/2002	2254	30	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2254	46	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	5/28/2002	2254	51	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2254	52	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2254	56	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/28/2002	2254	67	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2254	68	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2254	72	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2255	9	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2255	12	IT25	IT25	IT25
Bromus tectorum	cheatgrass	5/28/2002	2256	16	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2256	58	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2257	17	WUI55	WUI55	WUI55
Bromus tectorum	cheatgrass	5/28/2002	2257	23	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/26/2009	2260	1	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2260	15	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Bromus tectorum	cheatgrass	5/28/2002	2260	17	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Bromus tectorum	cheatgrass	5/28/2002	2260	19	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/28/2002	2260	28	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2260	38	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2261	1	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	5/28/2002	2261	3	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/28/2002	2261	5	dPFA - UEA40	dPFA - UEA40	dPFA - UEA40
Bromus tectorum	cheatgrass	5/28/2002	2261	27	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2261	28	SI40	SI40	SI40
Bromus tectorum	cheatgrass	5/28/2002	2261	51	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	5/28/2002	2261	66	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2261	73	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/28/2002	2262	1	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2262	4	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2262	11	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2262	15	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2262	27	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/26/2009	2262	30	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2262	31	SI40	SI40	SI40
Bromus tectorum	cheatgrass	5/28/2002	2262	36	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2262	48	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	5/28/2002	2263	41	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2263	49	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2263	60	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2264	2	IT40	IT40	IT40
Bromus tectorum	cheatgrass	5/28/2002	2264	8	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	6/18/2009	2264	27	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2264	41	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2264	42	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2264	56	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2265	2	Operational Burn	GL - Restoration	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	5/28/2002	2265	14	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2265	15	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2265	24	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2265	26	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2265	31	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2266	22	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2266	41	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2266	44	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2266	48	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2267	20	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/28/2002	2267	25	PFA - UEA25	PFA - UEA25	PFA - UEA25
Bromus tectorum	cheatgrass	5/28/2002	2267	26	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/28/2002	2268	4	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	5/28/2002	2268	5	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/28/2002	2268	22	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	5/28/2002	2268	24	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2268	25	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2268	26	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2268	27	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	5/28/2002	2268	32	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2268	33	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2269	52	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2270	37	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2272	34	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2273	15	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	5/28/2002	2275	9	Operational Burn	GL - Restoration	Operational Burn

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	5/28/2002	2275	19	IT40	IT40	IT40
Bromus tectorum	cheatgrass	5/28/2002	2275	19	IT40	IT40	IT40
Bromus tectorum	cheatgrass	5/28/2002	2275	21	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2276	13	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2276	28	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2276	29	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2276	35	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2276	36	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2276	37	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/28/2002	2276	42	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	5/28/2002	2276	51	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	5/28/2002	2276	62	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2277	2	Savanna	Savanna	Savanna
Bromus tectorum	cheatgrass	5/28/2002	2277	24	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2278	1	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2278	2	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2278	4	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2278	5	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2278	6	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2278	8	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	5/28/2002	2278	19	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2278	23	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2278	31	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2294	13	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2294	15	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2300	13	UEA40	UEA40	UEA40

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	5/28/2002	2300	19	Operational Burn	Operational Burn	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2300	21	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2303	1	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	5/28/2002	2303	4	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2303	5	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2303	11	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2318	2	GL - Restoration	GL - Restoration	GL - Restoration
Bromus tectorum	cheatgrass	5/28/2002	2318	5	UEA10	UEA10	UEA10
Bromus tectorum	cheatgrass	11/6/2009	2320	10	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	11/6/2009	2320	11	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	5/28/2002	2320	46	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2321	2	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2321	8	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	5/28/2002	2322	1	Operational Burn	GL - Restoration	Operational Burn
Bromus tectorum	cheatgrass	7/3/2010	4055	5	dPFA - UEA25	dPFA - UEA25	dPFA - UEA25
Bromus tectorum	cheatgrass	7/3/2010	4055	6	dPFA - PineSage	dPFA - PineSage	dPFA - PineSage
Bromus tectorum	cheatgrass	7/3/2010	4059	23	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4059	25	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4060	13	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4060	14	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4060	15	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4060	16	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	7/3/2010	4060	17	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4060	18	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	6/4/2010	4083	1	PineSage	PineSage	PineSage
Bromus tectorum	cheatgrass	7/3/2010	4088	12	UEA25	UEA25	UEA25

Scientific name	Common name	Date	Location	Site	Alternative B	Alternative C	Alternative D
Bromus tectorum	cheatgrass	7/3/2010	4088	13	UEA40	UEA40	UEA40
Bromus tectorum	cheatgrass	7/3/2010	4088	15	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4088	18	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4088	19	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4088	20	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	7/3/2010	4088	26	Burn Only	Burn Only	Burn Only
Bromus tectorum	cheatgrass	4/27/2009	4090	11	UEA25	UEA25	UEA25
Bromus tectorum	cheatgrass	4/27/2009	4140	8	Burn Only	Burn Only	Burn Only
Tamarix aphylla	Athel tamarisk	7/2/2002	336	13	UEA40	UEA40	UEA40
Tamarix ramosissima	saltcedar	7/2/2002	336	13	UEA40	UEA40	UEA40
Tamarix ramosissima	saltcedar	5/28/2002	2266	41	Savanna	Savanna	Savanna
Tamarix ramosissima	saltcedar	5/28/2002	2268	31	GL - Restoration	GL - Restoration	GL - Restoration
Salvia aethiopis	Mediterranean sage	8/15/2001	341	35	Operational Burn	GL - Restoration	Operational Burn
Salvia aethiopis	Mediterranean sage	8/15/2001	349	26	Operational Burn	GL - Restoration	Operational Burn
Salvia aethiopis	Mediterranean sage	7/7/1995	350	29	Operational Burn	GL - Restoration	Operational Burn
Salvia aethiopis	Mediterranean sage	8/15/2001	363	13	Operational Burn	GL - Restoration	Operational Burn
Salvia aethiopis	Mediterranean sage	8/15/2001	364	1	UEA40	UEA40	UEA40
Salvia aethiopis	Mediterranean sage	8/15/2001	375	17	IT40	IT40	IT40
Salvia aethiopis	Mediterranean sage	10/20/2000	378	2	Savanna	Savanna	Savanna
Salvia aethiopis	Mediterranean sage	7/1/1999	378	14	SI40	SI40	SI40

Appendix C. Noxious or invasive weed priority list from Grand Canyon National Park (2012)

Courtesy of Lori Makarick (GCNP)

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
	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	puncturevine	Zygophyllaceae
	Ulmus pumila	Siberian elm	Ulmaceae
	Verbascum thapsus	common mullein	Scrophulariaceae
	Vinca minor	common periwinkle	Apocynaceae
	Tamarix ramosissima	salt cedar	Tamaricaceae
	Tribulus terrestris	puncturevine	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 and Kaibab 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 and Kaibab National Forests. 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.

Alternative C

Amendment 2 to the Kaibab NF plan would be complementary to the portion of the Botany Specialist Report that addresses the effects to the Garland Prairie RNA. The amendment would add language to allow prescribed fire and mechanical treatments in order to maintain and/or restore the ecological qualities of the area. The effects to sensitive plants and noxious or invasive weeds resulting from the change in management of this area will be the same as those to similar areas discussed in the Botany Specialists Report. The area was analyzed in the 1987 plan as a potential RNA but the process to designate and establish the RNA was never completed. As a result, restrictions to the area currently remain in place. The restrictions on management activities in the area that result from the RNA designation will no longer apply when the revised Forest Plan is completed and implemented. In the revised forest plan (2012), the area will be managed as the Garland Prairie Management Area.

The treatments proposed in Alternative C would benefit the understory vegetation community in the RNA by reintroducing natural processes and reducing competition from trees to grassland plants and would achieve the goal of restoring fire. The

management actions in Alternative C would move the area toward this condition, which would be complementary to the objectives of the Kaibab NF plan (1987) and 4FRI.

Currently, the proposed RNA is heavily encroached upon by small- to mid-diameter ponderosa pine trees and has infestations of Dalmation toadflax, a noxious or invasive weed. Historically, grassland communities on the forest had less than 10 percent tree cover. Impacts from grazing, logging, and fire suppression practices reduced or eliminated the vegetation necessary to carry low-intensity surface fires across the landscape, thereby altering the natural fire regimes and allowing uncharacteristic forest succession to take place. In addition to past practices, the location of the proposed RNA within the urban interface has hindered the ability to use fire as a natural process within the RNA (Kaibab NF 2012).
If Alternative C is selected it would result in changing the nature of the area, making the area unacceptable for consideration as a Research Natural Area. This would be an adverse and irretrievable effect under most circumstances if the area had been officially designated as a Research Natural Area. The amendment will remove those conflicts and allow the treatments proposed in 4FRI to proceed.