

# United States Department of the Interior Bureau of Land Management

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Environmental Assessment UT- 040-09-03

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## Upper Kanab Creek Watershed Vegetation Management Project *Location: Kane County, Utah*



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## Table of Contents

<b>Table of Contents .....</b>	<b>i</b>
<b>1.0 Purpose and Need .....</b>	<b>1</b>
1.1. Introduction .....	1
1.2. Background.....	1
1.3. Purpose and Need for the Proposed Action.....	1
1.4. Conformance with BLM Land Use Plan(s).....	3
1.5. Relationship to Statutes, Regulations, or other Plans .....	4
1.6. Identification of Issues .....	8
1.6.1. Critical Elements of the Human Environment and other Resources/Concerns.....	9
1.7. Summary.....	11
<b>2.0 Description of Alternatives, Including Proposed Action .....</b>	<b>12</b>
2.1. Introduction .....	12
2.2. Additional Components Common to All Action Alternatives .....	16
2.3. Alternative A – UKCWVMP Proposed Action .....	20
2.4. Alternative B – UKCWVMP No Action .....	21
2.5. Alternative C – UKCWVMP– Kanab Field Office Portion Only.....	21
2.6. Alternative D UKCWVMP – Grand Staircase Escalante National Monument Portion Only.....	22
2.7. Summary of Action Alternatives.....	23
2.8. Alternatives Considered, but Eliminated from Further Action .....	23
<b>3.0 Affected Environment.....</b>	<b>24</b>
3.1. General Setting .....	24
3.2. Affected Environment – Resources/Issues Identified and Brought Forward for Analysis	24
3.2.1. Cultural Resources .....	24
3.2.2. Fire and Fuels .....	25
3.2.3. Greenhouse Gas Emissions.....	27
3.2.4. Range/Livestock .....	27
3.2.5. Recreation .....	30
3.2.6. Soils .....	30
3.2.7. Visual Resource Management (VRM).....	33
3.2.8. Natural Areas (KFO), WSA (GSENM) .....	35
3.2.9. Wildlife (including Special Status species) .....	35

3.2.10.	Woodland/Forestry.....	40
<b>4.0</b>	<b>Environmental Impacts .....</b>	<b>44</b>
4.1.	Introduction .....	44
4.1.1.	Cultural Resources.....	44
4.1.2.	Fire and Fuels .....	45
4.1.3.	Greenhouse Gas Emissions.....	47
4.1.4.	Range/Livestock .....	48
4.1.5.	Recreation .....	52
4.1.6.	Soils.....	52
4.1.7.	Visual Resource Management (VRM).....	56
4.1.8.	Natural Areas (KFO), WSA (GSENM) .....	57
4.1.9.	Wildlife (including Special Status species) .....	58
4.1.10.	Woodland/Forestry.....	64
4.2.	Cumulative Impacts Analysis.....	66
4.2.1.	Cultural Resources.....	66
4.2.2.	Fire and Fuels .....	67
4.2.3.	Greenhouse Gas Emissions.....	67
4.2.4.	Range/Livestock (including Socioeconomics).....	67
4.2.5.	Recreation .....	68
4.2.6.	Soils.....	68
4.2.7.	Visual Resource Management (VRM).....	69
4.2.8.	Natural Areas (KFO), WSA (GSENM) .....	69
4.2.9.	Wildlife (including Special Status species) .....	69
4.2.10.	Woodland/Forestry.....	70
4.3.	Monitoring and/or Compliance .....	70
4.4.	Reasonably Foreseeable Action Scenario (RFAS) .....	71
<b>5.0</b>	<b>Consultation and Coordination.....</b>	<b>73</b>
5.1.	Introduction .....	73
5.2.	Persons, Groups, and Agencies Consulted .....	73
5.3.	Summary of Public Participation .....	74
5.3.1.	Comment Analysis.....	74
5.3.2.	Response to Public Comments.....	74
5.3.3.	List of Preparers.....	74
<b>6.0</b>	<b>References, Glossary and Acronyms.....</b>	<b>76</b>
6.1.	References Cited .....	76
6.2.	Glossary of Terms .....	80
6.3.	List of Acronyms Used in this EA .....	81
<b>7.0</b>	<b>Appendices .....</b>	<b>82</b>
<b>8.0</b>	<b>Maps .....</b>	<b>106</b>

## List of Appendices

Appendix 1. Interdisciplinary Team Analysis Checklist .....	82
Appendix 2. Fundamentals of Rangeland Health (43 CFR 4180) and Utah Standards for Rangeland Health (1997). .....	85
Appendix 3. Sample of non-use agreement to be used prior to treating specific project units. Non-use agreements are specific to the individual permittee utilizing the area being treated (allotment). .....	88
Appendix 4. Fuels Treatment Specifications for treatments. ....	89
Appendix 5. Potential Species to be seeded as part of the action alternatives. ....	90
Appendix 6. Fire Regime Condition Classes (FRCC). ....	91
Appendix 7. Repeat photos for the Upper Kanab Creek Watershed Vegetation Management Project Area.....	92
Appendix 8. Draft* implementation schedule (based on 15 years) for all three treatment types (P/J Treatment, Vegetation Retreatment, Sagebrush Treatment),. ....	100
Appendix 9. Preliminary thinning guidelines for areas to be managed as pinyon-juniper. ....	101

## List of Tables

Table 1. Acres treated as part of Alternative A - Upper Kanab Creek Watershed Vegetation Management Project, Proposed Action. ....	21
Table 2. Acres treated as part of Alternative B – Upper Kanab Creek Watershed Vegetation Management Project, No Action. ....	21
Table 3. Acres treated as part of Alternative C – Upper Kanab Creek Watershed Vegetation Management Project – Kanab Field Office Portions Only. ....	22
Table 4. Acres treated as part of Alternative D – Upper Kanab Creek Watershed Vegetation Management Project – Grand Staircase Escalante National Monument Portions Only. ....	22
Table 5. Summary of all action alternatives, proposed as part of the Upper Kanab Creek Watershed Vegetation Management Project. ....	23
Table 6. Fire Regime Condition Class (FRCC) for the Upper Kanab Creek Watershed Vegetation Management Project Area. FRCC is identified for all alternatives. FRCC for rock and agricultural lands are not identified under this classification system. ....	26
Table 7. Kanab Field Office allotments, season of use and number of AUM’s for the Upper Kanab Creek Watershed Vegetation Management Project. ....	28
Table 8. Grand Staircase Escalante National Monument allotments, season of use and number of AUM’s for the Upper Kanab Creek Watershed Vegetation Management Project. ....	29
Table 9. Soil Map Units and acres for the Upper Kanab Creek Watershed Vegetation Management Project area, by treatment type, for Alternatives, A, C, and D. ....	33
Table 10. Visual Resource Management (VRM) classes for the UKCWVMP. ....	34
Table 11. Characteristics of sagebrush rangeland needed for productive sage grouse habitat. ....	38
Table 12. Vegetation Types within the Upper Kanab Creek Watershed Vegetation Management Project area.....	41
Table 13. Morphological characteristics of post-settlement (<150 years) and pre-settlement (>150 years) woodland trees. ....	65
Table 14. Past, Present and Reasonably Foreseeable Future Actions applicable to the Upper Kanab Creek Vegetation Watershed Management area. ....	72

## List of Figures

Figure 1. Representative sagebrush-steppe treatment site within the Upper Kanab Creek Watershed Vegetation Management area. Note the lack of understory, dying sage in the foreground. ....	13
Figure 2. Pinyon/juniper encroachment and infilling is extensive throughout the Upper Kanab Creek Watershed Vegetation Management Project area. ....	14
Figure 3. Old sagebrush treatment with newly invaded trees (past 20 years). Many of these areas consist of some of the healthier sagebrush-steppe communities throughout the watershed, with an intact understory and diverse sagebrush age classes. ....	16
Figure 4. Vegetation Cover Types within the UCKWVMP Area. ....	41

## List of Maps

Map 1. Upper Kanab Creek Watershed Vegetation Management Project, Proposed Action acres. ....	106
Map 2. Upper Kanab Creek Watershed Vegetation Management Project, No Action Alternative. ....	107
Map 3. Upper Kanab Creek Watershed Vegetation Management Project, Alternative C – Kanab Field Office Acres only. ....	108
Map 4. Upper Kanab Creek Watershed Vegetation Management Project, Alternative D – GSENM Acres only. ....	109
Map 5. Map of treatments scheduled for the Upper Kanab Creek Watershed Vegetation Management Project by year (2010-2024). ....	110
Map 6. Upper Kanab Creek Watershed Vegetation Management Project, showing the Visual Resource Management Classifications (VRM). ....	111

## 1.0 PURPOSE AND NEED

### 1.1. Introduction

This Environmental Assessment (EA) has been prepared to analyze resource treatments relative to the Upper Kanab Creek Watershed Vegetation Management Project (UKCWVMP). The EA is a site-specific analysis of potential impacts that could result with the implementation of a proposed action or alternatives to the proposed action. The EA assists the BLM in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any “significant” impacts could result from the analyzed actions. “Significance” is defined by NEPA and is found in regulation 40 CFR 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of “Finding of No Significant Impact” (FONSI). A Decision Record (DR), which includes a FONSI statement, is a document that briefly presents the reasons why implementation of the selected action will not result in “significant” environmental impacts (effects) beyond those already addressed in the Kanab Field Office Record of Decision and Approved Resource Management Plan and BLM Grand Staircase Escalante National Monument Record of Decision and Approved Resource Management Plan. If the decision maker determines that this project has “significant” impacts following the analysis in the EA, then an EIS would be prepared for the project. If not, a Decision Record may be signed for the EA approving the alternative selected.

### 1.2. Background

The UKCWVMP encompasses the upper portion of the Kanab, Arizona-Utah 4<sup>th</sup> level, 8-digit HUC (#15010003)<sup>1</sup>. The project area (130,689 acres) is interspersed with Bureau of Land Management (BLM) lands (89,900 acres) State of Utah School and Institutional Trust Lands Administration (SITLA) lands (3,378 acres), small private parcels (31,401 acres), and U.S. Forest Service (USFS) owned lands (6,008 acres) near the town of Alton, Utah. A variety of vegetation treatments are proposed for approximately 51,600 acres within the 130,689 acre project area. The UKCWVMP is proposed for BLM lands only; however, continued coordination with SITLA, private landowners and the USFS regarding projects in place or proposed within or adjacent to the project area would ensure resource benefits that cross jurisdictional boundaries.

Vegetative cover is predominantly pinyon-juniper and sagebrush with sparse amounts of native grasses and forbs. Specific vegetation types will be discussed as part of the affected environment, Chapter 3.

### 1.3. Purpose and Need for the Proposed Action

The need to rehabilitate vegetation communities within the Upper Kanab Creek Vegetation Management Area (Map 1) has been recognized for many years. Numerous individual resource

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<sup>1</sup> 8-digit Hydrological Unit Codes (HUC4), commonly referred to as sub-basins, represent the smallest watersheds known as hydrologic cataloging units (HUCs). Throughout the country, watersheds have been categorized by the United States Geological Survey (USGS), as areas where a unique set of features, a system of recurring process, and a collection of dependent plants and animals, interact. Analysis at this level provides greater opportunities for partnership, addresses overlapping resource issues, and is more cost effective. HUC4 watershed planning and efforts are being encouraged through a variety of land management agencies and directives (BLM Healthy Lands Initiative, Utah’s Watershed Restoration Initiation (WRI & UPCD), NRCS (Natural Resources Conservation Service Watershed Assessments, etc.)

management plans, including the Utah Division of Wildlife Resources Statewide Management Plan for Mule Deer (2008), the Paunsagunt Mule Deer Management Plan (2000) and the Color Country Adaptive Resource Management Plan (CCARM) (2008) for sage grouse and the southwest Utah support Area Fire Management Plan have all addressed resource and vegetation management needs within this area.

As recently as 2008, small vegetation treatments (<1000 acres) have been implemented to decrease fuel loads, reduce encroaching pinyon/juniper and enhance sagebrush-steppe habitat. Additionally, over the past 10 years, BLM has initiated several larger scale watershed planning projects in this area, but none have moved toward implementation due to the jurisdictional complexity, reductions and changes in agency staffing and funding constraints.

Currently, BLM Utah, in partnership with Utah's Watershed Restoration Initiative (UWRI)<sup>2</sup> and Utah Partners for Conservation and Development (UPCD), has taken the lead in identifying priority watersheds (at the HUC4 level) throughout the state, to address a variety of interdependent resource issues and improve long-term watershed conservation and restoration. These watershed Focus Areas, such as the Upper Kanab Creek Vegetation Management Project area, are then targeted and prioritized for funding through BLM program dollars, with additional coordination and funding prioritized through the Southern Region Utah Partnership for Conservation and Development team.

Of particular concern within this watershed is the expansion and infilling of pinyon/juniper into areas once dominated by shrubs and other herbaceous vegetation. An increase in pinyon/juniper affects soil resources, water and nutrient cycles, fire regimes, plant community structure and composition, forage production, and wildlife habitat.

The purpose of the proposed project is to utilize a variety of resource management tools (such as prescribed fire, mechanical and chemical treatments, seedings and short-term grazing management) to enhance sagebrush/grassland areas and reduce invading pinyon/juniper throughout the project area. The project includes participation from a variety of resource specialists with diverse backgrounds and skills to help achieve multiple resource benefits within the project area.

An Interdisciplinary Team (IDT), composed of Bureau of Land Management resource personnel has identified opportunities within the project area, which include: 1) reducing hazardous fuels and risk to life and property from catastrophic wildland fire<sup>3</sup>; 2) restoring and improving the sagebrush-steppe ecosystem; 3) increasing plant species diversity and improving watershed conditions and water quality; 4) improving the health of both woodlands and

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<sup>2</sup> Launched in 2004, Utah's Watershed Restoration Initiative is a partnership-driven effort to conserve and restore ecosystems across the state. The partnership helps to identify high-priority focus areas and then works to identify threats and improve watershed health and productivity. To date, there are more than 50 groups in this partnership, all working toward the success of this initiative, including government agencies, private landowners, local industries and non-profit organizations.

<sup>3</sup> Communities at Risk (2002) in the Wildland Urban Interface (WUI) benefiting from this project include Alton and Glendale.



sagebrush/grasslands by increasing vegetation biological diversity as well as the age class and stand structure; 5) enhancing habitat conditions for mule deer and sage grouse, as well as other sagebrush-obligate and other wildlife species; 6) decreasing the amount of pinyon/juniper encroachment into areas historically dominated by sagebrush; and 7) maintaining ponderosa pine trees as a component throughout the landscape.

A variety of vegetation treatments to address these issues are the basis of the proposed action. Vegetation treatments, to be implemented over a 15 year period will be discussed as part of the Proposed Action and alternatives in Chapter 2.

#### **1.4. Conformance with BLM Land Use Plan(s)**

The Kanab Creek Watershed Vegetation Project is in Conformance with the following land use plans and helps meet the specific objectives, accordingly.

BLM Kanab Field Office. 2008. **Kanab Field Office Record of Decision and Approved Resource Management Plan. Available**

[http://www.blm.gov/ut/st/en/fo/kanab/planning/rod\\_approved\\_rmp.html](http://www.blm.gov/ut/st/en/fo/kanab/planning/rod_approved_rmp.html)

- SOL -2 Reduce soil loss on watershed by performing appropriate land treatments.
- SOL -3 Land Treatments would be prioritized in the following fifth field watersheds...  
Upper Kanab Creek
- WAT-8 Improve watershed health by performing appropriate land treatments
- WAT -9 Land treatments would be prioritized in the following fifth field watersheds:...  
Upper Kanab Creek
- Veg-3 Rehabilitation target would be to manage for 51 percent or higher of Potential Natural Community (PNC) unless site specific management objectives for other resources dictate otherwise.
- VEG-30 Treat sagebrush steppe communities to restore natural disturbance processes and a healthy diverse mosaic of different height and age structures with components of native grasses and forbs and an appropriate pinyon juniper component for a given ecological site.
- VEG-33 Use the full range of upland vegetation treatment methods and tools (i.e. prescribed fire, mechanical chemical, biological, woodland product removal and wildland fire use).
- VEG-35 Focus restoration or vegetation treatment projects based on the following factors: Restore areas functioning at less than 51% of PNC, Restore areas with noxious weed and or non native invasive plants, Maintain previously treated areas, Achieve other objectives identified in this RMP, Restore special status species habitats to achieve long term conservation and recovery objectives, ,Achieve rangeland health objectives.
- WL-6 Conduct habitat improvement treatments for species in accordance with current species specific guidelines and local working group prescriptions.
- WL-9 Maintain existing vegetation treatments that benefit wildlife.

**BLM Grand Staircase Escalante National Monument. Available**  
[http://www.blm.gov/ut/st/en/fo/grand\\_staircase-escalante/planning/monument\\_management.html](http://www.blm.gov/ut/st/en/fo/grand_staircase-escalante/planning/monument_management.html)

### **Archaeology**

- Identify, document, and protect the array of archaeological resources.
- Manage uses to prevent damage to archaeological resources.

### **Fish and Wildlife**

- Work in conjunction with the Utah Division of Wildlife Resources (UDWR) in managing fish, wildlife and other animals to achieve and maintain natural populations, population dynamics, and population distributions in a way that protects and enhances Monument resources.
- Work cooperatively with the UDWR to reestablish populations of native species to historic ranges within the boundaries of the Monument, and take needed actions to protect and enhance the habitat of these native species.
- Manage uses to prevent damage to fish and wildlife species and their habitats.

### **History**

- Identify, document and protect the historic resources of the monument.
- Manage use on the Monument to prevent damage to historical resources.

### **Paleontology**

- Protect the abundant paleontological resource in the monument from destruction or degradation
- Manage uses to prevent damage to paleontological resources in the Monument.

### **Soils and Biological Soil Crusts**

- Manage uses to prevent damage to soil resources and to ensure that the health and distribution of fragile biological soil crusts is maintained or improved.

### **Vegetation**

- Protect unique vegetation associations such as hanging gardens and relict plant associations.

## **1.5. Relationship to Statutes, Regulations, or other Plans**

Taylor Grazing Act of (TGA) of 1934

Federal Land Policy and Management Act (FLPMA) of 1976 (43 U.S.C. 1701 et seq.)

Public Rangelands Improvement Act (PRIA) of 1978

Endangered Species Act (ESA) of 1973 (as amended)

43 CFR 4100 Grazing Administration-Exclusive of Alaska

Standards of Quality for Waters of the State, R317-2-6, Utah Administrative Code, December 1997

BLM Utah Riparian Management Policy, UT-93-93, March 1993

Section 106 of the National Historic Preservation Act of 1966 (as amended)  
National Environmental Policy Act of 1969 (as amended)  
Executive Order 11988 (floodplains)  
Executive Order 11990 (wetlands)  
Executive Order 12898 (environmental justice)  
Executive Order 13186 (Migratory Bird Treaty Act)  
Clean Air Act of 1970 (As Amended)  
American Indian Religious Freedom Act of 1979  
Archaeological Resource Protection Act of 1980  
Establishment of the Grand Staircase-Escalante National Monument by the President of the United States of America, September 18, 1996  
PUBLIC LAW 111-11—MAR. 30, 2009 123 STAT. 1095 SEC. 2002. Establishment of the National landscape Conservation System.  
IM 2008-050, Migratory Bird Treaty Act - Interim Management Guidelines

The following local and national directives specifically address or apply to vegetation treatments within the UKCWVMP.

**Southwest Utah Support Area Fire Management Plan (2005)** – The project area falls within the Glendale Bench and Big Deer Fire Management Units (FMU).

FMU objectives which support the purpose and needs outlined for the UKCWVMP Project are:

Big Deer FMU – convert 50,000 acres of pinyon and juniper woodland, 25,000 acres of juniper and 20,000 acres of sagebrush to sagebrush/perennial grass using wildfire, prescribed fire and non-fire fuels treatments.

Glendale Bench FMU – Improve ponderosa pine vigor and reproduction by reducing competition from pinyon and juniper woodland using prescribed fire and/or non-fire fuels treatments. Convert pinyon and juniper woodlands to sagebrush grassland using natural fire, prescribed fire and mechanical treatment. Convert juniper to sagebrush grassland using natural fire, prescribed fire and mechanical treatment. Convert sagebrush using mechanical methods; create a mosaic of age classes in the sagebrush and sagebrush perennial grassland vegetation types.

#### **BLM National Sage Grouse Habitat Conservation Strategy (2004)**

The BLM National Sage Grouse Habitat Conservation Strategy provides national guidance for management of sage grouse and sagebrush habitat on BLM lands. The primary strategies that are applicable to the UKCWVMP are:

- Develop BLM state-level strategies and/or plans for sage grouse and sagebrush conservation on BLM-administered lands.
- Provide guidance to ensure integration of sage grouse habitat conservation measures for actions provided through the management in land use planning process.

- Give priority to sage grouse and sagebrush conservation in Challenge Cost Share (CCS), Cooperative Conservation Initiative (CCI), and National Fish and Wildlife Federation (NFWF) funding proposals.

### **National Fire Plan (2000)**

The National Fire Plan provides national direction for hazardous fuels reduction. This direction emphasizes measures to reduce the risk to communities and the environment. The primary elements applicable to the UKCWVMP are:

- Improve Prevention and Suppression
- Reduce Hazardous Fuels
- Restore Fire Adapted Ecosystems

The UKCWVMP follows the guidelines outlined in the National Fire Plan (2000), by utilizing the Fire Regime Condition Class model (see Fire and Fuels – Chapter 4). By restoring fire in appropriate areas, hazardous fuels would be decreased and firefighter and public safety would be improved through prevention and suppression.

### **Healthy Forest Restoration Act of 2003 (HFI)**

- Reduce the risks severe wildfires pose to people, communities, and the environment.
- By protecting forests, woodlands, shrublands, and grasslands from unnaturally intensive and destructive fires, HFI helps improve the condition of our public lands, increases firefighter safety, and conserves landscape attributes valued by society.

### **Federal Wildland Fire Management Policy (1995)**

- Establishes a unified and cohesive federal fire management policy codified in agency, inter-agency and departmental manuals, guidebooks and other documents through clear, concise, and uniform language across all agencies.
- Through a communication plan shares work and information with all wildland agencies.

### **Color Country Adaptive Resource Management Plan for Sage Grouse (CCARM) - 2007 Strategies and Actions**

- Improve age distribution of plants within sagebrush-steppe communities by 2016
  - Identify and prioritize target areas needing improvement
  - Coordinate among agencies and landowners to fund implementation of projects and monitoring
  - Monitor response of sage grouse to changing habitat conditions

### **Southwest Utah Regional Wildfire Protection Plan (SURWPP) (2007)**

The SURWPP identified and prioritizes issues related to wildfire prevention and fuel mitigation in the Wildland Urban Interface (WUI) areas of southwestern Utah.

The regional priorities, applicable to the UKCWVMP area are:

- Protect Human Life
- Firefighter and public safety
- Equipment access

- Protection of infrastructure
- Reduce cheatgrass occurrence after wildfire

### **Utah Wildlife Conservation Strategy (2005)**

Comprehensive Wildlife Conservation Strategies have been developed for every state and territory to help effectively restore and enhance wildlife populations and their habitat, and prevent the need for additional listing on the Endangered Species List. Utah uses a 3-tier system, which defines and prioritizes Utah's native animal species according to conservation need. Tier I includes federally listed species and species for which a Conservation Agreement has been completed and implemented. Tier II species include those listed on the Utah Species of Concern List under sole state authority. Tier III includes species that are of conservation concern because they are linked to an at-risk habitat, have suffered marked population declines, or there is little information available regarding the ecology or status of the species. Additionally, the CWCS describes the ten most at risk habitat types (out of 24) found in Utah, specifying their relative priority based on the degree of threat faced by each habitat type and the presence of prioritized species.

Of particular concern within the UKCWVMP area are:

#### Wildlife

- Greater sage grouse – Tier II
- Mule Deer – Tier III

#### Key Habitats

- Shrubsteppe
- Ponderosa Pine

### **Utah Division of Wildlife Resources Statewide Management Plan for Mule Deer (2008)**

This document provides overall guidance and direction for managing Utah's mule deer populations. This plan briefly describes general information on mule deer natural history, management, habitat, population status, and issues concerning mule deer management in Utah. This plan also outlines the goals, objectives, and strategies for managing mule deer populations and their habitats. The plan will be used to help set priorities for statewide mule deer management programs and provide guidance for individual unit management plans.

- Work with land management agencies, conservation organizations, private landowners, and local leaders through the regional Watershed Restoration Initiative working groups to identify and prioritize mule deer habitats that are in need of enhancement or restoration (Wildlife Management Unit 27 – Paunsagunt area is identified as a crucial summer, winter and transition range).
- Initiate broad scale vegetative treatment projects to improve mule deer habitat with emphasis on drought or fire damaged sagebrush winter ranges, ranges that are being taken over by invasive annual grass species, and ranges being diminished by encroachment of conifers into sagebrush or aspen habitats.

**Paunsaugunt Deer Herd Unit Management Plan (2001)**

- Participate, as possible, with public and private land managers to rehabilitate and enhance important rangelands.
- Work with private and federal agencies to maintain and protect critical and existing winter range from future losses.

**Rangeland Health Standards (43 CFR 4180) (Appendix 2)**

The Fundamentals of Rangeland Health (43 CFR 4180) and Utah's Standards and Guidelines for Rangeland Health address watersheds, ecological condition, water quality and habitat for special status species.

**1991. Final Environmental Impact Statement Vegetation Treatment on BLM Lands in Thirteen Western States and associated Records of Decision. BLM Wyoming State Office, Casper Wyoming. 1991. (BLM-WY-ES-91-036-4320)****Final Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement and associated Record of Decision. USDI, Bureau of Land Management, 2007. (FEIS 07-21)****Final Vegetation Treatments Using Herbicides Programmatic Environmental Impact Statement (VEIS) and Record of Decision, 2007. (VEIS)**

These documents analyze chemical use and application on BLM lands.

*The UKCVMP is committed to maintaining partnerships with those involved in resource management within the watershed. Efforts are being made to conduct a cohesive project that furthers progress toward meeting multiple resource benefits.*

**1.6. Identification of Issues<sup>4</sup>**

Identification of issues for this assessment was accomplished by considering the resources that could be affected by implementation of the alternatives, as well as through involvement with the public and input from the interdisciplinary team. Public involvement consisted of posting the proposal on the Utah BLM Environmental Notification Bulletin Board (beginning November 2008), through contact with permittees that could be affected by the actions proposed, and through consultation with partner agencies, including SITLA, USFS, NRCS, and UDWR.

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<sup>4</sup> Analysis for this project began in early Spring, 2008. Since then, BLM has modified their NEPA guidebook, to include additional direction to comply with laws as currently interpreted by the Council on Environmental Quality's (CEQ) regulations for implementing NEPA (40 CFR Parts 1500-1508), the Departmental Manual regulations (516 DM 1-7), the Bureau's National Environmental Policy Handbook, H-1790-1 and the decisions of the Federal courts and Department of Interior Office of Hearings and Appeals. For consistency purposes, this analysis utilizes the forms and templates available during scoping and project analysis (2008). However, to comply with new mandates, and new items on the BLM checklist, the following issues are discussed as follows:

Migratory Birds – Discussed as part of the 'Wildlife' write-up  
Biological Soil Crusts – Discussed as part of the 'Soils' write-up  
Greenhouse Gas Emissions – Greenhouse Gas Emissions

### **1.6.1. Critical Elements of the Human Environment and other Resources/Concerns**

Critical elements of the human environment as identified in BLM Handbook 1790-1 must be considered. Those critical elements of the human environment and resources which are not present, or are not affected by the Proposed Action or alternatives, are included as part of the Interdisciplinary team checklist (Appendix 1). These issues will not be discussed further.

Those critical elements of the human environment and resources which may be affected by the Proposed Action and/or alternatives are carried forward throughout this analysis (Chapters 3 and 4), are introduced briefly as follows:

#### **1.6.1.1. Cultural Resources**

A high concentration of archaeological resources can be expected in some areas within the UKCWVMP area. There may be sites that are eligible for the National Register of Historic Places.

#### **1.6.1.2. Fire and Fuels**

Within the project area, there is a large fuel load build-up and an alteration in fuel load types. Pinyon/juniper trees once held to lower densities by more frequent fires, have expanded in range and moved into areas once dominated by shrubs, forbs and grasses. Without the proposed action, fuel conditions are such that an unexpected wildfire may not be containable, leading to an increased risk to fire fighter and community safety, suppression effectiveness and natural resource degradation. Fire Regime Condition Class (FRCC) throughout the entire watershed is primarily FRCC3, where fire frequencies have departed from historical frequencies by multiple return intervals.

#### **1.6.1.3. Greenhouse Gas Emissions**

Ongoing scientific research has identified the potential impacts of anthropogenic (man-made) greenhouse gas (GHG) emissions and changes in biological carbon sequestration due to land management activities on global climate. Greenhouse gas emissions may or may not increase/decrease by the action alternatives proposed as part of this project.

#### **1.6.1.4. Range/Livestock**

Grazing and browsing from both livestock and wildlife, invasion of pinyon/juniper woodlands and drought-related impacts have reduced the overall health, vigor, recruitment and production of a variety of grass and shrub species within the project area. The proposed action and alternatives may impact grazing and browsing from wildlife and livestock.

#### **1.6.1.5. Recreation**

Recreational activities within project areas may be temporarily disrupted or displaced during actual land treatments.

#### **1.6.1.6. Socioeconomics**

Proposed activities may impact permittee livelihood by requiring a two growing season rest following vegetation treatments. Declining vegetation conditions, as a result of no action may also impact permittees because of the continued decrease in available forage, resulting in reduced herd health.

Risks associated with wildfire (community and public safety) and fire fighter safety may be compromised because of existing fuel conditions throughout the project area, under the no action alternative.

The proposed action and associated activities may provide economic opportunities for local communities, through contracting.

*Note: Socioeconomics are discussed throughout this EA, as part of individual issue write-ups (range, fire/fuels, recreation etc.).*

#### 1.6.1.7. Soils, including Biological Soil Crusts (BSC)

Although many of the soils within the UKCWVMP area are not considered highly erodible, the fact that understory vegetation is lacking and pinyon/juniper is expanding, places the woodland and sagebrush-steppe communities at greater risk to long-term erosion potential, especially should a wildland fire and/or overland flooding occur. Short-term impacts to soils may occur as part of the proposed action and long-term soil impacts may occur as part of no action.

#### 1.6.1.8. Visual Resources

Visual resources may be impacted, especially in the short term (less than five years), by the activities associated with the proposed actions.

#### 1.6.1.9. Natural Areas (KFO), WSA (GSENM)

Lands with wilderness characteristics are located within the boundary of proposed treatment area and may be impacted by activities associated with the proposed actions and no action alternatives.

#### 1.6.1.10. Wildlife, including Special Status species & Migratory Birds

Much of the deer transition range in the UKCWVMP area is in poor condition as a result of 30+ years of concentrated heavy deer use and drought.

Greater sage-grouse, a BLM state sensitive animal occurs in the project area.

Vegetation composition has changed from dense stands of sagebrush with an understory of native, cool-season grasses and perennial forbs to scattered, decadent sagebrush, pockets of cheatgrass, annual forbs and warm-season grasses. Juniper and pinyon trees are invading sagebrush sites, and sagebrush and cool-season grasses are being eliminated from those areas. Wildlife populations are being negatively impacted by vegetation changes that are currently occurring throughout the project area.

Wildlife populations could be impacted, both positively and negatively, by actions proposed as part of the UKCWVMP.

#### 1.6.1.11. Woodland/Forestry

Within the UKCWVMP are, the majority of the landscape consists of dense stands of pinyon/juniper with little or no understory present. In the absence of disturbance (in this case,



fire) the successional<sup>5</sup> trend has been toward a large proportion of the project area being dominated by pinyon-juniper communities at the expense of sagebrush-grass communities. Pinyon and Juniper has encroached into all other vegetation types, including ponderosa pine areas, sagebrush grasslands, and mountain brush communities. High densities of trees create a closed-canopy with little or no opportunity for future recruitment of sagebrush or other desired understory vegetation. Upland erosion has increased, resulting in reduced soil moisture and decreased groundwater recharge. Actions proposed may increase opportunities for sagebrush and other understory vegetation, while also decreasing upland erosion.

Ponderosa pine is very limited in the project area, forming no identifiable ‘stands.’ Understory pinyon/juniper currently form ladder fuels that could potentially spread ground fires into the crowns of remaining ponderosa pine and further reduce their presence on the landscape. Ponderosa pine could be impact by the no action alternative.

## **1.7. Summary**

This chapter has presented the Purpose and Need of the Proposed Action, as well as the relevant issues (i.e., those elements that could be affected by implementation of the Proposed Action). In order to meet the purpose and need of the Proposed Action in a way that resolves the issues, the BLM has developed a range of alternatives. These alternatives, including the No Action Alternative, are presented in Chapter 2. The potential environmental impacts or consequences resulting from the implementation of each alternative are then analyzed in Chapter 4 for each of the identified issues.

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<sup>5</sup> “Succession” is defined as “the gradual supplanting of one community of plants to another...” by the Helms J.A. 1998. *The Dictionary of Forestry*, Society of American Foresters. 210 p.

## 2.0 DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

### 2.1. Introduction

To address the Purpose and Need for the Proposed Action and the relevant issues identified during scoping, the IDT has developed 3 general landscape treatment descriptions<sup>6</sup> that could be incorporated into a range of alternatives. These treatment descriptions (described below) are based on extensive individual visits and IDT visits to the analysis area, over the past several years, as well as resource and specialist input. To provide a context for the proposed action, both “current conditions” and “desired future conditions” have been outlined for each treatment type in the project area. The change between the current condition and desired future condition is the basis for the Proposed Action and the alternatives presented. A summary of treatment types by alternatives is shown in Table 5.

#### Sagebrush-Steppe/Sagebrush Treatment

##### *Current Condition*

Historic photos (Appendix7), ecosite descriptions and soil types indicate that sagebrush-steppe communities were once more prevalent throughout the Upper Kanab Creek Watershed. Today less than 27% of the watershed is composed of true sagebrush stands, with the majority of sagebrush sites slowly converting to pinyon-juniper woodlands.

Where sagebrush stands do exist, an increase in canopy cover and density has resulted in a loss of herbaceous understory, further increasing risk of acreages susceptible to high intensity wildfire and to cheatgrass invasion following wildland fires.

A decrease in sagebrush sites and a lack of grasses/forbs has negatively impacted mule deer and sage grouse.

Vegetation use by large ungulates continues to be concentrated into smaller sagebrush/grassland areas because of pinyon/juniper encroachment. Figure 1 is representative of sagebrush/grasslands throughout the watershed, where pinyon/juniper encroachment is minimal.

##### *Desired Future Condition*

Diverse, healthy age classes of sagebrush exist, with an understory of desired grasses and forbs. The quantity and continuity of sagebrush communities provide quality habitat necessary to maintain sustainable populations of Greater sage grouse, mule deer and sagebrush-obligate species. Rangelands are managed to prevent net loss of properly functioning sagebrush-steppe habitat. Desirable vegetation species compete with and keep the weed and cheatgrass component of the understory at acceptable levels.

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<sup>6</sup> The 3 different treatments are titled as follows: sagebrush-steppe/sagebrush treatment, pinyon/juniper treatment/ and vegetation retreatment. These titles reflect the majority of the existing vegetation type, and not desired future condition.



**Figure 1. Representative sagebrush-steppe treatment site within the Upper Kanab Creek Watershed Vegetation Management area. Note the lack of understory, dying sage in the foreground.**

Mosaics, with stands of old and young sagebrush, openings (ranging from bare ground to short and sparse vegetation to high-density grasslands), wet meadows, seeps, healthy streamside (riparian) vegetation and other interspersed shrub and woodland habitats, contribute to overall watershed health. A wide range of habitat types, vegetation “edge” and migration corridors contribute to healthy use of the landscape by wildlife and livestock.

***Proposed Treatment to Move Toward the Desired Future Condition***

- Use, as appropriate, mechanical tools or hand-thinning to remove 100 percent of invading pinyon/juniper (Appendix 4).
- Where rabbitbrush occurs in dense stands rather than as isolated plants, treat according to herbicide use described in the Final Vegetation Treatment VEIS (2007) and in accordance with land use plans to avoid further establishment within treatment areas.
- Use an appropriate seed mixture to reseed areas where understory grasses and forbs are lacking and no seed base is present (Appendix 5).
- Treat dense sagebrush (more than 30 percent cover)<sup>7</sup> with mechanical, chemical or grazing management<sup>8</sup>, tools to reduce sagebrush canopy cover, change large even-aged sagebrush stands to multiple age structures, and improve native grass and forb density and cover.
- Utilize, as appropriate, mechanical tools, hand thinning and chemical treatments to open corridors for travel to and from sage grouse strutting grounds, nesting areas, brood areas and water areas.

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<sup>7</sup> Percent sagebrush treated would follow the guidelines from Western Association of Fish and Wildlife Agencies (WAFWA) Guidelines to manage sage-grouse populations and their habitats (Connelly et al. 2000); see Chapter 3, affected environment.

<sup>8</sup> Grazing management could include implementation of temporary rest rotation, non-grazing, reduction in use, and/or change in season of use. Permanent changes in grazing use would be determined through separate NEPA actions and analysis.

- Provide periodic maintenance (hand-thinning) to reduce potential of future pinyon and juniper encroachment into sagebrush-steppe areas and to protect the investment made by BLM and partners.

### **Pinyon Juniper Treatment**

#### ***Current Condition***

Within the Upper Kanab Creek Watershed, the major vegetation composition has changed from vegetation mosaics composed of sagebrush/grasslands with an understory of native, cool-season grasses and perennial forbs, to scattered, decadent sagebrush pockets with an overstory of pinyon and juniper. Pinyon and Juniper has in-filled and encroached into all other vegetation types, including ponderosa pine areas, sagebrush/grasslands, and mountain brush communities. High densities of trees create a closed-canopy with little or no opportunity for future recruitment of sagebrush or other desired understory vegetation. Upland erosion has increased, resulting in reduced soil moisture and decreased groundwater recharge. The risk of catastrophic wildfire is increased because of closed canopy conditions. In the event of a catastrophic wildfire, there is the likelihood of increased erosion and the introduction of noxious weeds. Areas where pinyon and juniper has invaded within the watershed (and 93% of the project area) are currently in FRCC3, where vegetation communities and fire regimes have been significantly altered from historic regimes and the risk of losing key ecosystem components is high. Figure 2 depicts the extent of pinyon/juniper encroachment throughout the Upper Kanab Creek Watershed Vegetation Management Area.



**Figure 2. Pinyon/juniper encroachment and infilling is extensive throughout the Upper Kanab Creek Watershed Vegetation Management Project area.**

#### ***Desired Future Condition***

Limited pinyon and juniper woodlands occur naturally throughout the watershed as open multiple age class stands with a grass and forb understory. Vegetation mosaics of sagebrush-steppe (primary) and woodlands (secondary) contribute to healthy and diverse wildlife communities.

Pinyon/Juniper is held in check by periodic low intensity fire (every 15-50 years) and is representative of FRCC2 or FRCC1. Historic stands (generally located in more rocky soils with a tendency toward unique growth form characteristics of rounded, spreading canopies, large basal branches, large irregular trunks and furrowed fibrous bark) experience fire-return intervals every 100+ years.

Self sustaining, ponderosa pine located throughout the watershed consist of predominately park like groups, with a grass and forb understory. Stands experience normal levels of mortality and

are resilient to low-intensity fire. Ponderosa pine regeneration is present, but generally not abundant.

### ***Proposed Treatment to Move Toward the Desired Future Condition***

- Use, as appropriate, mechanical hand-thinning, approved chemical treatments or prescribed fire to thin dense stands of pinyon/juniper (Appendix 4)<sup>9</sup>.
- Remove up to 90% of standing trees within sagebrush/grassland areas to restore productive grass, forb and shrub communities.
- Where rabbitbrush occurs in dense stands rather than as isolated plants, treat according to herbicide use described in the Final Vegetation Treatment VEIS (2007) and in accordance with land use plans to avoid further establishment within treatment areas.
- Where appropriate, utilize stewardship contracting authority to remove forest products.
- Use an appropriate seed mixture to reseed areas where understory grasses and forbs are lacking and no seed base is available (Appendix 5).
- Use, as appropriate, mechanical tools or hand-thinning to remove ladder fuels and maintain ponderosa pine health (Appendix 4).
- On a case-by-case basis, supplement declining ponderosa groups with ponderosa seedlings.
- Reintroduce low-intensity ground fire to ponderosa pine groups, following treatments to remove ladder fuels, as a long-term maintenance strategy.
- Provide periodic maintenance (hand-thinning) to reduce potential of future pinyon and juniper encroachment into sagebrush-steppe areas and to protect the investment made by BLM and partners.

### **Vegetation Retreatment**

#### ***Current Condition***

Over the past 40-to-50 years, numerous vegetation management projects have occurred throughout the watershed. Many of the earlier projects consisted of vegetation chainings and seedings, while more recent projects have involved hand cutting and mechanical treatments. These treatments were originally designed to improve grass/forb communities, by removing invading pinyon/juniper.

Small-to-medium sized pinyon and juniper have re-encroached into all of the older treatments in the absence of additional disturbance (such as fire). Many of these areas contain some of the more productive remaining sagebrush/grasslands within the watershed, due to the periodic maintenance, and although understory grasses and forbs are still evident, they are slowly disappearing as trees re-encroach and in-fill on the sites. Sagebrush remaining in these areas is even-aged and lacks vigor and diversity, due to historic grazing practices, fire suppression efforts and lack of additional disturbance.

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<sup>9</sup> Actions proposed as part of the Upper Kanab Creek Vegetation Management Plan fall under two different management plans (see Section 1.4). Because both plans may differ in acceptable treatments (such as visual resource management, use of native seed, etc.), implementation would be in compliance with the appropriate management plan.

Many of the recent treatments (last 10 years) consist of healthy grass/forb/shrub communities, where small trees are just starting to re-encroach, due to the absence of natural fire or additional mechanical disturbance. Because of the cost and effort already invested, and the existing in-tact understory, these areas are high priority for treatment. Restoration potential is high and the cost investment and effort to restore these areas is greatly reduced. Figure 3 shows one past treatment, where trees are beginning to invade.



**Figure 3. Old sagebrush treatment with newly invaded trees (past 20 years). Many of these areas consist of some of the healthier sagebrush-steppe communities throughout the watershed, with an intact understory and diverse sagebrush age classes.**

### ***Desired Future Condition***

Sagebrush-steppe grasslands located throughout the watershed are diverse in age class and structure. In the absence of natural fire to maintain these areas, a variety of land management treatments are utilized to maintain the ecological integrity of sagebrush-steppe grasslands. Travel corridors are present to assist in the movement of wildlife and to offer a variety of nesting and brood rearing habitat for sage grouse.

### ***Proposed Treatment to Move Toward the Desired Future Condition***

- Use, as appropriate, mechanical tools (Appendix 4) hand-thinning, grazing management or approved chemical treatments to remove 100% of invading pinyon-juniper.
- Where seeding diversity is lacking (monocultures), utilize an appropriate mix of grasses and forbs to provide for multiple resource benefits (Appendix 5).

## **2.2. Additional Components Common to All Action Alternatives**

All clearances would be completed prior to ground disturbing activities or as required (wildlife, archaeology, cadastral). In addition, the following components would be implemented as part of the Proposed Action and all Action alternatives.

### **Fire and Fuels**

- A Prescribed Fire Plan (Burn Plan) would be prepared prior to any burning within the proposed project area. The Prescribed Fire Plan would be prepared in conformance with the BLM's 9214 manual designed to meet resource objectives while containing fire spread to targeted areas.

**Wildlife**

- Sage grouse guidelines would be followed in all mapped sage grouse brood habitat, in accordance with, “Guidelines to Manage Sage Grouse Populations and Their Habitat (Connelly et. al., 2000) and Utah Sage Grouse Conservation Plan (Fourth Draft) (State of Utah, 2001). Sagebrush treatments would generally be scheduled to avoid the sage grouse lekking/nesting period within delineated brooding habitat. Lekking/nesting season runs from approximately March 15 through June 15. Sagebrush treatment areas would be reseeded in the fall and would include grass and forb species preferred by sage grouse. However, should a need arise to conduct vegetation treatments during this time, the areas to be treated would first be cleared by a qualified biologist. Active nests found during clearance activities may require that polygon boundaries be adjusted to avoid potential impacts to sage-grouse. Once the nestlings are mobile, the area would be treated according to the prescription.
- Use of prescribed fire in areas mapped by UDWR as crucial mule deer winter range or sage grouse brood rearing habitat would be coordinated with UDWR, and would only occur outside of crucial breeding seasons.
- Any raptor nest found within the project area would be protected and managed according to Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances (U.S. Fish and Wildlife Service, Utah Field Office, Salt Lake City, Jan. 2002).
- Proposed treatments would generally be scheduled to avoid the migratory bird nesting season (May 15 to July 15). However, should a need arise to conduct vegetation treatments during this time, the areas to be treated would first be cleared by a qualified biologist. Active nests of migratory birds found during clearance activities may require that polygon boundaries be adjusted to avoid potential impacts to migratory birds. Once the nestlings have fledged, the area would be treated according to the prescription.

**Vegetation**

- Traditional forest types within or adjacent to treatment areas (specifically Ponderosa Pine), would be maintained. Where necessary, ladder fuels would be removed below larger trees.
- Restriction of understory vegetation growth through tree litter would need to be avoided by lopping and scattering cut trees to avoid deep litter piles.
- In treatment areas, where rabbitbrush occurs in dense plots rather than as single isolated plants, mechanical treatments and prescribed burning should be avoided to limit spread.
- Sagebrush stands exceeding 25% canopy cover would be treated in the fall after seed ripe to encourage sagebrush regeneration and to create small openings to provide a mosaic of multiple sagebrush age classes and increase forb and grass diversity.
- Once areas are treated, if necessary, they would be maintained in the future using mechanical methods, hand thinning and other management prescriptions. This would prolong the life of the treatments and protect the investment made by BLM and the contributing partners.

Grand Staircase Escalante National Monument only

- In keeping with the overall vegetation objectives and Presidential EO 11312, native plants will be used as a priority for all projects in the GSENM.
- Non-native plants may be used in limited, emergency situations where they may be necessary in order to protect Monument resources by stabilizing soils and displacing noxious weeds.
- In existing range seedings, both introduced and native species may be used to help ensure project success. Introduced species may be used in the seed mix to provide immediate soil stabilization and competition with exotic weed species. Natives will be included for long term site stability, drought resistance, and diversity.
- In rangelands that have not been previously treated, and do not meet emergency situations that warrant introduced species, all native seed mixes will be used.

**Herbicide Use**

- Herbicide treatments have been analyzed in the BLM Vegetation Treatments Using Herbicides Final Programmatic Environmental Impact Statement (BLM, 2007). Impacts associated with the use of herbicides used to create mosaics in sagebrush and reduce occurrence of rabbitbrush have been analyzed in detail in the PEIS (BLM, 2007).

Incorporating the following Standard Operating Procedures and Mitigation Measures would ensure that impacts associated with herbicide treatments would be minimized.

Standard Operating Procedures (BLM Vegetation Treatments Using Herbicides, June 2007 Final Programmatic EIS):

- Use herbicides of low toxicity to wildlife.
  - Use spot applications or low-boom broadcast applications, where possible, to limit the probability of contaminating non-target food and water sources.
  - Use timing restrictions (e.g., do not treat during critical wildlife breeding or staging periods) to minimize impacts to wildlife.
- Mitigation for herbicide treatment impacts (BLM Vegetation Treatments Using Herbicides, June 2007 Final Programmatic EIS):
    - Apply chemicals at the typical application rate to minimize risks to terrestrial wildlife.
    - To protect special status wildlife species, implement all conservation measures for terrestrial animals presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment*. Apply these measures to sensitive species, as well as listed species (refer to conservation measures for a similar size and type of species, of the same trophic guild).



**Visual Resources**

- Treatment areas would be designed so as not to produce visual contrasts in form, line, color and texture of the characteristic landscape in which they are located.
- Treatment area edges would be designed to mimic the edge effects on naturally occurring stands of vegetation in the project area. Feathering of treatment edges could be utilized.
- Leave areas of untreated vegetation would be designed to mimic the shapes of naturally occurring isolated stands of vegetation in the project area.
- A visual contrast rating would be prepared for all site specific project locations in GSENM and for all locations in VRM Class II in the KFO in order to meet resource objectives.

**Recreation**

- No new roads would be constructed as part of this project.
- Public outreach efforts, including signage, news articles and brochures would be utilized to inform the public regarding the nature, extent, timing and location of treatments. Such outreach would help people avoid areas slated for treatment if they so desired; it would also allow people to observe the treatments or treated areas if that activity fit into their desired recreation experiences.

**Noxious Weeds**

- Noxious weeds would be controlled on all disturbed areas when detected.
- All equipment used for mechanical treatments would be pressure washed when entering and exiting the project area to reduce outbreaks of noxious weeds.

**Soil and Hydrology**

- Should water sources appear following treatment, these water sources would be managed in accordance with multiple use management objectives and the Utah BLM Riparian Policy. Resulting riparian areas would be fenced if necessary to protect from wildlife, livestock or other disturbance.

**Vegetation**

- Range improvements (fences, water developments, pipelines, corrals, cattleguards) would be identified and protected from any damage associated with treatment activities.
- Signed grazing non-use agreements would be obtained prior to project implementation (see example, Appendix 3).
- Seedings would be rested from cattle grazing for a minimum of two complete growing seasons. This would be accomplished by either fencing the cattle out of the treatment areas or resting the treated pastures. A longer rest may be required if the Authorizing Officer determines that the seeding has been slow to establish, such as during a drought. Once seeding establishment has been confirmed, the BLM may authorize grazing according to Utah BLM's Fundamentals for Rangeland Health (43 CFR 4180) and Guidelines for Grazing Management (1997) which address watershed, ecological condition, water quality and habitat for special status species. Permittees would be notified in a timely manner of changes to their active permit.
- To help reduce economic impacts to permittees, where possible those allotments which are not divided into pastures would have the treatments completed in one year in order to

help reduce the overall period of time the allotment is rested. Where possible, those allotments which are divided into pastures would have one pasture treated each year so that the untreated pastures remain available for use.

- Additional fence construction or maintenance may be necessary to prevent livestock trespass on treatment areas during the designated rest and recovery periods. Any needed fence construction or maintenance would be adequately planned and budgeted when the specific project implementation plan is developed.
- Any adjustments in stocking levels or other modification to the existing permits would require further NEPA analysis and would be conducted at the time the permits expire and are analyzed under the permit renewal process. The implementation of proper utilization guidelines would be incorporated into the terms and conditions of the grazing permits when they are renewed under the permit renewal process.

### **Cultural/Paleontology Resources**

- Cultural/paleontology clearances would be completed on all project sites, prior to any ground disturbing activity and sites avoided. Cultural sites will be handled in accordance to Section 106 of the National Historic Preservation Act (1966). If any cultural resources eligible for the National Register of Historic Places are discovered, they would be avoided.
- In the event that potentially eligible historic properties are discovered during the course of ground disturbance, work in the immediate vicinity of the discovery will cease. BLM will further evaluate the site, and in consultation with SHPO, select the appropriate action.

### **Fences**

- Any fences installed as part of project implementation would follow BLM fencing guidelines (BLM H-1741-1).

### **Air Quality**

- All burning would be done in compliance with the State Department of Environmental Quality and the Division of Air Quality Standards.

## **2.3. Alternative A – UKCWVMP Proposed Action**

Alternative A would incorporate all 3 treatment types (p/j treatment, sagebrush-steppe treatment and vegetation re-treatment) described in Section 2.0. Appropriate treatments have been identified for up to 51,600 acres (39%) of the project area. Under this alternative, an average of 3440 acres (3%) of the project area would be treated each year, over a 15 year period. Fewer acres likely would be completed, based on project design/topography, cultural avoidance and available funding (Map 1, Table 1). Appendix 8 and Map 5 contain a draft implementation schedule for the treatments scheduled as part of the proposed action. Treatment years were determined based on the imminent need for a specific area, and to spread treatment areas out over the watershed to reduce cumulative impacts to any one area.

**Table 1. Acres treated as part of Alternative A - Upper Kanab Creek Watershed Vegetation Management Project, Proposed Action.**

<b>Alternative A - Proposed Action</b>	<b>Acres</b>	<b>BLM %</b>	<b>Project Area %</b>
P/J Treatment	32572	36	25
Sagebrush-steppe Treatment	7607	8	6
Vegetation Re-Treatment	11421	13	9
<b>Total</b>	<b>51600</b>	<b>57</b>	<b>39</b>

## 2.4. Alternative B – UKCWVMP No Action

Under the No Action Alternative, no acres would be treated. The area would remain as described in the Existing Condition (Map 2, Table 2).

**Table 2. Acres treated as part of Alternative B – Upper Kanab Creek Watershed Vegetation Management Project, No Action.**

<b>Alternative B - No Action</b>	<b>Acres</b>	<b>BLM %</b>	<b>Project Area %</b>
P/J Treatment	0	0	0
Sagebrush-steppe Treatment	0	0	0
Vegetation Re-Treatment	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>

## 2.5. Alternative C – UKCWVMP– Kanab Field Office Portion Only

Alternative C would incorporate all 3 treatment types described above. Appropriate treatments have been identified for up to 31,191 acres (24%) within the Kanab Field Office portion of project area. No acres would be treated within the Grand Staircase Escalante National Monument Area portion of the project area. Under this alternative, an average of 2000 acres (2%) of the project area would be treated each year, over a 15 year period. Fewer acres likely would be completed, based on project design/topography, cultural avoidance and available funding. (Map 3, Table 3).

Appendix 8 and Map 5 contain a draft implementation schedule for the treatments scheduled as part of the action alternatives. Treatment years were determined based on the imminent need for a specific area, and to spread treatment areas out over the watershed to reduce cumulative impacts to any one area.

**Table 3. Acres treated as part of Alternative C – Upper Kanab Creek Watershed Vegetation Management Project – Kanab Field Office Portions Only.**

<b>Alternative C - KFO Only</b>	<b>Acres</b>	<b>BLM %</b>	<b>Project Area %</b>
P/J Treatment	18861	21	14
Sagebrush-steppe Treatment	7258	8	6
Vegetation Re-Treatment	5072	6	4
<b>Total</b>	<b>31191</b>	<b>35</b>	<b>24</b>

## **2.6. Alternative D UKCWVMP – Grand Staircase Escalante National Monument Portion Only.**

Alternative D would incorporate all 3 treatment types described above. Appropriate treatments have been identified for up to 20,408 acres (16%) on the Grand Staircase Escalante National Monument within the project area. No acres would be treated within the Kanab Field Office portion of the project area. Under this alternative, an average of 1300 acres (<2%) of the project area would be treated each year, over a 15 year period. Fewer acres likely would be completed, based on project design/topography, cultural avoidance and available funding. (Map 4, Table 4). Appendix 8 and Map 5 contain a draft implementation schedule for the treatments scheduled as part of the action alternatives. Treatment years were determined based on the imminent need for a specific area, and to spread treatment areas out over the watershed to reduce cumulative impacts to any one area.

**Table 4. Acres treated as part of Alternative D – Upper Kanab Creek Watershed Vegetation Management Project – Grand Staircase Escalante National Monument Portions Only.**

<b>Alternative D (GSENM Only)</b>	<b>Acres</b>	<b>BLM %</b>	<b>Project Area %</b>
P/J Treatment	13711	15	10
Sagebrush-steppe Treatment	6349	7	5
Vegetation Re-Treatment	349	0	0
<b>Total</b>	<b>20421</b>	<b>23</b>	<b>16</b>

## 2.7. Summary of Action Alternatives

This chapter presents a reasonable range of alternatives to be considered as part of the UKCWVMP. A summary of acres by alternatives is presented in Table 5.

**Table 5. Summary of all action alternatives, proposed as part of the Upper Kanab Creek Watershed Vegetation Management Project.**

	Alt A - Proposed Action			Alt B - No Action			Alt C - KFO Portion			Alt D - GSENM Portion		
	Acres	BLM %	Project Area %	Acres	BLM%	Project Area %	Acres	BLM %	Project Area %	Acres	BLM %	Project Area %
<b>P/J Treatment</b>												
KFO	18861	21	14	0	0	0	18882	21	14	0	0	0
GSENM	13711	15	10	0	0	0	0	0	0	13711	1	10
UKCWVP	32572	36	25	0	0	0	18882	21	14	13711	1	10
<b>Vegetation Retreatment</b>												
KFO	5072	6	4	0	0	0	5072	6	4	0	0	0
GSENM	6349	7	5	0	0	0	0	0	0	6349	0	5
UKCWVP	11421	13	9	0	0	0	5072	6	4	6349	0	5
<b>Sagebrush Treatment</b>												
KFO	7258	8	6	0	0	0	7258	8	6	0	0	0
GSENM	349	0.4	0.3	0	0	0	0	0	0	349	0	0
UCKWVP	7607	8	6	0	0	0	7258	8	6	349	0	0
<b>TOTAL PROJECT AREA ACRES</b>												
KFO	31191	35	24	0	0	0	31191	35	24	0	0	0
GSENM	20408	23	15.6	0	0	0	0	0	0	20408	2	16
UCKWVP	51599	57.40	39.5	0.00	0	0	31191	35	24	20408	2	16

## 2.8. Alternatives Considered, but Eliminated from Further Action

### Permanent Grazing Changes

Permanent grazing changes, such as season of use, livestock numbers, closures, etc. are handled under the grazing permit renewal process. The grazing allotments within the UKCWVMP area were analyzed as recently as 2008, during a 10-year cycle of renewing all grazing permits. Permanent and/or long-term changes will continue to be handled on a case-by-case basis as part of the permit renewal process.

### Analysis of the Entire Kanab Creek Watershed

The upper and lower portions of the Kanab Creek Watershed are separated by the white cliffs, and represent two very distinct types of vegetative communities. Processes and land forms within the Upper Kanab Creek Watershed are similar in nature. The Upper Kanab Creek Watershed contains a variety of opportunities, within similar vegetation types, and could geographically and logistically be implemented within the life of this plan; whereas, the inclusion of the lower portion of the watershed would have increased this effort both in complexity and size. Additionally, the upper portion of the watershed is a focus area for UPCD.

### Inclusion of Riparian Treatments/Water Developments as Part of the Proposed Action.

A percentage of riparian areas throughout the project area are in need of improvement. However, completing riparian treatments before upland treatments would be futile, as overland flow from degraded uplands continues to be a factor in water quality and quantity. Water developments and/or riparian restoration will be handled on a case-by-case basis, as uplands are improved.

### **3.0 AFFECTED ENVIRONMENT**

This chapter presents the potentially affected existing environment (i.e., the physical, biological, social, and economic values and resources) of the impact area as identified in the Interdisciplinary Team Analysis Record Checklist (found in Appendix 1) and presented in Chapter 1 of this assessment. This chapter provides the baseline for comparison of impacts/consequences described in Chapter 4.

#### **3.1. General Setting**

The UKCWVMP encompasses the upper portion of the Kanab, Arizona-Utah 4<sup>th</sup> level, 8-digit HUC (#15010003). The project area (130,689 acres) is interspersed with Bureau of Land Management (BLM) lands (89,900 acres) State of Utah School and Institutional Trust Lands Administration (SITLA) lands (3,378 acres), small private parcels (31,401 acres), and U.S. Forest Service (USFS) owned lands (6,008 acres) near the town of Alton, Utah.

Land within the watershed is used primarily for wildlife habitat, with some livestock forage production.

Elevation in the project area ranges from approximately 5,800 feet to over 9,000 feet (upper portion of the project area, within USFS boundaries). Average annual precipitation is 14 to 18 inches.

#### **3.2. Affected Environment – Resources/Issues Identified and Brought Forward for Analysis**

##### **3.2.1. Cultural Resources**

A fairly high concentration of archaeological resources can be expected in some areas within the UKCWVMP area. Primary cultural resources within this area relate to the Archaic (6000 B.C. to A.D. 1) and Fremont (A.D. 450 to A.D.1300) cultures with, perhaps some Paiute evidence. The semi-arid climate of the area has resulted in a remarkable degree of preservation of cultural material. These, often, well-preserved sites and artifacts can provide anthropologists with a large body of data that could be translated into detailed cultural history for the region.

Locations of archaeological resources containing data potential within the UKCWVMP area can be predicted. For example, areas of high sensitivity for archaeological resources include sources of fresh water (seeps, creeks and springs), major and adjoining ridge lines, ecotones between sagebrush and forest margins, or prominent geographical features. Conversely, dense forested areas and steep slopes tend to be lower in archaeological sensitivity. There may be archaeological sites that are eligible for the National Register of Historic Places within the project area.

Some archaeological resources in the project area have been adversely impacted from past ecosystem restoration projects, perhaps occurring as a result of inadvertent impacts prior to the legal requirements for archaeological survey, site protection, and mitigation. Natural erosion processes have also contributed to past archaeological impacts.

### 3.2.2. Fire and Fuels

#### Fire Management Plan

The UKCWVMP area falls within 2 different Fire Management Units (FMU) identified in the current Southern Utah Support Area (SUSA) Management Plan (FMP) (2005). All alternatives fall within the Glendale Bench and Big Deer Fire Management Units (FMU).

The Glendale Bench FMU calls for the treatment of 22,000 acres, over a 10 year period, as follows:

- Improve ponderosa pine vigor and reproduction by reducing competition from pinyon and juniper woodland using prescribed fire and/or non-fire fuels treatments. Convert pinyon and juniper woodland to sagebrush/grassland using natural fire, prescribed fire, and mechanical treatment. Convert juniper to sagebrush/grassland using natural fire, prescribed fire, and mechanical treatment. Convert sagebrush using mechanical methods; create a mosaic of age classes in the sagebrush and sagebrush perennial grassland vegetation types.

The Big Deer FMU calls for the treatment of 95,000 acres, over a 10 year period, as follows:

- Convert 50,000 acres of pinyon and juniper woodland, 25,000 acres of juniper, and 20,000 acres of sagebrush to sagebrush/perennial grass using wildfire, prescribed, and non-fire fuels treatments.

Under the previous Fire Management Plan, full suppression tactics were applied to any wildfires within the project area. This has resulted in a large fuel load build-up and an alteration of fuel structure and composition. Pinyon/juniper trees once held in check by frequent fires, have expanded in range and moved into areas once dominated by shrubs, forbs and grasses. Pinyon/juniper expansion is well documented throughout the west, both through repeat photographs and peer-reviewed journals.

#### Fire Regime Condition Class

Fire Regime Condition Class (FRCC) is outlined in the Forest Service Rocky Mountain Research Station technical report entitled "Development of Coarse Scale Spatial Data for Wildland Fire and Fuel Management (RMRS-87, 2004). The Healthy Forest Restoration Act adopts this classification system, known as the Fire Regime Condition Class (Appendix 6) which describes the amount of departure of an area or landscape from historic to present conditions. This departure from the natural state may be a result of changes in one or more ecosystem components such as fuel composition, fire frequency, or other ecological disturbances. As mandated by national direction, the SUSA FMP utilizes the FRCC classification system to rank existing ecosystem conditions and prioritize areas for treatment. Approximately 93% of the project area is in FRCC 3 (lands that are significantly altered from their historical range). The remaining 6% would be classified as FRCC 2 (lands that have been moderately altered by either decreased or increased fire frequency) (Table 6).

**Table 6. Fire Regime Condition Class (FRCC) for the Upper Kanab Creek Watershed Vegetation Management Project Area. FRCC is identified for all alternatives. FRCC for rock and agricultural lands are not identified under this classification system.**

Fire Regime Condition Class (FRCC)	Alt. A - Proposed Action, Alt B - No action		Alt C. - KFO		Alt D - GSENM		Total
	Acres	%	Acres	%	Acres	%	
2	7,970	6	5,062	5	2,908	9	7,975
3	121,337	93	91,475	94	29,861	91	121,430
Rock, Agricultural Land	1,382	1	1,285	1	97	0	1,383
<b>Total</b>	<b>130,689</b>	<b>100</b>	<b>97,822</b>	<b>100</b>	<b>32,867</b>	<b>100</b>	<b>130,789</b>

### Fire Frequency

During the past 15 years, this area has experienced frequent but small fires (due primarily to fire suppression efforts). There were approximately 46 recorded fire starts on BLM lands only within the project area between 1993 and 2008. Of these, only 6 fires (16%) burned over 25 acres. All told, BLM records show 1,366 acres burned during this 15 year window.

Pinyon/juniper trees continue to expand in range and increase in density. Current closed tree canopy and material on the ground (ladder fuels) has increased the risk of catastrophic wildfire. Extreme fire behavior such as fire whorls, flame lengths in excess of 300 feet, and spotting distances in excess of ½ mile can be anticipated in dense canopy pinyon/juniper and sagebrush fuel types within the UKCWVMP.

### Cheatgrass

Cheatgrass may also increase fire frequency. Cheatgrass is present in isolated portions of the project area, specifically where recent wildfire has occurred and emergency stabilization and rehabilitation efforts have not been undertaken due to agency time constraints/funding.

The potential for wildfires and subsequent cheatgrass invasion continues to be the biggest threat and greatest management concern for native sagebrush steppe communities in the Great basin, and is of concern in the Upper Kanab Creek Watershed. This cheatgrass-wildfire cycle is rapidly converting shrub/grass/forb communities to annual grass communities throughout much of the western United States. This is especially true for areas where pinyon/juniper has encroached into sagebrush sites, increasing the risk for catastrophic wildfire. Sagebrush steppe ecosystems encompass 57 million acres of public lands throughout the west. Within the UKCWVMP area, 67% of the project area consists of evergreen forest types (pinyon/juniper woodlands), and 27% of the project area is classified as grass/shrub/scrub types (sagebrush-steppe communities) (see Table 11). These areas are at risk to cheatgrass invasion and subsequent conversion to annual grasslands following repeated wildfires.



### 3.2.3. Greenhouse Gas Emissions

Ongoing scientific research has identified the potential impacts of anthropogenic (man-made) greenhouse gas (GHG) emissions and changes in biological carbon sequestration due to land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused CO<sub>2</sub>(e) concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The Intergovernmental Panel on Climate Change recently concluded that “warming of the climate system is unequivocal” and “most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations” (IPCC 2000a).

Global mean surface temperatures have increased nearly 1.8°F from 1890 to 2006 (Gooddard, 2007). Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24° N) have exhibited temperature increases of nearly 2.1°F since 1900, with nearly a 1.8°F increase since 1970 alone. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

In 2001, the IPCC indicated that by the year 2100, global average surface temperatures would increase 2.5 to 10.4°F above 1990 levels. The National Academy of Sciences has confirmed these findings, but also has indicated there are uncertainties regarding how climate change may affect different regions (National Academy of Sciences, 2006). Computer model predictions indicate that increases in temperature will not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures. Increases in temperatures would increase water vapor in the atmosphere, and reduce soil moisture, increasing generalized drought conditions, while at the same time enhancing heavy storm events. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

Several activities contribute to the phenomena of climate change, including emissions of GHGs (especially carbon dioxide and methane) from fossil fuel development, large wildfires and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of carbon dioxide can influence climate for 100 years.

### 3.2.4. Range/Livestock

#### Allotments/Seasons of Use

Grazing allotments affected by the UKCWVMP are shown in Table 7 and Table 8. The number of acres associated with each allotment within the Kanab Creek Watershed boundaries, the Season of use, and the number of (Animal Unit Months) AUM's is also included.

## Kanab Field Office Portion

**Table 7. Kanab Field Office allotments, season of use and number of AUM's for the Upper Kanab Creek Watershed Vegetation Management Project.**

Allotment Name	Acres	Season of Use	AUM's
Alton	216	6/1-10/31	5
Bald Knoll	7,392	5/16-10/11	216
Black Mountain	980	10/1-11/30	42
Buck Knoll	4,432	7/1-10/15	151
Burnt Cedar Point	2,959	3/1-2/28	108
Coal Hollow	451	7/1-8/31	22
Cottonwood Springs	13,449	6/1-10/15	553
Elbow Springs	2,370	6/1-10/31	50
Glendale Bench	839	8/1-10/31	130
Isolated Tracks	1,621	5/16-10/31	67
LeVanger Lakes	321	6/1-11/15	33
Lower Sink Valley	4,160	6/1-6/30	35
Mill Creek	13,099	6/1-9/30	301
Red Hollow	93	6/20-10/31	40
Robinson Creek	517	6/1-11/30	24
Rocking Chair	2,968	6/1-6/30	61
Spencer Bench	797	7/1-10/15	98
Syler Knoll	504	5/1-10/31	6
Upper Place	3,643	6/15-11/1	23
Upper Sink Valley	6,291	6/1-10/15	311

All of the allotments associated with the Kanab Creek watershed are summer and fall use with the exception of Burnt Cedar Point which is year round but used primarily in the mid summer months. There are a total of 2,276 AUM's that the Kanab Field Office manages in the UKCWVMP.

The Kanab Field Office has established photo plots and nested plot frequency studies on each allotment in the Kanab Creek Watershed. These studies are read every 5 years. The majority of the allotments in the Kanab Creek Watershed are in a static to downward trend due to pinyon and juniper invasion. However portions of the Upper Sink Valley allotment, the Bald Knoll allotment, the Spencer Bench allotment, and the Buck Knoll allotment are in upward trend due to recent vegetation treatments. It is anticipated that the proposed action will serve to reverse the static to downward trend found on most of the allotments and will serve to strengthen the upward trend by reintroducing a more desirable plant community, by increasing water infiltration, and by stabilizing the eroding areas within the watershed.

## Grand Staircase Escalante National Monument

**Table 8. Grand Staircase Escalante National Monument allotments, season of use and number of AUM's for the Upper Kanab Creek Watershed Vegetation Management Project.**

Allotment Name	Acres	Season of Use	AUM's
Black Rock	10,573	6/6-10/16	478
First Point	2,958	6/1-12/31	401
Ford Well	4,824	6/10-10/9	291
Johnson Canyon	2,649	6/1-11/15	274
Pine Point	9,126	6/16-10/15	365
Second Point	3,873	6/1-9/30	69
Timber Mountain	6,899	6/16-10/15	426

Most of the allotments on the Monument portion of the UKCWVMP are used in the summer and fall. One allotment, First Point, is grazed until the end of December. There are a total of 2,304 AUM's that the Monument manages in the UKCWVMP. Within the Monument portion of the watershed there are ten different allotments, with twelve different permittees authorized to graze livestock on these Allotments.

The Grand-Staircase has trend plots on every allotment. The photo plot method is used on all of them. Two of the allotments, Black Rock and Pine Point, also have quadrat frequency studies to help determine trend. The trend studies are read every five years. Blackrock and Ford Well have an upward trend. Portions of both of these allotments have been treated within the last ten years. The treated areas exhibit a higher diversity of species, and a higher percentage of ground cover than existed prior to the treatments.

First Point and Second Point have a static trend. These trend studies show that there is still a grass understory, but pinyon/juniper trees and sagebrush are slowly encroaching into the seedings/rangelands, and competing with understory grass species.

Timber Mountain, Johnson Canyon, and Pine point have a downward trend. The trend studies show overall reduction in the amount of grasses, both native and seeded species. The reduction in grasses can be attributed to an increase in the number of pinyon and juniper that trees are encroaching into previously treated areas, and sagebrush flats. There is also an apparent reduction in herbaceous ground cover and an increase in bare ground on these allotments.

### Plant Species Composition

Species composition and distribution is similar throughout the project area. Native, perennial, cool-season<sup>10</sup> and warm-season<sup>11</sup> grasses include species such as Indian ricegrass (*Oryzopsis*

<sup>10</sup> cool-season plant A plant that makes most or all of its growth during the winter and early spring when ambient air temperatures are cooler [e.g. Indian ricegrass (*Oryzopsis hymenoides*), crested wheatgrass (*Agropyron cristatum*), needle and thread (*Stipa comata*), bottlebrush squirreltail (*Sitanion hystrix*), globemallow (*Sphaeralcea*)] (American Society for Range Management, 1964).

*hymenoides*), needle and thread (*Stipa comata*), bottlebrush squirreltail (*Sitanion hystrix*), muttongrass (*Poa fendleriana*), sand dropseed (*Sporobolus cryptandrus*), blue grama (*Bouteloua gracilis*) and galleta (*Hilaria jamesii*). Non-native, perennial cool-season grasses include species such as crested wheatgrass (*Agropyron cristatum*). Undesirable, non-native, annuals such as cheatgrass (*Bromus tectorum*) occur on the allotments primarily in the disturbed areas. Native shrubs include big sagebrush (*Artemisia tridentata*), black sagebrush (*Artemisia nova*) Gambel oak (*Quercus gambelli*), curlleaf mountain mahogany (*Cercocarpus ledifolius*), antelope bitterbrush (*Purshia tridentata*), Utah serviceberry (*Amelanchier utahensis*), green rabbitbrush (*Chrysothamnus viscidiflorus*), rubber rabbitbrush (*Chrysothamnus nauseosus*), and broom snakeweed (*Gutierrezia sarothrae*).

The primary tree species are pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*).

There has been an overall reduction in the production and vigor of native and non-native perennial, cool-season grasses and native shrub communities on sites within the proposed treatment areas. On some sites, warm-season grasses such as galleta (*Hilaria jamesii*) occur at high densities where cool-season grasses such as Indian ricegrass (*Oryzopsis hymenoides*) have been displaced. Many of the existing perennial, cool-season grasses occur beneath the canopy of shrub species. Undesirable, non-native annuals such as cheatgrass (*Bromus tectorum*) are common and shrub communities dominated by Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) have declined in both density and plant vigor. Many of the sagebrush communities are comprised of older, even-aged, decadent plants which have low vigor and poor nutritional value for browsers. Grazing and browsing from both livestock and wildlife, invasion of pinyon/juniper woodlands and drought-related impacts have reduced the overall health, vigor, recruitment and production of a variety of grass and shrub species.

Many former sagebrush steppe sites within the proposed treatment area are dominated by pinyon/juniper woodlands. The invasion of pinyon/juniper woodlands limits the site potential for the recruitment and establishment of native grasses and shrubs. Native grasses and shrubs are not capable of competing with pinyon and juniper trees for sunlight, nutrients and water, resulting in the long-term loss of understory species which are important for grazing and browsing and soil stability.

### **3.2.5. Recreation**

#### Recreation

There are no developed recreation facilities in any of the proposed treatment areas. Current recreation uses and opportunities include dispersed activities such as hunting, sightseeing, driving for pleasure, accessing canyons for scenic photography or canyoneering, nature study, wildlife photography and hiking/backpacking/camping.

### **3.2.6. Soils**

The soils of the UKCWVMP have been studied, mapped and described as part of two official soil survey, completed by the Natural Resource Conservation Service (NRCS), including the

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<sup>11</sup> warm-season plant A plant that makes most or all of its growth during the spring and summer [e.g. galleta (*Hilaria jamesii*), blue grama (*Bouteloua gracilis*), (American Society for Range Management, 1964).

Grand Staircase Escalante National Monument Survey (2003) and the Kane County/Kanab Creek Survey (in progress, 2009). Each of the soil surveys, which meet the standards of the National Cooperative Soil Survey, describe soil map units, their individual components, and provide interpretive information on soil use and management.

There are 16 acres designated by Kane County as Prime and Unique Farmland if irrigated. None of the 16 acres occur within the UKCWVMP area.

The majority of the soils in the project area are formed in alluvium, eolian sand and residuum derived from sandstone and basalt. Soils occur primarily on two major affected landforms – hills and plateaus. The UKCWVMP includes elevations ranging from 5800 to 9000 feet, with precipitation ranging from 14-18 inches.

Specific soil map units are represented within the project area. All map units (Table 9) contain two or more significantly different soils and are grouped as associations. Specific soil descriptions are summarized as part of the project record or are available in published form through NRCS.

A summary of the individual soil map units within the UKCWVMP is included as part of the project record.

#### Surface Erosion

The majority of individual soils within the UKCWVMP project area have a low-to-medium potential for surface soil erosion, and are moderately to excessively well-drained due to the presence of some rock fragment in the soil horizon. Rock fragments help to stabilize soils and allow water to penetrate faster by creating macro pores and acting as a buffer to wind to minimize wind erosion.

#### Soil Stability

Soil stability is the potential of an ecosystem to maintain its porous structure to allow for passage of air and water, withstand erosive forces and provide a medium for plant root. Overall, long-term soil stability has been an issue within the UKCWVMP, due to past management efforts and land uses. The lack of understory vegetation throughout the project area has increased upland and riparian erosion, and has resulted in severe headcutting and downcutting in some areas.

#### Biological Soil Crusts

Biological Soil Crusts (BSC) play an ecological role in soil stability and, atmospheric nitrogen fixation, nutrient contribution to plants, soil-plant-water relations, seedling germination and plant growth.

Biological soil crusts occur throughout the project area; however, they are not pervasive. Because soil crust cover is inversely related to vascular plant cover, biological soil crusts decrease as elevation increases, and/or until vascular plant cover precludes their growth. Elevations within the UKCWVMP area range from 5,800 feet to over 9,000 feet, limiting the potential for wide spread distribution of BSC throughout the project area.

Biological soil crusts that do occur within the project area may have been impacted by a variety of past disturbances including fire, grazing, trampling by foot or vehicle and increased erosion. Such disturbances are generally more detrimental when BSC are dry (dormant) than when damp or wet (active). Disturbances that remove or kill BSC take longer to recover from than disturbances that leave crushed crust material in place. Most of the past activities associated with disturbance within the project area would likely have damaged rather than destroyed existing biological crust communities, if and when such actions occurred.

Historic fire regimes in semi-arid and arid landscapes, such as the Upper Kanab Creek Watershed, generally left small patches of burn and unburned areas, creating a mosaic of successional stages of vascular plants and biological soil crusts. High intensity fire generally kills biological soil crusts and/or results in a loss of BSC surface cover and species diversity (see Fire and Fuels section for a discussion of fire history and fire intensity) (Belnap 2001).

While no one can dispute the presence of BSC within the project area, the ecological role of soil crusts in arid and semi-arid environments has been found, in the scientific literature, to be controversial. Some research indicates that's BSC inhibit water infiltration while other studies claim BSC facilitate water infiltration. The same is said for seed germination; BSC can either aide or inhibit germination. In regards to nitrogen fixation, not all BSC can fix nitrogen. Only cyanobacteria and lichens with blue-green algae are capable of fixing nitrogen. These are usually the first organisms to colonize a suitable site, but may persist for decades. However, cryptogamic soils are not the only source of nitrogen in arid environments. Nitrogen fixing vascular plants found in this region are: *Oxytropis* sp., *Trifolium* sp., *Astragalus* sp., *Cercocarpus ledifolius*, *Cowania mexicana*, *Purshia tridentata* and *Sheperdia rotundifolia* (Belnap, 2008).

#### Soil Productivity

Soil productivity (long term) is the inherent potential of the ecosystem to produce a certain level of vegetation and associated processes, such as water, wildlife, and clean air. Fixed components which influence soil productivity include local climate, topographic features, and soil type. Components affecting productivity that can be changed include: soil volume, porosity, water availability, biology, and chemistry.

Process known to cause the greatest adverse effects on soil physical, chemical, and biological properties associated with the types of proposed management activities include the following: soil compaction, displacement, and surface erosion. Direct effects to the soils include compaction and displacement. Soil erosion and soil biology usually occur as indirect effects.

Overall, soil productivity is high in the UKCWVMP Area.

**Table 9. Soil Map Units and acres for the Upper Kanab Creek Watershed Vegetation Management Project area, by treatment type, for Alternatives, A, C, and D.**

Soil Type	Alternative A - Upper Kanab Creek Watershed					Alternative C - Kanab Field Office					Alternative D - GSENM				
	PJ Treat	SB Treat	Previous	Total	%	PJ Treat	SB Treat	Previous	Total	%	PJ Treat	SB Treat	Previous	Total	%
1103	679.7	321.4	819.1	1820.2	3.5	679.7	321.4	819.1	1820.2	5.8					0.0
1104	1300.4	244.1	304.0	1848.5	3.6	1300.4	244.1	304.0	1848.5	5.9					0.0
1105	296.7	134.0	21.4	452.0	0.9	296.7	134.0	21.4	452.0	1.4					0.0
1106	1021.4	224.5	508.8	1754.7	3.4	1021.4	224.5	508.8	1754.7	5.6					0.0
1107	1620.8	1640.2	142.3	3403.3	6.6	1620.8	1640.2	142.3	3403.3	10.9					0.0
1108	203.7	0.0	2.0	205.7	0.4	203.7		2.0	205.7	0.7					0.0
1110	737.9	1056.9	1415.5	3210.2	6.2	737.4	1056.7	1415.0	3209.1	10.3	0.5	0.1	0.5	1.1	0.0
1111	112.5	107.3	176.9	396.7	0.8	112.5	107.3	176.9	396.7	1.3					0.0
1113	243.8	25.2	174.4	443.4	0.9	243.8	25.2	174.4	443.4	1.4					0.0
1120	1319.2	13.4	190.0	1522.6	2.9	1319.2	13.4	189.8	1522.4	4.9	0.0		0.1	0.2	0.0
1121	1738.5	350.3	767.3	2856.1	5.5	1738.1	350.1	767.3	2855.5	9.1	0.4	0.2	0.0	0.5	0.0
1181	4455.7	2738.6	361.4	7555.7	14.6	4455.6	2738.6	361.4	7555.6	24.2	0.1		0.0	0.1	0.0
1182	948.6	273.8	6.2	1228.5	2.4	948.6	273.8	6.1	1228.5	3.9	0.0	0.0	0.0	0.1	0.0
1201	29.9	0.0	0.0	30.0	0.1	29.9	0.0		30.0	0.1					0.0
5004	14.0	0.0	32.0	46.0	0.1				0.0	0.0	14.0		32.0	46.0	0.2
5120	0.0	30.7	0.9	31.6	0.1			0.0	0.0	0.0	0.0	30.7	0.9	31.6	0.2
5126	1585.1	0.0	1122.2	2707.3	5.2	483.2			483.2	1.5	1101.9		1122.2	2224.0	10.9
5180	98.8	140.0	8.6	247.4	0.5	38.7	122.5	7.3	168.5	0.5	60.1	17.5	1.3	78.9	0.4
5181	8976.5	46.5	3921.6	12944.7	25.0	0.0	0.0	0.0	0.0	0.0	8976.5	46.5	3921.6	12944.6	63.4
5182	1331.7	0.0	233.3	1564.9	3.0	0.0			0.0	0.0	1331.7		233.3	1564.9	7.7
5183	774.5	41.4	139.8	955.6	1.8		0.1	0.0	0.1	0.0	774.5	41.3	139.7	955.5	4.7
5200	415.5	2.3	54.9	472.7	0.9	0.1			0.1	0.0	415.4	2.3	54.9	472.6	2.3
5201	425.2	2.6	37.8	465.6	0.9		0.1	0.0	0.1	0.0	425.2	2.6	37.8	465.5	2.3
5206	0.7	0.0	0.0	0.7	0.0				0.0	0.0	0.7		0.0	0.7	0.0
5210	610.7	208.0	804.8	1623.5	3.1	0.4	0.5	0.7	1.5	0.0	610.3	207.5	804.2	1622.0	7.9
DA	3706.4	8.7	185.1	3900.1	7.5	3706.4	8.6	185.1	3900.0	12.5		0.1		0.1	0.0
TOTAL	32647.7	7609.8	11429.9	51687.4	100.0	18936.5	7261.1	5081.4	31279.0	100.0	13711.2	348.7	6348.5	20408.4	100.0

### 3.2.7. Visual Resource Management (VRM)

#### *Visual Resource Management Objectives*

VRM classes were identified for GSENM and KFO lands during recent land use planning efforts. BLM uses a Visual Resource Management (VRM) system to inventory and manage visual resources on public lands. The primary objective of VRM is to minimize visual impacts on BLM administered public lands. The VRM system uses four classes to describe the degrees of modification allowed within a given landscape. Visual Resource Management classes are based upon a landscape's visual quality, viewer sensitivity to that landscape, and comprehensive management objectives. Once an area has been assigned a VRM class, the classification is used to analyze the visual impacts of proposed projects and activities on BLM lands. The basic philosophy underlying the VRM system is that the degree to which a proposed project or activity affects the visual quality of a landscape depends on the visual contrast created between the proposal and the existing landscape. The VRM system's assessment process provides a means for determining visual impacts and for identifying measures to mitigate those impacts. The proposed action project locations are in areas classified as VRM class II, III and IV as detailed in Table 10 and shown in Map 6:

**Table 10. Visual Resource Management (VRM) classes for the UKCWVMP.**

	VRM Class (acres)			
	II	III	IV	Total
<b>GSENM</b>				
PJ Treatment	11,840	1,870		13,710
Previously Treated	6,205	145		6,350
Sagebrush Treatment	350			350
<b>Total</b>	<b>18,395</b>	<b>2,015</b>	<b>0</b>	<b>20,410</b>
<b>KFO</b>				
PJ Treatment	1,850	7,565	9,420	18,835
Previously Treated	5	1400	3,635	5,040
Sagebrush Treatment	445	2,850	3,950	7,245
<b>Total</b>	<b>2,300</b>	<b>11,815</b>	<b>17,005</b>	<b>31,120</b>
<b>Total Overall Acres</b>	<b>20,695</b>	<b>13,830</b>	<b>17,005</b>	<b>51,530</b>

Each VRM Class has an objective that prescribes the amount of change allowed in the characteristic landscape, as described below:

*Class II:* The objective for VRM Class II is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

*Class III:* The objective for VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Any changes should repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

*Class IV:* The objective for VRM Class IV is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location; minimal disturbance; and repeating the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.



### ***Visual Landscape Character***

As viewed along Glendale Bench, Johnson Canyon and Skutumpah Roads, the project areas consist primarily of gently rolling terrain within a series of broadly enclosed landscapes. Foreground views are primarily composed of broad valleys covered with desert shrubs and grasses and dotted with randomly spaced trees. Thick stands of trees cover the periphery of the valleys and hillsides. The mid-ground and background views are primarily composed of solid expanses of trees. In those areas where the stands of trees are adjacent to the roads, the view is shortened to the immediate surroundings and has a sense of enclosure.

The lines in the landscape are strongly horizontal and are formed by the landform edges and the edges created when vegetation types change.

The predominant colors of this landscape are greens, tans, reds, and grays. The greens run the spectrum of sage to dark green because of the vegetation. The tans and reds are lighter and darker variations depending on the soil type and exposed stone outcrops. The grays are the predominant undertone of all other colors in the landscape.

The textures of this are primarily medium to fine depending on variations in landform and vegetation.

There are very few built environment elements within this landscape, but of those that do occur, the roadways are the most obvious and add linear banding to the landscape. Other elements include fences, signs, a few homes, cattle management infrastructure (i.e. water tanks, etc) and power lines. The elements add vertical and horizontal lines as well as small three-dimensional shapes to the landscape.

The project area is a classic pinyon/juniper and mixed shrubland landscape in Southern Utah which creates a feeling of vastness and open space similar to many areas within the Colorado Plateau region.

### **3.2.8. Natural Areas (KFO), WSA (GSENM)**

“Natural areas” were formerly referred to as “non-WSA lands with wilderness characteristics”. Similar to WSAs, these lands typically consist of at least 5,000 contiguous acres bearing a high degree of naturalness, and offering outstanding opportunities for solitude or primitive and unconfined recreation. The Upper Kanab Creek natural area is characterized by exceptionally scenic white cliffs which separate uplands and lower slopes which are covered with juniper, pinyon pine, scrub oak, and a variety of other shrubs, forbs and cacti. The lower slopes have many open sandy areas, and only a few motorized routes penetrate the upper and lower elevation portions of the natural area.

### **3.2.9. Wildlife (including Special Status species)**

#### **Migratory Birds**

Most birds in the analysis area are considered neotropical migratory birds except for the gallinaceous (upland game) birds such as greater sage-grouse (*Centrocercus urophasianus*) and wild turkey (*Meleagris gallopavo*). Migratory birds are protected and managed under the

Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703 *et. seq.*) and Executive Order 13186. Under the MBTA nests (nests with eggs or young) of migratory birds may not be harmed, nor may migratory birds be killed. Executive Order 13186 directs federal agencies to promote the conservation of migratory bird populations.

There are dozens of migratory bird species that utilize the different habitats associated with the proposed project areas for a portion of their lifecycle. Some of these species are: ash-throated flycatcher (*Myiarchus cinerascens*), Bewick's wren (*Thryomanes beweckii*), black-billed magpie (*Pica hudsonia*), black-throated gray warbler (*Dendroica nigrescens*), blue-gray gnatcatcher (*Polioptila caerulea*), bushtit (*Psaltriparus minimus*), Brewer's sparrow (*Spizella breweri*), ferruginous hawk (*Buteo regalis*), gray flycatcher (*Empidonax wrightii*), gray vireo (*Vireo vicinior*), juniper titmouse (*Baeolophus ridgwayi*), loggerhead shrike (*Lanius ludovicianus*), mountain chickadee (*Poecile gambeli*), pinyon jay (*Gymnorhinus cyanocephalus*), sage sparrow (*Amphispiza belli*), sage thrasher (*Oreoscoptes montanus*), vesper sparrow (*Poocetes gramineus*), western bluebird (*Sialia mexicana*), and western scrub jay (*Aphelocoma californica*).

The KFO maintains information regarding neotropical migratory birds by conducting an annual breeding bird survey in June of each year with the U.S. Geological Survey, Patuxent Wildlife Research Center and an annual Christmas Bird Count with the American Birding Association. The latter data is on file, and available for review, in the Kanab Field Office, or at [www.Americanbirding.com](http://www.Americanbirding.com).

Of the priority habitats currently listed by Partners in Flight for the state of Utah, the analysis area may contain portions of the following priority habitats for migratory bird species, including but not limited to the following habitats and species.

Pinyon-juniper – black-throated gray warbler, gray vireo, Virginia's warbler

Shrub-steppe – sage sparrow, Brewer's sparrow

### Special Status Species

Special status species include federally listed threatened/endangered/candidate species and Utah State sensitive species for these habitats. BLM policy is to provide these species with the same level of protection as provided for candidate species in BLM Manual 6840.06C, that is to “ensure that actions authorized, funded, or carried out do not contribute to the need for the species to become listed.”

A search of all the known available data was conducted to determine which special status species may be present in the analysis area. Special status species that are known to occur or may occur in the analysis area include: bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk (*Buteo regalis*), greater sage-grouse (*Centrocercus urophasianus*), lewis's woodpecker (*Melanerpes lewis*), northern goshawk (*Accipiter gentilis*), and pygmy rabbit (*Brachylagus idahoensis*). As each of these species deserves special consideration, each is discussed further below:

**Bald eagle** - The national symbol of the United States was first protected under the Bald Eagle Protection Act of 1940, then listed as an endangered species in most of the lower 48 states in

1966 and again in 1973. Because it was listed in 1973, the bald eagle population has clearly increased in number and expanded in range throughout the contiguous 48 states. During a survey in January 2002, approximately 22 bald eagles were counted along the Sevier River within Kane and Garfield counties—17 adults and 5 immatures (BLM 2002c). The increase is a direct result of the ban on the use of DDT and other persistent organochlorines, habitat protection, and other recovery efforts. In 1995 the USFWS reclassified the bald eagle under the ESA from endangered to threatened in the lower 48 states (*Federal Register* 50 CFR, part 17, vol. 60, no. 133). The bald eagle was removed from the list of threatened and endangered species by the USFWS in June 2007.

The bald eagle is found throughout Utah and more often during the winter than the summer. Habitat consists of communal winter roosting habitat and foraging habitat within the planning area. Feeding areas, diurnal perches, and night roosts are fundamental elements of bald eagle winter range. In Utah, eagles nest in mature cottonwoods. Wintering habitat exists within both Garfield and Kane counties. Fish and waterfowl are the primary sources of food for bald eagles, but they also will feed on rabbits, carrion, and small rodents. Bald eagles that winter in Utah number in the thousands, but the nesting population (9 active nests in 2005) has not reached the recovery goal of 10 (UDWR 2005a). Threats to the species include loss of lowland riparian habitats, which serve as both nest and roost habitat, as well as nest and roost abandonment which results from excessive human disturbance (UDWR 2005a). There are no known roosts or nests in the project area.

**Ferruginous Hawk** is distributed throughout most of Utah, although it is rare and productivity may not be sufficient to maintain the state's population (UDWR 2005a). Productivity in ferruginous hawks is directly correlated with the available prey base such as jackrabbits. Due to the cyclic nature of jackrabbit populations, ferruginous hawks may experience similar population booms and crashes. Breeding ferruginous hawks rely on grassland or shrub-steppe terrain and, in many parts of Utah, nest on the ecotone between these habitats and pinyon-juniper woodlands (UDWR 2005c). "The species is prone to abandon nest sites with...low levels of human disturbance" (UDWR 2005a, pp 6-25). Threats include human disturbance (recreation and mineral development) and loss of preferred pinyon-juniper woodland habitats for nesting (UDWR 2005a).

**Greater Sage-grouse** is a sagebrush obligate species and is strictly associated with sagebrush/grasslands. Sage-grouse may eat a variety of grasses, forbs, and insects during the breeding season. They feed almost entirely on sagebrush during the winter months, selecting shrubs with high protein levels (Paige and Ritter, 1999).

UDWR has identified approximately 11,858 acres of brooding habitat in the Project area. This accounts for approximately 9% of the total acreage within the assessment area. Brood rearing habitat is typically defined for early-brood rearing and late-brood rearing activities. Early-brood rearing activities are maintained relatively close to the nesting site where young chicks feed primarily on insects and native forbs. Late-brood rearing activities may be more concentrated around areas containing more palatable vegetation; insects still remain an important part of the diet.

Several historic leks (male strutting grounds) are found within the project area in the Ford Pasture and Skutumpah Ranch areas. An active lek is located in the Sink Valley area on private ground.

Table 11 summarizes sagebrush characteristics typically used or referenced in sage grouse conservation planning efforts for general habitat management guidelines taken from the Western Association of Fish and Wildlife Agencies (WAFWA) Guidelines to manage sage-grouse populations and their habitats (Connelly et al. 2000).

**Table 11. Characteristics of sagebrush rangeland needed for productive sage grouse habitat.**

	Breeding		Brood-rearing		Winter <sup>e</sup>	
	Height (cm)	Canopy (%)	Height (cm)	Canopy (%)	Height (cm)	Canopy (%)
Mesic sites <sup>a</sup>						
Sagebrush	40-80	15-25	40-80	10-25	25-35	10-30
Grass-forb	>18 <sup>c</sup>	≥25 <sup>d</sup>	Variable	>15	N/A	N/A
Arid sites <sup>a</sup>						
Sagebrush	30-80	15-25	40-80	10-25	25-35	10-30
Grass-forb	>18 <sup>c</sup>	≥15	Variable	>15	N/A	N/A
Area <sup>b</sup>		>80		>40		>80

a Mesic and arid sites should be defined on a local basis; annual precipitation, herbaceous understory, and soils should be considered (Tisdale and Hironaka 1981, Hironaka et al. 1983).

b Percentage of seasonal habitat needed with indicated conditions.

c Measured as "droop height"; the highest naturally growing portion of the plant.

d Coverage should exceed 15% for perennial grasses and 10% for forbs; values should be substantially greater if most sagebrush has a growth form that provides little lateral cover (Schroeder 1995)

e Values for height and canopy coverage are for shrubs exposed above snow.1

Historically sage-grouse within the analysis area probably had a greater distribution than they currently do (UDWR, 2002). Although difficult to understand all of the reasons for their decline, it is thought that encroachment of pinyon-juniper woodland into historic sagebrush habitat has contributed to the decline in suitable habitat. Additionally, the lack of natural disturbances such as wild fire and grazing practices that favor shrub growth have led to large, even-aged stands of dense, decadent sagebrush which provides little value to sage-grouse (Frey, et. al., 2006). These dense sagebrush stands lack the desired grass and forb component in the understory that grouse need for seasonal nutritional requirements.

**Lewis's Woodpecker** is known to occur within the project area in low numbers. The primary nesting habitat of this woodpecker is open, park-like ponderosa pine forests which are very limited within the project area. Secondary nesting habitat includes riparian habitat and the fringes of pinyon and juniper stands. Lewis's woodpeckers are cavity nesters and often move into burned areas shortly after a fire to excavate the burned trees. The diet of this woodpecker consists of insects during the breeding season and nuts and berries during the winter. Habitat with a diverse understory of shrubs, grasses, and forbs is important to this woodpecker because such habitat supports the insect prey on which this species feeds.

**Northern Goshawk** is present within both Kane and Garfield counties. The northern goshawk prefers mature mountain forest (conifer and aspen) and riparian zone habitats. Nests are constructed in trees in mature forests; often nests previously used by northern goshawks or other bird species are re-used. Northern goshawks cruise low through forest trees to hunt, and may also perch and watch for prey. Major prey items include rabbits, hares, squirrels, and birds (UDWR

2005b). Threats include changes in connectivity among suitable habitat stands and the loss of large-diameter trees to fire, insects, or harvest (UDWR 2005a).

Northern goshawks are not likely to be directly impacted by the Proposed Action. Nesting usually occurs from early April – mid June but is highly dependent on elevation. No nesting birds have been documented in the project area, Utah guidelines for Raptor Management USFWS, (Kanab RMP Appendix 2) outlines the spatial and seasonal buffers should raptors be found in the project area.

**Pygmy Rabbit** is typically restricted to the sagebrush-grass complex. A dietary study of pygmy rabbits showed that they are dependent on sagebrush year round. Sagebrush was eaten throughout the year as 51% of the diet in summer and 99% in the winter. They also showed a preference for grasses and to lesser extent forbs in the summer (Green and Flinders, 1980). These data seem to indicate that pygmy rabbits require sagebrush stands with an understory of perennial grasses to meet their seasonal dietary requirements. Pygmy rabbits are typically associated with deep, friable soils in areas with low to moderate slope. This type of habitat is common in drainage bottoms, flood plains, and alluvial fans which make up a small portion of the proposed project areas. Much of the substrate within the project area has a very sandy texture which may preclude the ability to excavate a sustainable burrow. No pygmy rabbit sightings have ever been documented within the proposed project areas although sightings have been reported in Garfield County to the north of the project area.

#### General Wildlife

A variety of terrestrial wildlife resources in the proposed project areas are typical of the Colorado Plateau physiographic province. The vegetation on the proposed project areas could be categorized as primarily sagebrush steppe and pinyon-juniper woodland with small inclusions of oak, ponderosa pine and mountain brush species. Mammalian species typical of these habitats include mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), coyote (*Canis latrans*), jack rabbit (*Lepus ssp.*), cottontail rabbit (*Sylvilagus ssp.*) and several species of small mammals, most notably the sagebrush vole (*Lagurus curtatus*) and the whitetail antelope squirrel (*Ammospermophilus leucurus*).

Many different species of reptiles and amphibians may be present in the proposed project areas. The most abundant amphibian species is probably the great basin spadefoot toad (*Spea intermontana*) which may inhabit springs, seeps and riparian areas. The most common reptilian species include side-blotched lizard (*Uta stansburiana*), sagebrush lizard (*Sceloporus graciosus*), gophersnake (*Pituophis catenifer*), terrestrial gartersnake (*Thamnophis elegans*), and prairie rattlesnake (*Crotalus viridis*). None of these amphibian or reptilian species is considered “sensitive” by the BLM or the State of Utah.

**Mule deer** – The assessment area is within the Paunsaugunt Deer Herd Unit, known for producing trophy bucks. There are some resident mule deer within the assessment area although most of the deer migrate seasonally along elevation gradients. Areas with heavy snow accumulations that are generally only accessible during the late spring to late fall are classified as “crucial summer habitat” by the UDWR. Approximately 72,550 acres within the assessment area falls into this category. Approximately 56,764 acres within the assessment area are

classified as “substantial winter habitat. This habitat is primarily used by deer during the transition time as they move from their summer habitat to their winter habitat and vice versa. Approximately 1,396 acres within the assessment area are classified as “crucial winter habitat.” This habitat is the final destination point for deer as winter sets in and generally occurs at lower elevations where deep snows are not often present for long periods of time.

Deer are generally classified as browsers, with shrubs and forbs making up the bulk of their annual diet although their diet can be quite varied. The importance of various classes of forage plants varies by season. In winter, especially when grasses and forbs are covered with snow, their entire diet may consist of shrubby species. In spring and early summer, grasses and forbs become increasingly important to nursing does with fawns and bucks for antler growth.

In this area Big sagebrush (*Artemisia spp.*), Cliffrose (*Purshia tridentata*), Snowberry (*Symphoricarpos spp.*) and Serviceberry (*Amelanchier spp.*) are probably the most important browse species. Perennial grasses such as Indian ricegrass (*Acnatherum spp.*), bottlebrush squirreltail (*Sitanion hystrix*) and crested wheatgrass (*Agropyron cristatum*) are important when they are green in spring and early summer and in the winter when they are not covered by deep snow. These perennial grasses provide diversity in the mule deer’s diet. Forbs such as globemallow (*Sphaeralcea spp.*), and arrowleaf balsamroot (*Balsamorhiza spp.*) also provide needed diversity in the deer’s diet.

**Rocky Mountain elk** – There are a few elk within the assessment area that have become permanent residents. Like other members of the deer family, elk migrate seasonally to avoid heavy snows at higher elevations. The very northern tip of the assessment area (approximately 15,710 acres) is classified as “crucial summer habitat” for elk. The remainder of delineated elk habitat within the assessment area (approximately 106,925 acres) has been classified as “substantial year-long habitat.” Being that elk are larger in size than mule deer, they are able to remain at higher elevations during harsh winters.

Elk are generally classified as both a grazer and a browser, with grasses and forbs making up the bulk of their summer diet. However, during harsh winters elk consume large quantities of browse species. They tend to be found in areas of semi-open forest and forest edges next to parks and meadows. Browse species available to elk in the area are similar to those described above for mule deer.

The projects analyzed in this EA would be managed to achieve the objectives described in the Utah Standards for Rangeland Health (Appendix 2), including maintaining desired species “at a level appropriate for the site and species involved.” Those areas currently in late seral (good) ecological condition would be managed to maintain, at a minimum, that condition. Those areas in early to mid seral ecological condition would be managed to improve their condition. (While this would be the primary objective, there may be circumstances, such as threatened or endangered species requirements, where areas would be managed for an earlier seral stage.)

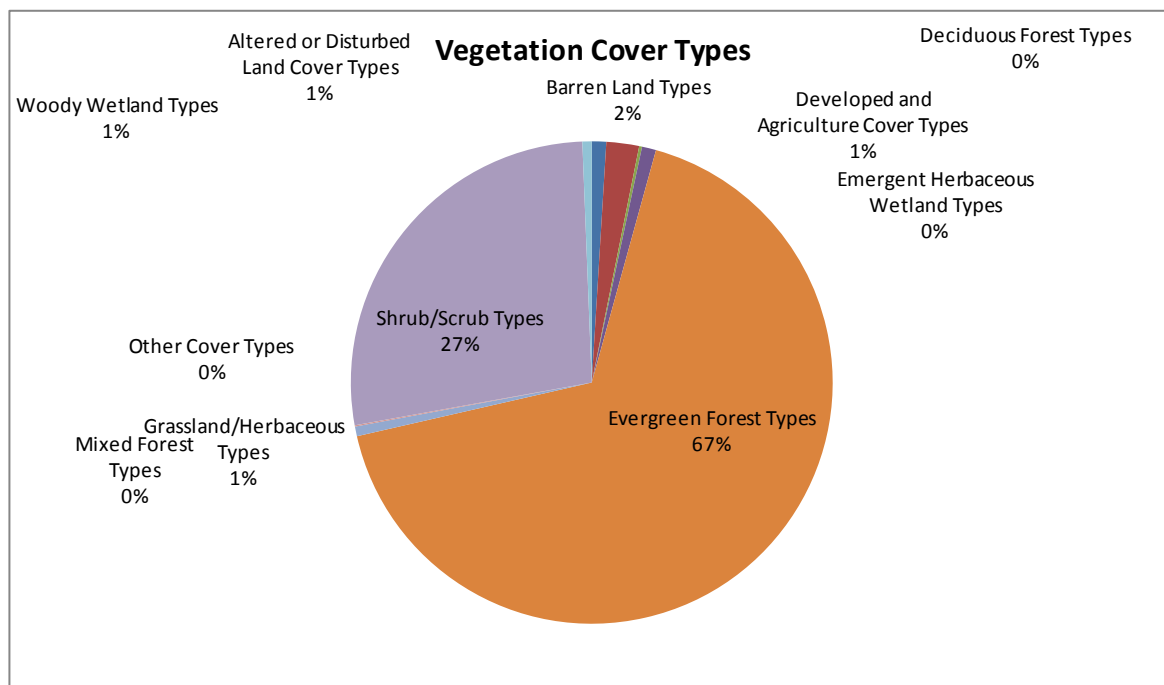
### **3.2.10. Woodland/Forestry**

Woodland and forest cover types were analyzed using Vegetation Re-Gap Data. Ten dominant vegetation types occur throughout the 130,688 acre project area. Evergreen Forest Types

(Pinyon/Juniper) and Shrub/Scrub types (sagebrush steppe types) occupy the majority of BLM-administered lands within the project area. Specific vegetation cover type breakdowns in the project area are identified in Table 12 and Figure 4.

**Table 12. Vegetation Types within the Upper Kanab Creek Watershed Vegetation Management Project area.**

Vegetation Type	Total
Altered or Disturbed Land Cover Types	1,264.42
Barren Land Types	2,866.21
Deciduous Forest Types	251.92
Developed and Agriculture Cover Types	1,237.65
Emergent Herbaceous Wetland Types	0.10
Evergreen Forest Types	87,722.61
Grassland/Herbaceous Types	847.87
Mixed Forest Types	108.21
Other Cover Types	6.57
Shrub/Scrub Types	35,569.80
Woody Wetland Types	813.88
<b>Total Acres</b>	<b>130689.24</b>



**Figure 4. Vegetation Cover Types within the UCKWVMP Area.**

Pinyon/juniper expansion into areas historically dominated by sagebrush and perennial grasses is well documented (Brockway, et. al, 2002) (West, 1998). Long-term fire suppression efforts, coupled with excessive browsing and grazing by wildlife and livestock have led to the

conversion of sagebrush-steppe communities to large shrubland areas, dominated by homogenous stands of mature sagebrush, with declining, remnant populations of native perennial forbs and grasses. Understory shrubs, forbs and grasses are lacking, which may cause excessive surface runoff and soil erosion, reduced soil moisture and decreased groundwater recharge (Bedell, 1993)(Thurow, 2005). Reduced soil moisture and competition of woody species for light and moisture has resulted in reduced forage for both wildlife and livestock. Critical winter habitat and structural plant diversity needed by mule deer and other wildlife, continues to be lost (Thurow, 2005)(USGS, 2005).

Within the UKCWVMP, the majority of the landscape consists of areas where pinyon/juniper has infilled or encroached into surrounding landscapes. Pinyon and Juniper has encroached into all other vegetation types, including ponderosa pine areas, sagebrush grasslands, and mountain brush communities. High densities of trees create a closed-canopy with little or no opportunity for future recruitment of sagebrush or other desired understory vegetation. Upland erosion has increased, resulting in reduced soil moisture and decreased groundwater recharge.

All pinyon/juniper areas within the watershed are currently in FRCC3, where vegetation communities and fire regimes have been significantly altered from historic regimes and the risk of losing key ecosystem components is high.

Vegetation cover types are dynamic over time. Disturbance regimes and use patterns influence distribution and health of cover types (see the Fire & Fuels specialist report for a discussion on altered fire regimes in the area). While the forest cover types in this area have likely remained more or less static (in acreage covered) since European settlement, the woodland areas generally have not. In 1979 it was estimated that pinyon-juniper woodlands covered over 18 million acres within the United States, which represented an increase in area and density over the previous century (Tausch, 1981). Twenty years later estimates were that pinyon/juniper woodlands covered over 30 million hectare (74.1 million acres) (West, 1999, as cited in Harper, 2003), representing an increase of 400 percent in a twenty year period. The Utah Forest Health Report (1999-2001) placed increases at closer to 300 percent, from populations prior to European settlement, with most of the expansion occurring into areas where sagebrush-grass and lower elevation plant communities dominated. Although the actual percent increase of pinyon/juniper is not available for the project area, it is expected that percent increases are similar to those occurring elsewhere throughout Utah and the western United States. Repeat photographs taken over the past 100 years, within the UKCWVMP area serve to document the increase and infilling of pinyon/juniper (see Appendix 7).

Ponderosa Pine is very limited in the project area, forming no identifiable 'stands.' Understory pinyon/juniper currently form ladder fuels that could potential spread ground fires into the crowns of remaining ponderosa pine and further reduce their presence on the landscape.

Approximately 6,349 acres of pinyon-juniper woodlands and sagebrush sites were treated in the GSENM portion of the project area as recent as the 1980's to improve livestock forage, enhance wildlife habitat, increase soil site stability, and improve the hydrologic function of the landscape.



Approximately 5,497 acres of pinyon/juniper woodlands were chained, cleared or treated in the 1960's, 1970's, 1980's and as recent as 2008 in the KFO portion of the project area to improve livestock forage, enhance wildlife habitat, increase soil site stability, and improve the hydrologic function of the landscape.

## 4.0 ENVIRONMENTAL IMPACTS

### 4.1 Introduction

This chapter summarizes the physical, biological, social and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents as appropriate the scientific and analytical basis for the comparison of each alternative. Affected environments, in which issues have been identified include: 1) cultural resources; 2) fire and fuels; 3) range/livestock (including socioeconomics); 4) soils; 5) visual resources (including wilderness characteristics, recreation); 6) wildlife (including special status species); and 7) woodland/forestry. This chapter also contains the cumulative impacts for the above resources with the implementation of the alternatives.

#### 4.1.1 Cultural Resources

The assessment of impacts on cultural resources would be made in accordance with regulations of the Advisory Council on Historic Preservation (36 CFR 800), implementing Section 106 of the National Historic Preservation Act. The assessment would determine the nature and extent of effects on cultural resources anticipated from implementing the proposed actions. Cultural resources can be affected by actions that alter in any way the attributes that qualify the resources for inclusion in the National Register. Adverse effects can result when the integrity of a resource's significant characteristics is diminished. Consideration will be given both to the effects anticipated at the same time and place of the undertaking and to those potentially occurring indirectly at a later time and distance from the resource.

##### *Alternative A. Proposed Action*

###### Direct/Indirect Impacts

An intensive cultural resource survey would be conducted and determinations of eligibility and effect would be made by qualified archaeologists prior to the beginning of any surface disturbing activities.

Cultural sites in the project area would be appropriately marked and avoided by all surface disturbing activities and consultation with the State Historic Preservation Officer under Section 106 of the National Historic Preservation Act.

Because of the avoidance strategy, there would be no impact on cultural resources as part of the Proposed Action.

##### *Alternative B. No Action*

###### Direct/Indirect Impacts

The no action alternative would not contribute to direct impacts on identified archaeological resources, because no physical disturbance would occur. However, the no action alternative could contribute to indirect or cumulative impacts on identified archeological resources, due to increased erosion, exposure, etc., should a fire occur.

***Alternative C. UKCWVMP– Kanab Field Office Portions Only***  
Direct/Indirect Impacts

The effects for alternative C would be the same as the effects described for Alternative A, because of the avoidance strategy.

***Alternative D.– UKCWVMP - Grand Staircase Escalante National Monument Portion Only***  
Direct/Indirect Impacts

The effects for alternative D would be the same as the effects described for Alternative A, because of the avoidance strategy.

***Mitigation***

No mitigation measures have been identified other than those incorporated as part of the Proposed Action and action alternatives.

**4.1.2. Fire and Fuels**

***Alternative A. Proposed Action***  
Direct/Indirect Impacts

Treatments identified under the proposed action would help reduce hazardous fuel loads, create fuel breaks and reduce the overall threat of a catastrophic wildfire event impacting private property, firefighter and public safety, simply by reducing the overall fuel loads. Additionally, creating mosaics of treated and untreated vegetation would provide opportunities to utilize fire for resource benefits, under appropriate management response (AMR) guidelines.

Treatments in and around the sagebrush areas would break up continuous fuels and reduce the risk of wildfire entering these sensitive areas. Treatments designed at creating a variety of age classes of sagebrush would reduce the potential for high intensity fire, should a fire enter these areas, allowing fire to play a more natural role.

Removing and/or thinning pinyon/juniper in a mosaic pattern would also break up continuous fuels and reduce the risk of a high intensity wildfire entering these areas. Because there is a greater risk of conversion of shrublands to annual grasslands under a high intensity fire, managed treatments under the proposed action would reduce the likelihood of cheatgrass invasion and help native grasses and forbs persist long-term.

All treatment types proposed would help to effectively return these areas to a fire regime closer to the historical range (FRCC1 and FRCC2). All treatment types are effective in breaking up contiguous acres of fuels, increasing the potential for firefighters and resource managers to catch the fire and/or to utilize a fire for resource benefits. Mechanical treatments and prescribed burning would be most effective at mimicking natural events (such as low-intensity wildland fire) and in moving the area toward the desired future condition. Hand thinning and mechanical treatments are effective, but take longer to accomplish and may increase ladder fuels (and subsequent fire risk) for a short period of time (1-2 years as the needles fall and fuels break down).

In areas where there is not a sufficient understory of grasses and forbs, seeding a mix of native (GSENM portion and KFO portion) and non-native plants (KFO portion only) following treatment would decrease the risk of establishment of invasive plants (such as cheatgrass), following treatment.

Because of the stipulations for use of non-native plants on the GSENM, there is a greater chance of seeding failure because many non-native species cannot compete with more aggressive species such as cheatgrass. From a fuels perspective, the previously disturbed areas on the monument, where non-native species have been used in the past, would provide better opportunities for long-term fuels management and would be more likely to move to a FRCC2 or FRCC1.

The majority of the GSENM portion of this project is on public land. The opportunity to implement landscape level fuels treatments is excellent, and overall, carries very little risk. The Timber Mountain, First Point and Second Point areas (some of which have been previously disturbed) offer some of the best potential for treatment success as discussed in this EA.

### ***Alternative B. No Action***

#### Direct/Indirect Impacts

Under the no action alternative, small fires would continue to occur throughout the project area. However, existing and accumulating surface fuels would lead to a greater probability of a high intensity, catastrophic fire, long-term.

The areas would remain in a significantly or moderately altered state (FRCC 3 & FRCC 2) outside of the historical fire regime.

Under the no action alternative, there is not an opportunity for pro-active vegetation rehabilitation (re-seeding following treatment projects). Instead areas not treated are left more susceptible to high intensity fire, making seeding establishment following a fire more expensive and in some cases, depending on fire intensity and timing of treatment, less effective. Additionally, because of the current condition of the project area, with many areas lacking in vegetation diversity, there is an increased opportunity for cheatgrass and invasive plant establishment following wildfire.

Under the no-action alternative, there is the potential for sagebrush steppe areas (present to some extent in all three treatment types- sagebrush, re-treatment and pinyon/juniper) to convert to cheatgrass following one or more wildfires. Thus, in cheatgrass-burn-reburn cycles, even a short-term increase in erosion and loss of top soil would result in long-term depletion of soil organic matter. Conversion of sagebrush-steppe types and woodland types to annual grasslands could impact carbon emissions and decrease the potential for carbon sequestration in rangelands.

***Alternative C. UKCWVMP – Kanab Field Office Portions Only*****Direct/Indirect Impacts**

The direct impacts of Alternative C would be the same as the proposed action, only on fewer acres. Because this portion of the project area is interspersed with private and state lands, there would be a greater need to coordinate with landowners and permittees to effectively use some treatment methods (such as prescribed fire) and to ensure fuel breaks, etc. meet multiple resource objectives.

The use of native and non-native plants for rehabilitation following treatments would increase the success of plant establishment and would better compete with non-desired vegetation species, such as cheatgrass.

Providing fuels treatments for an entire watershed area would not be achieved under this alternative. Because fire knows no boundary, the indirect impacts which would come following a fire could mean that fire starts within another, non-treated portion of the watershed (off-site), and the secondary effects of erosion and soil movement following fire, would logically impact this portion of the watershed.

***Alternative D. UKCWVMP– Grand Staircase Escalante National Monument Portion Only*****Direct/Indirect Impacts**

The Direct/Indirect Impacts for Alternative D would be the same as with Alternative A, with the following exceptions:

Because of the stipulations for use of non-native plants on the GSENM, there is a greater chance of seeding failure because many non-native species cannot compete with more aggressive species such as cheatgrass. From a fuels perspective, the previously disturbed areas on the monument, where non-native species have been used in the past, would provide better opportunities for long-term fuels management and would be more likely to move to a FRCC2 or FRCC1.

The majority of the GSENM portion of this project is on public land. The opportunity to implement landscape level fuels treatments is excellent, and overall, carries very little risk. The Timber Mountain, First Point and Second Point areas (some of which have been previously disturbed) offer some of the best potential for treatment success as discussed in this EA.

***Monitoring***

No mitigation measures have been identified other than those incorporated as part of the Proposed Action

**4.1.3. Greenhouse Gas Emissions*****Alternatives A, B, C and D***

Climate change analyses are comprised of several factors, including greenhouse gases (GHGs), land use management practices, the albedo effect, etc. The tools necessary to quantify climatic impacts are presently unavailable. As a consequence, impact assessment of specific effects of anthropogenic activities cannot be determined. Additionally, specific levels of significance have

not yet been established. Existing climate prediction models are global in nature; so are not at the appropriate scale to estimate potential impacts of climate change on the project area. Therefore, climate change analysis for the purpose of this document is limited to accounting and disclosing of factors that contribute to climate change. Qualitative and/or quantitative evaluation of potential contributing factors within the project area are included where appropriate and practicable.

The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts. However, potential impacts to air quality due to climate change are likely to be varied. For example, if global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased wind blown dust from drier and less stable soils. Cool season plant species' spatial ranges are predicted to move north and to higher elevations, and extinction of endemic threatened/endangered plants may be accelerated. Due to loss of habitat, or due to competition from other species whose ranges may shift northward, the population of some animal species may be reduced. Less snow at lower elevations would be likely to impact the timing and quantity of snowmelt, which, in turn, could impact aquatic species (Final Utah GHG Inventory, July 2007).

#### **4.1.4. Range/Livestock**

##### ***Alternative A. Proposed Action***

###### Direct/Indirect Impacts

Under Alternative A, rangeland conditions are expected to improve following implementation of the proposed vegetation treatments. The health, vigor, recruitment and production of perennial grasses, forbs and shrubs would improve which would provide a more palatable and nutritional source of forage for both livestock and wildlife and also protect the soil resource and other associated watershed values. The rejuvenation of decadent, even-aged stands of sagebrush and invading pinyon/juniper woodlands would assist in improving the ecological condition of sites within the project area. Implementation of the Proposed Action would assist those portions of allotments within the project area in conforming with Standard No. 3 of the Utah Standards for Rangeland Health and the Fundamentals of Rangeland Health (Title 43 CFR 4180) by increasing the quantity and quality of herbaceous vegetation.

Implementing the proposed action would help improve condition and trend on all of the allotments in the UKCWVMP. The rangelands on allotments with static and declining trend would improve because the proposed treatments would reduce the competition between herbaceous species and larger woody species. This would allow for establishment of grass and forb species which would improve diversity, cover, and productivity. An increase in cover would lower the amount of erosion that is occurring. An increase in diversity would improve the resistance of the plant community to drought and disease.

On allotments that have an upward trend, the proposed action would help ensure and retain healthy plant communities. Maintenance on the treated pastures would decrease the competition between encroaching pinyon/juniper trees and herbaceous species. Rangelands within these allotments that weren't previously treated could also be treated, which would improve the overall rangeland health of the allotments.

The proposed treatments would assist the project area in conforming to Standards and Guides by aiding in the establishment of perennial grasses and forbs, which would result in an increase in the amount of ground cover. This increase in ground cover would support infiltration, stabilize soils, and allow the soil to maintain its moisture storage properties. This would help ensure that watersheds are making progress toward being a properly functioning system. The project would also assist in supporting healthy biotic communities by increasing the amount of litter, and by improving the overall production of grasses, forbs, and shrubs.

However, when seeding rangelands, native seeds are harder to establish than introduced species. The introduced species can have a positive impact to livestock grazing because they are more likely to compete with annual species by germinating sooner, and competing for the early spring moisture. Native plants produce less aboveground biomass that can be utilized by wildlife and livestock. Most native grasses can't withstand as much herbivory as many of the introduced grasses.

Planting all native seed mixes may have a negative impact to livestock grazing if the seeding does not get established due to being outcompeted by annual species. Planting a mix with native seed in it can also have a positive impact because native plants are, often times, more drought resistant than the equivalent introduced species. Native plants can also improve long term site stability and diversity.

Implementation of the Proposed Action would eventually improve overall livestock performance and improve the economic stability of the permittees due to an increase in the quantity and quality of grasses and other herbaceous forage which are important to livestock grazing. With an increase in the production and vigor of herbaceous plant communities, the forage base would more adequately support the existing herd sizes and would improve overall livestock performance (e.g. increased cow weights, increased calf crops, increased weaning weights, etc.). The Kanab Creek allotments support a traditional and historical lifestyle for several permittees in Kane County, Utah. Several of the permittees are dependent on the allotments to help generate a portion of their annual income. Implementation of the Proposed Action should eliminate a potential need for future reductions in stocking rates which would adversely affect the permittees' long-term economic goals and objectives.

Implementation of the Proposed Action may have a short-term economic affect on the permittees due to a mandatory rest period of the treatment areas. The rest period is necessary in order to ensure the establishment, protection and long-term viability of the vegetation enhancement project. The rest period would be for a minimum of two complete growing seasons. The rest period may be extended pending the rate of progress towards vegetative establishment. Seed germination, drought-related influences, wildfire or other natural unforeseen events could potentially affect the rate of vegetative establishment. The type of treatment implemented may also affect the rate of recovery (e.g. mechanical, chemical, prescribed fire, etc.). With adequate understory vegetation, prescribed burn treatments are generally completed at a much faster rate than mechanical or chemical methods. Under normal precipitation levels and with proper seed sources, a prescribed burn or chemical treatment are expected to recover at a faster rate than most mechanical methods.

In the long-term, the Proposed Action should benefit the permittees by providing more palatable, nutritious forage for livestock due to the establishment of seeded native and non-native vegetation and due to the recovery and improved vigor of existing vegetation. Overall, more AUMs would be available for livestock utilization. Long-term viability of the vegetative treatments would be expected so long as utilization levels are limited to 50 percent of the current year's vegetative growth. Any adjustments in stocking levels or other modification to the existing permits would require further NEPA analysis and would be conducted at the time the permits expire and are analyzed under the permit renewal process. The implementation of proper utilization guidelines would be incorporated into the terms and conditions of the grazing permits when they are renewed under the permit renewal process.

### ***Alternative B. No Action***

#### ***Direct/Indirect Impacts***

Under the No Action Alternative, rangeland conditions are expected to remain the same for the short-term and decline in condition over the long-term. The health, vigor, recruitment and production of native and non-native, perennial grasses and native shrubs would decline in the long-term due to a combination of factors including continued grazing and browsing use by livestock and wildlife and competition for nutrients, sunlight and precipitation with older, decadent shrubs and invasive pinyon/juniper woodlands. Future drought related factors would also contribute to the decline in condition of upland vegetative communities. The invasion of pinyon/juniper woodlands onto sagebrush-steppe type habitats would continue and the older, decadent even-aged shrub communities would further decline in health and vigor affecting the recruitment and establishment of new grasses, forbs and shrubs.

The No Action Alternative is expected to eventually affect overall livestock performance and economic stability of the permittees due to a reduction in the quantity and quality of grasses and other herbaceous forage in areas invaded by P/J, which are important to cattle and other grazing animals. With a reduction in the production and vigor of herbaceous plant communities, the forage base may not adequately support the existing herd sizes and would adversely affect livestock performance (e.g. reduced cow weights, reduced calf crops, reduced weaning weights, etc.). Several of the permittees are dependent on their allotments to help generate a large portion of their annual income, while other permittees have alternate sources of income and depend on the allotment for supplemental income. The need for a future reduction in stocking rates may adversely affect the permittees' long-term economic goals and objectives.

The No Action Alternative may also eventually prevent portions of the allotments within the project area from conforming with Standard No. 3<sup>12</sup> of the Utah Standards for Rangeland Health

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<sup>12</sup> Standard No. 3 Desired species, including native, threatened, endangered and special status species, are maintained at a level appropriate for the site and species involved. As indicated by (a) frequency, diversity, density, age classes and productivity of desired native species necessary to ensure reproductive capability and survival; (b) habitats connected at a level to enhance species survival; (c) native species reoccupy habitat niches and voids caused by disturbances unless management objectives call for introduction or maintenance of non-native species and (d) appropriate amount, type and distribution of vegetation reflecting the presence of (1) the Desired Plant Community [DPC], where identified in a land use plan conforming to these Standards, or (2) where the DPC is identified as a community that equally sustains the desired level of productivity and properly functioning ecological processes.



and the Fundamentals of Rangeland Health (Title 43 CFR 4180) due to reduced levels of native, herbaceous vegetation.

***Alternative C. UKCWVMP – Kanab Field Office Portions Only***

**Direct/Indirect Impacts**

Under Alternative C impacts would be the same as Alternative A impacts for those areas within the Kanab Field Office Boundary.

***Alternative D. UKCWVMP – Grand Staircase Escalante National Monument Portion Only***

**Direct/Indirect Impacts**

Under Alternative D impacts would be the same as Alternative A impacts for those areas within the Grand Staircase Escalante National Monument portion of the UKCWVMP.

However, when seeding rangelands, native seeds are harder to establish than introduced species. The introduced species can have a positive impact to livestock grazing because they are more likely to compete with annual species by germinating sooner, and competing for the early spring moisture. Native plants produce less aboveground biomass that can be utilized by wildlife and livestock. Most native grasses can't withstand as much herbivory as many of the introduced grasses.

Planting all native seed mixes may have a negative impact to livestock grazing if the seeding does not get established due to being outcompeted by annual species. Planting a mix with native seed in it can also have a positive impact because native plants are, often times, more drought resistant than the equivalent introduced species. Native plants can also improve long term site stability and diversity.

***Mitigation***

No mitigation measures have been identified other than those incorporated as part of the Proposed Action and action alternatives.

***Summary***

From a rangeland resource and livestock grazing management perspective, both Alternative A and Alternative C provide an excellent opportunity to improve long-term ecological conditions and socio-economics in the Kanab Field Office administered portions of the project. Alternative A would provide a greater overall impact than Alternative C by including more acreage adjacent to the Kanab Field Office resulting in a more complete watershed level range restoration project.

For the Grand Staircase-Escalante National Monument, alternatives A and D would have a positive impact to range resources by improving the vegetation composition and productivity of rangelands. Alternative A would have a larger positive impact because lands adjacent to the Monument would also improve in health and ecological condition, which would improve the Upper Kanab Creek Watershed as a whole.

#### **4.1.5. Recreation**

##### ***Alternative A. Proposed Action***

###### Direct/Indirect Impacts

Current recreation uses and opportunities include dispersed activities such as hunting, sightseeing, driving for pleasure, accessing canyons for scenic photography or canyoneering, nature study, wildlife photography and hiking/backpacking/camping. These activities may be temporarily disrupted or displaced during actual land treatments. In the short term, post-treatment areas may become less or more attractive to the recreating public, depending on the nature of their activities and their preferred settings. For instance, creating more open areas might enhance wildlife viewing opportunities, but it might also discourage photographers in search of totally natural-appearing, unaltered landscapes. As native vegetation becomes re-established on treatment areas, those sites will also probably attract some recreation activities while discouraging others, due to the altered vegetative cover, scenery, naturalness and use by wildlife species.

##### ***Alternative B. No Action***

###### Direct/Indirect Impacts

Under the no action alternative, there would be no expected change from current recreation uses and opportunities. Dispersed activities as noted above would continue in various degrees, at various locations scattered among the proposed treatment areas. New types of recreation or changing demands may create shifts in usage of the areas, but those trends are too difficult to predict and are beyond the scope of this document.

##### ***Alternative C. UKCWVMP– Kanab Field Office Portions Only***

###### Direct/Indirect Impacts

Effects to Recreation under Alternative C would be the same as those described under the proposed action.

##### ***Alternative D. UKCWVMP – Grand Staircase Escalante National Monument Portion Only***

###### Direct/Indirect Impacts

Effects to Recreation under Alternative D would be the same as those described under the proposed action.

##### ***Mitigation***

No mitigation measures have been identified other than those incorporated as part of the Proposed Action and action alternatives.

#### **4.1.6. Soils**

##### ***Alternative A. Proposed Action***

###### Direct/Indirect Impacts

The majority of soils within the Proposed Action area are suitable for the treatment activities designated for pinyon/juniper treatment, sagebrush treatment and retreatment. Many of the soil types found within the watershed will and likely did support a wider community of grasses and forbs, with pinyon/juniper as a smaller component of the vegetation community. Removal of

pinyon/juniper will allow perennial grasses and forbs to return to the site, adding stability to the soil layers and reducing upland erosion.

Rock fragments occur throughout most of the soil types, which would aid in project implementation, especially when using mechanical tools. Implementing treatments at the larger watershed level would lessen the impact of upland erosion from treatment methods, as a variety of treatment polygons and mosaics (approx. 1,000 acre in size) could be placed over a larger area, slowing the flow of water and soil movement should flooding occur. Because the project is designed in areas where slopes are less than 30 percent (traditional sagebrush-steppe sites), erosion would be minimal, regardless.

Approximately 3,403 acres (6.6 percent of the project area) of the proposed treatment are contained in Soil Unit 1107 (see Table 9). These soils are more susceptible to erosion and care should be taken to reduce long-term exposure of the soil surface. This impact would be minimized by planting native and non-native species, leaving “mulch” on site, and by intermixing smaller (<1,000 acre) treatment and non-treatment polygons.

Soil Units 1104, 1106, 1121, 1181 and 5181 (26,959 acres, 52.2% of the potential treatment polygons), are extremely well suited for any of the treatments specified. These soils contain sufficient rock fragments, microclimates and soil moisture to ensure establishment of a variety of desired understory grasses and forbs. These soils are found in areas with virtually no slope, reducing the potential for soil loss and wide-spread erosion.

#### Biological Soil Crusts

Disturbance to biological crusts from treatment methods may impact existing cryptobiotic communities, but would not impact them any more than may have already occurred as a result of past disturbance activities (grazing, previous land management, wildlife use, etc.).

Studies have shown that prescribed fire can be a useful tool in helping to renew vascular plant and BSC vigor, if a sufficient seed bed exists and/or the site is revegetated to reduce the establishment of exotic species, such as cheatgrass. (BLM Tech. Ref. 1730-2. 2001) Because prescribed fire can be used to mimic natural, low-intensity fire, this tool would provide little disturbance to BSC and overall help maintain and encourage diverse biological soil crusts.

Project designs which create a variety of edge and a mosaic of treated and untreated areas would encourage quicker BSC recolonization (especially for lichens) following disturbance, than designs that treat contiguous acres (>1000 acre patches). Scheduling treatments over the 15 year life of the plan and implementing standard treatment protocols (such as leave islands, buffers, wildlife travel corridors, arch sites, etc.) would help to preserve and restore BSC diversity and structure.

Mechanical treatments proposed as part of this project, such as the use of different types of mastication equipment, may crush or compact BSC. However, these impacts would be short-term and likely not detrimental to the BSC community. Numerous studies on soil disturbance following mastication have shown little to no detrimental impact to soil resources and soil infiltration rates (Tepler, 2005; Jaros, 2003, Hatchett, 2006). Current design of equipment limits

compaction (estimated to be less than 3.6 lbs/sq in vs. 6.2 lbs/sq in. exerted by a 150 lb man), and help to meet vegetation goals for soils and plant management on federal lands.

Mechanical treatments proposed as part of this project, such as the use of harrows or drills may disturb BSC communities. Such treatments could be used effectively where overall resource benefits outweigh the disturbance to BSC, such as in areas where sites are at risk to wildfire and/or invasion by exotic annual grasses, such as cheatgrass. Additionally, higher BSC cover (given elevation parameters) can be expected in some tall sagebrush communities (Wyoming, basin and mountain big sagebrush) and short sagebrush (low, black) which are currently limited within the project area due to pinyon/juniper encroachment.

Because of use of native seed only in previously undisturbed sites, there may be an increased risk of cheatgrass invasion into disturbed sites. If annual grasses were to establish in disturbed sites, BSC would be at risk because there would be little to no interspaces in which BSC could flourish and/or establish.

### ***Alternative B. No Action***

#### **Direct/Indirect Impacts**

There would be no direct increase in detrimental soil conditions that would negatively affect the soil if this alternative was implemented. There would be no removal of pinyon and juniper trees, no removal or change in age class of sagebrush, and no seeding of barren ground. There would be no soil compaction or erosion that could be attributed to treatment methods. The soils would remain similar to existing conditions, during the short-term.

Throughout the project area, however, understory vegetation (grasses/forbs) is lacking. Active fire suppression efforts over the past 100 years have allowed sagebrush to increase into riparian zones and areas once dominated by grasses/forbs. In other areas, pinyon and juniper, once held in check by periodic fire, have also increased, reducing both sagebrush and grasses/forbs. Bare soils have resulted in long term soil movement throughout the watershed. Juniper encroachment has been associated with increased soil loss and reduced soil infiltration rates (Deboodt 2008, Pierson 2007). This is also evidenced throughout the Upper Kanab Creek Watershed through a series of historic photos, re-taken in the 21<sup>st</sup> Century (Kay 2002), (Appendix 7).

#### **Biological Soil Crusts**

No disturbance would occur to biological crusts from the proposed activities. Natural disturbances from animal, soil, water and wind movement would continue during the short-term.

Under the no action and current conditions, extreme wildfire potential continues to be a threat. If and when a wildfire occurs, biological crusts could be impacted and their presence totally removed from the landscape. Hilty, et. al. (2004) reported that the recovery of BSC in sagebrush steppe following wildfire resulted in significantly reduced shrub cover, and substantially reduced diversity and richness of crust taxa (increased cover of short mosses, but reduced cover of lichens and tall mosses growing on the shrub hummocks). Increased annual plant species, which would more likely occur following an uncontrolled wildfire, would also decrease the presence of BSC because there would be very few interspaces where BSC could establish.

Should a wildfire occur, re-seeding the site and rangeland disturbance (sometimes detrimental to BSC) would actually be more beneficial and facilitate the recovery of BSC, compared to no disturbance/seeding treatment (Hilty, 2004). Because wildfire and associated emergency stabilization funding is difficult if not impossible to predict, there is the potential that those areas within FRCC3 (93% of the project area), where rehabilitation may or may not occur, are at risk to losing the BSC component. With few or no treatments on the landscape, there are reduced opportunities to “catch” a fire, to maintain desired mosaics of burned and unburned vegetation, which allow for BSC to repopulate.

### ***Alternative C. UKCWVMP– Kanab Field Office Portions Only***

#### Direct/Indirect Impacts

The majority of soils within the Kanab Field Office area are suitable for the treatment activities designated for pinyon/juniper treatment, sagebrush treatment and retreatment. Many of the soil types found within the Alternative C boundary would and likely did support a wider community of grasses and forbs, with pinyon/juniper as a smaller component of the vegetation community. Removal of pinyon/juniper would allow grasses and forbs to return to the site, adding stability to the soil layers and reducing upland erosion.

Rock fragments occur throughout most of the soil types. Because the project is designed in areas where slopes are less than 30 percent, erosion would be minimal.

Approximately 3,403 acres (10.9 percent of the Kanab Field Office portion) of the proposed treatment area are contained in Soil Unit 1107 (Table 9). These soils are more susceptible to erosion and care should be taken to reduce long-term exposure of the soil surface. This impact would be minimized by planting native and non-native species, leaving “mulch” on site, and by intermixing smaller (<1,000 acre) treatment and non-treatment polygons.

Soil Units 1104, 1106, 1121, and 1181 (14,014 acres, 44.8% of the potential treatment polygons in Alternative C), are extremely well suited for any of the treatments specified. These soils contain sufficient rock fragments, microclimates and soil moisture to ensure establishment of a variety of desired understory grasses and forbs. These soils are found in areas with virtually no slope, reducing the potential for soil loss and wide-spread erosion.

#### Biological Soil Crusts

The impact to Biological Soil Crusts would be the same as Alternative A.

### ***Alternative D. UKCWVMP – Grand Staircase Escalante National Monument Portion Only***

#### Direct/Indirect Impacts

The majority of soils within the Grand Staircase Escalante National Monument area are suitable for the treatment activities designated for pinyon/juniper treatment, sagebrush treatment and retreatment. Many of the soil types found within the Alternative D boundary will and likely did support a wider community of grasses and forbs, with pinyon/juniper as a smaller component of the vegetation community. Removal of pinyon/juniper will allow grasses and forbs to return to the site, adding stability to the soil layers and reducing upland erosion.

Rock fragments occur throughout most of the soil types. Because the project is designed in areas where slopes are less than 30 percent, erosion would be minimal.

Soil Units 1121 1181 and 5181 (12,945 acres, 63% of the potential treatment polygons in Alternative D), are extremely well suited for any of the treatments specified. These soils contain sufficient rock fragments, microclimates and soil moisture to ensure establishment of a variety of desired understory grasses and forbs. These soils are found in areas with virtually no slope, reducing the potential for soil loss and wide-spread erosion.

Grand Staircase Escalante National Monument plan calls for the use of native seed as a priority for all restoration-related activities. Although cheatgrass is not prevalent throughout the GSENM, there is potential for cheatgrass and noxious weed establishment, which would still reduce soil loss, but would not meet the overall objectives of this vegetation management plan. In the event that native seed cannot establish, resulting in bare ground following restoration activities, there is potential for increased soil erosion.

#### Biological Soil Crusts

The impact to Biological Soil Crusts would be the same as Alternative A. However, because of use of native seed only in previously undisturbed sites, there may be an increased risk of cheatgrass invasion into disturbed sites. If annual grasses were to establish in disturbed sites, BSC would be at risk because there would be little to no interspaces in which BSC could flourish and/or establish.

#### ***Mitigation***

No mitigation measures have been identified other than those incorporated as part of the Proposed Action and action alternatives.

#### **4.1.7. Visual Resource Management (VRM)**

##### ***Alternative A. Proposed Action***

##### Direct/Indirect Impacts

The proposed vegetation treatments would be designed, as noted in the proposed action, to mimic natural appearing edges between vegetation types and to resemble natural openings and clearings in the vegetation patterns such that contrasts in form, line, color and texture would be avoided or minimized so as to meet VRM objectives. If heavy equipment is used to implement treatments, its presence could create visual contrasts, but these would be of short-term duration.

In the long term, when stands of various aged vegetation and a less homogeneous mix of vegetation are established, the visual variety created by the proposed action could result in a more interesting visual landscape.

Treatment areas may be noticeable to the casual observer during implementation and during the short term when dead vegetation or bare ground is visually obvious, but visual resource objectives would be met for the long term in all VRM Class areas when proposed action design criteria are followed.

***Alternative B. No Action*****Direct/Indirect Impacts**

Under the no action alternative, there would be no human-caused alterations to the existing landscape, so VRM objectives in the project area would continue to be realized. However, failure to conduct vegetation treatments could result in large, uncontrolled wildfires which could alter the landscape and created dramatic visual contrasts.

***Alternative C UKCWVMP – Kanab Field Office Portions Only*****Direct/Indirect Impacts**

Effects to visual resources under Alternative C would be the same as those described under the proposed action, but would apply only to KFO lands. The potential impacts of the No Action Alternative would apply to GSENM lands.

***Alternative D. UKCWVMP – Grand Staircase Escalante National Monument Portion Only*****Direct/Indirect Impacts**

Effects to visual resources under Alternative D would be the same as those described under the proposed action but would apply only to GSENM lands. The potential impacts of the No Action Alternative would apply to KFO lands..

***Mitigation***

No mitigation measures have been identified other than those incorporated as part of the Proposed Action and action alternatives.

**4.1.8. Natural Areas (KFO), WSA (GSENM)*****Alternative A. No Action*****Direct/Indirect Impacts**

Some of the proposed treatment areas lie within the Upper Kanab Creek natural area as identified in the Kanab RMP (2008). In the very short term, vegetative treatments would be likely to temporarily adversely affect opportunities for solitude and primitive, unconfined recreation during the actual treatment operations. This would be due to the presence and noise of equipment and laborers conducting those operations. Post-treatment, there would be relatively short-term impacts to naturalness, as long as the evidence of human manipulation of the vegetation remained visible to casual observers. As new vegetation gradually replaces the treated vegetation, the appearance of naturalness would be restored to a certain degree to many visitors without the scientifically trained eyes able to discern the difference.

***Alternative B. No Action*****Direct/Indirect Impacts**

Under the no action alternative, there would be no human-caused alterations to the landscape that would affect the area's naturalness. Failure to implement fuels treatments could result in large, uncontrolled wildfire scars; however, those would be natural in appearance. Removal of vegetative cover and the screening it provides could, however, negatively impact opportunities for solitude.

***Alternative C UKCWVMP – Kanab Field Office Portions Only*****Direct/Indirect Impacts**

Effects to Natural Areas under Alternative C would be the same as those described under the proposed action.

***Alternative D. UKCWVMP – Grand Staircase Escalante National Monument Portion Only*****Direct/Indirect Impacts**

Effects to Natural Areas under Alternative D would be the same as those described under the proposed action.

***Mitigation***

No mitigation measures have been identified other than those incorporated as part of the Proposed Action and action alternatives.

**4.1.9. Wildlife (including Special Status species)*****Alternative A. Proposed Action*****Direct/Indirect Impacts****Migratory Birds**

Direct impacts that may be associated with the Proposed Action would be the occasional destruction of nests and eggs due to associated nest abandonment of birds intolerant to disturbances. Indirect impacts may be associated with changes in vegetation as a result of treatment practices, which may lead to loss of nesting, roosting, or foraging habitat.

The proposed project's surface disturbing activities may cause temporary habitat alteration, fragmentation, and/or loss depending on the type, amount, and location of activity. Habitat fragmentation occurs when a contiguous habitat is broken up (fragmented) by surface disturbing activities, causing a reduction in usable ranges; disruption of movements among habitats, transitional areas, and breeding areas; isolation of smaller, less mobile species; and increase in habitat generalists that are characteristic of disturbed environments (Harris 1991).

The Proposed Action would aid in the maintenance of or lead to improvement to the upland key species which would improve habitat for a variety of neotropical migratory birds. The Proposed Action would help ensure that enough residual vegetation remains to provide adequate cover requirements over the life of the project to meet the needs of nesting birds. On average only 3% (3440 acres) of the project area (Appendix 8) would be in some level of treatment over the life of the project. This would limit potential impacts to the localized individual level, not to the species population as a whole.

**Special Status Species**

The proposed projects surface disturbing activities may cause short term habitat alteration, fragmentation, and/or loss depending on the type, amount, and location of activity. Habitat fragmentation occurs when a contiguous habitat is broken up (fragmented) by surface disturbing activities, causing a reduction in usable ranges; disruption of movements among habitats, transitional areas, and breeding areas; isolation of smaller, less mobile species; and increase in habitat generalists that are characteristic of disturbed environments (Harris 1991).



Vegetation treatments on an annual average of no more than 3440 acres over the life of the project would result in temporary displacement of special status species wildlife during treatment.

This type of habitat improvement project which focuses on improving habitat over an entire watershed as opposed to small, isolated treatments would benefit special status species on a landscape scale over the long term. Health, vigor, and productivity of sagebrush-steppe habitats would see an incremental improvement. Pinyon/juniper habitats would be returned to a more natural state, allowing for rejuvenation of understory grass and shrub species while still allowing tree cover for concealment, foraging, thermal cover and nesting. The expected change in habitat condition for all habitat types would improve forage conditions and reduce erosion, enhancing special status species wildlife habitat over the long term.

### **General Wildlife**

Vegetation treatments on an annual average of 3440 acres would result in temporary displacement of wildlife that uses the treatment areas for a portion of their life cycle. Some species would recover quickly and would reoccupy the sites, although others may be displaced for longer, until the habitat conditions required by the species become reestablished.

Health, vigor, and productivity of sagebrush-steppe habitats would see an incremental improvement. Pinyon/juniper habitats would be returned to a more natural state, allowing for rejuvenation of understory grass and shrub species while still allowing tree cover for concealment, foraging, thermal cover and nesting. The monotony of vast acreages of one dominant vegetation type would be broken up, providing diversity to wildlife and creating “edges” which are important for their diverse diets. The expected change in habitat condition for all habitat types would improve forage conditions and reduce erosion, enhancing wildlife habitat over the long term.

Herbicide treatments, applied in pellet form and/or limited to “spot” or “strip” treatments would enable applicators to target specific vegetation treatment area, which would reduce the potential for direct impacts to wildlife and non-target vegetation.

### ***Alternative B. No Action***

#### **Direct/Indirect Impacts**

#### **Migratory Birds, Special Status Species and General Wildlife**

Under this alternative, there would be no direct impacts because no active management activity would occur. However, indirect impacts from not taking action could potentially lead to a decrease in the overall quality of the habitat within the analysis area.

Pinyon/juniper encroachment of historic sagebrush/grassland would continue to increase, leading to a monoculture which would rob nutrients from existing shrubs, grasses and forbs. Over time, the understory vegetation in these untreated areas would decline in quality and eventually may die-off entirely. Animal diversity would most likely decrease as one vegetation type would dominate the landscape. Sage-grouse, pygmy rabbit, mule deer, elk, Brewer’s sparrow, sage sparrow, sage thrasher, loggerhead shrike, vesper sparrow and other species which depend on a

diverse sagebrush/grassland habitat may suffer incremental population declines. Species such as gray flycatcher, Bewick's wren, and juniper titmouse may see an incremental increase in population because they are more adapted to a forested environment.

Dense, decadent stands of sagebrush with no understory would continue to be a concern for species adapted to a sagebrush environment with a diversified understory. Soil erosion potential would increase while the potential for the soil to store water would decrease. These losses of growth medium and water storage capacity would only accelerate the decline in the overall quality of the habitat as a whole. Additionally, wildfire events have the potential to burn thousands of acres at high temperatures. These types of fires may lead to complete habitat conversion from a sagebrush/grassland to an invasive annual grassland dominated by undesirable species.

The landscape level benefits to all wildlife species by providing a mosaic of diversified habitats in their optimal proportions would not be realized.

### ***Alternative C. UKCWVMP – Kanab Field Office Portions Only***

#### **Direct/Indirect Impacts**

##### **Migratory Birds**

Direct impacts that may be associated with the Proposed Action would be the occasional destruction of nests and eggs due associated nest abandonment of birds intolerant to disturbances. Indirect impacts may be associated with changes in vegetation as a result of treatment practices, which may lead to loss of nesting, roosting, or foraging habitat. The Proposed Action would aid in the maintenance of or lead to improvement to the upland key species which would improve habitat for a variety of neotropical migratory birds. The Proposed Action would help ensure that enough residual vegetation remains to provide adequate cover requirements over the life of the project to meet the needs of nesting birds. On average only 2% percent( 2000 acres) of the project area would be in some level of treatment over the life of the project. This would limit potential impacts to the localized individual level, not to the species population as a whole.

##### **Special Status Species**

Permitted surface disturbing activities can cause temporary habitat alteration, fragmentation, and/or loss depending on the type, amount, and location of activity. Habitat fragmentation may temporarily occur when a contiguous habitat is broken up (fragmented) by surface disturbing activities, causing a reduction in usable ranges; disruption of movements among habitats, transitional areas, and breeding areas; isolation of smaller, less mobile species; and increase in habitat generalists that are characteristic of disturbed environments (Harris 1991).

Vegetation treatments on an annual average 2000 acres over the life of the project would result in temporary displacement of special status species wildlife during treatment. However, over the long term, the treated areas would provide improved forage conditions and reduced erosion, which would enhance special status species wildlife habitat.

Under this alternative only the Kanab Field Office portions of the watershed would be treated. However, over half of the encroaching pinyon/juniper habitats needing treatment are located on

the Monument portion of the watershed which would not be treated. Therefore continued encroachment of pinyon/juniper habitats onto sagebrush-steppe would be an indirect impact from this alternative. Sage-grouse habitat, already limited in size and quality would not see the complete benefit realized from treating the watershed as a whole. Sagebrush-steppe habitats on the Monument portion of the watershed would continue to experience an incremental decline in quality and may eventually be lost entirely as the tree canopy closes.

### **General Wildlife**

The projects surface disturbing activities may cause short term, temporary habitat alteration, fragmentation, and/or loss depending on the type, amount, and location of activity. Habitat fragmentation occurs when a contiguous habitat is broken up (fragmented) by surface disturbing activities, causing a reduction in usable ranges; disruption of movements among habitats, transitional areas, and breeding areas; isolation of smaller, less mobile species; and increase in habitat generalists that are characteristic of disturbed environments (Harris 1991).

Vegetation treatments on an annual average of no more than 2000 acres would result in temporary displacement of wildlife that uses the treatment areas for a portion of their life cycle. Some species would recover quickly and would reoccupy the sites, although others may be displaced for longer, until the habitat conditions required by the species become reestablished. However, over the long term, the treated areas would provide improved habitat conditions and reduced erosion, which would enhance habitat for wildlife.

Health, vigor, and productivity of sagebrush-steppe habitats within the Kanab Field Office portion of the watershed would see an incremental improvement. Pinyon/juniper habitats would be returned to a more natural state, allowing for rejuvenation of understory grass and shrub species while still allowing tree cover for concealment, foraging, thermal cover and nesting. The monotony of vast acreages of one dominant vegetation type would be broken up, providing diversity to wildlife and creating “edges” which are important for their diverse diets. The expected change in habitat condition for all habitat types would improve forage conditions and reduce erosion, enhancing wildlife wildlife habitat over the long term.

Under this alternative only the Kanab Field Office portions of the watershed would be treated. However, over half of the encroaching pinyon/juniper habitats needing treatment are located on the Monument portion of the watershed which would not be treated. Therefore continued encroachment of pinyon/juniper habitats onto sagebrush-steppe would be an indirect impact from this alternative. Sage-grouse habitat, already limited in size and quality would not see the complete benefit realized from treating the watershed as a whole. Sagebrush-steppe habitats on the Monument portion of the watershed supporting large herds of migrating mule deer would continue to experience an incremental decline in quality and may eventually die off entirely as the tree canopy closes.

Herbicide treatments, applied in pellet form and/or limited to “spot” or “strip” treatments would enable applicators to target specific vegetation areas, which would reduce the potential for direct impacts to wildlife and non-target vegetation.

***Alternative D. UKCWVMP – Grand Staircase Escalante National Monument Portion Only***  
**Direct/Indirect Impacts**

**Migratory Birds**

Direct impacts that may be associated with the proposed action would be the occasional destruction of nests and eggs due to associated nest abandonment of birds intolerant to disturbances. Indirect impacts may be associated with changes in vegetation as a result of treatment practices, which may lead to loss of nesting, roosting, or foraging habitat.

The proposed project's surface disturbing activities may cause temporary habitat alteration, fragmentation, and/or loss depending on the type, amount, and location of activity. Habitat fragmentation occurs when a contiguous habitat is broken up (fragmented) by surface disturbing activities, causing a reduction in usable ranges; disruption of movements among habitats, transitional areas, and breeding areas; isolation of smaller, less mobile species; and increase in habitat generalists that are characteristic of disturbed environments (Harris 1991).

Alternative D would aid in the maintenance of or lead to improvement to the upland key species which would improve habitat for a variety of neotropical migratory birds. The Proposed Action would help ensure that enough residual vegetation remains to provide adequate cover requirements over the life of the project to meet the needs of nesting birds. Species such as gray flycatcher, Bewick's wren, and juniper titmouse may see an incremental decrease in population since they are more adapted to a forested environment. On average less than 2% (1300 acres) of the project area would be in some level of treatment over the life of the project. This would limit potential impacts to the localized individual level, not to the species population as a whole.

Under this alternative only the Monument portion of the watershed would be treated. However, most of the sagebrush-steppe habitats needing treatment are located on the Kanab Field Office portion of the watershed which would not be treated. Therefore the benefits of treating thousands of acres of decadent sagebrush stands with little or no understory would not be realized. Brewer's sparrow, sage sparrow, sage thrasher, loggerhead shrike, vesper sparrow and other species which depend on a diverse sagebrush/grassland habitat may suffer incremental population declines since much of the habitat needing restoration would not be treated.

**Special Status Species**

The proposed projects surface disturbing activities may cause temporary habitat alteration, fragmentation, and/or loss depending on the type, amount, and location of activity. Habitat fragmentation occurs when a contiguous habitat is broken up (fragmented) by surface disturbing activities, causing a reduction in usable ranges; disruption of movements among habitats, transitional areas, and breeding areas; isolation of smaller, less mobile species; and increase in habitat generalists that are characteristic of disturbed environments (Harris 1991).

Vegetation treatments on an annual average of 1300 acres over the life of the project would result in temporary displacement of special status species wildlife during treatment. However, over the long term, the treated areas would provide improved forage conditions and reduced erosion, which would enhance special status species wildlife habitat.

Under this alternative only the Monument portion of the watershed would be treated. However, most of the sagebrush-steppe habitats needing treatment are located on the Kanab Field Office portion of the watershed which would not be treated. Therefore the benefits of treating thousands of acres of decadent sagebrush stands with little or no understory would not be realized. Sage-grouse habitat, already limited in size and quality would not see the complete benefit realized from treating the watershed as a whole. Sagebrush-steppe habitats on the Field Office portion of the watershed supporting a small population of sage-grouse which depend on a diverse sagebrush/grassland habitat may suffer incremental population declines since much of the habitat needing restoration would not be treated.

### **General Wildlife**

Vegetation treatments on an annual average of 1300 acres would result in temporary displacement of wildlife that uses the treatment areas for a portion of their life cycle. Some species would recover quickly and would reoccupy the sites, although others may be displaced for longer, until the habitat conditions required by the species become reestablished. However, over the long term, the treated areas would provide improved habitat conditions and reduced erosion, which would enhance habitat for wildlife.

Health, vigor, and productivity of sagebrush-steppe habitats within the Monument portion of the watershed would see an incremental improvement. Pinyon/juniper habitats would be returned to a more natural state, allowing for rejuvenation of understory grass and shrub species while still allowing tree cover for concealment, foraging, thermal cover and nesting. The monotony of vast acreages of one dominant vegetation type would be broken up, providing diversity to wildlife and creating “edges” which are important for their diverse diets. The expected change in habitat condition for all habitat types would improve forage conditions and reduce erosion, enhancing wildlife habitat over the long term.

Under this alternative only the Monument portions of the watershed would be treated. However, most of the sagebrush-steppe habitats needing treatment are located on the Kanab Field Office portion of the watershed which would not be treated. Therefore the benefits of treating thousands of acres of decadent sagebrush stands with little or no understory would not be realized. Wildlife species requiring sagebrush-steppe habitats with a diverse understory would not receive the full benefit of treating the entire watershed.

Herbicide treatments, applied in pellet form and/or limited to “spot” or “strip” treatments would enable applicators to target specific vegetation treatment area, which would reduce the potential for direct impacts to wildlife and non-target vegetation.

### ***Mitigation***

No mitigation measures have been identified other than those incorporated as part of the Proposed Action and action alternatives.

#### **4.1.10. Woodland/Forestry**

##### ***Alternative A – Proposed Action***

##### Direct/Indirect Impacts

Under the proposed action, a variety of vegetation treatment types would occur over a 15 year period. Appendix 8 provides an analysis of the different treatment types and the projected treatment year, based on a 15 year time frame. Overall, the Proposed Action considers approximately 51,600 acres (39%) of the project area, as suitable for one of the three treatment types listed.

All of the proposed treatment methods (burning, mechanical, chemical, hand-thinning, etc.) would be effective at removing pinyon/juniper.

Mechanical and chemical treatments would be effective at providing a diversity of age classes in the sagebrush steppe areas.

The majority of areas targeted for treatment (pinyon/juniper and retreatment areas) have been selected because of more recent invasion of pinyon/juniper to these sites. Removal of woodland species within areas traditionally dominated by sagebrush/grasslands would improve the overall health of sagebrush communities by increasing age class diversity and allowing a more open canopy for grasses, forbs and shrubs. Impacts to woodland species would be negligible as these areas were likely sagebrush/grassland sites, prior to European settlement.

Grass and forb species diversity/biomass and site resource conservation is better achieved by removing pinyon/juniper through methods that provide some degree of soil disturbance, followed by slash scattered across the site to serve as a mulch (Brockway, 2002). Water yield would also be expected to increase (Bedell, 1993).

Following pinyon/juniper treatments, there would be an expected increase in shrubs, grasses, forbs and other desirable understory vegetation, especially with treatments designed to provide some site disturbance, seeding and mulching. Pinyon/juniper trees would eventually move back into the site, in the absence of additional disturbance. Future removal of trees and maintenance of pinyon/juniper woodlands, (where appropriate) that follow the guidelines outlined in, Preliminary Thinning Guidelines for Pinyon-Juniper Ecosystems (Page, 2005) (Appendix 9) would ensure long-term ecosystem restoration.

Because the majority of treated areas consist of slopes less than 30 percent, and contain some shrub understory, it is expected that the majority of pinyon/juniper targeted for treatment are post-settlement (<150 years). Observation of woodland tree growth forms can provide an indicator of post-settlement (>150 years), old growth trees vs. pre-settlement woodland trees (Table 13) (Tausch, 2009). Selective thinning of mature trees would increase stand health, while also providing thermal cover needs of large ungulates, such as deer and elk. Thinning of mature trees may not meet fuels management objectives, as larger trees would still be susceptible to crown fire, if tree spacing is not adequate.

**Table 13. Morphological characteristics of post-settlement (<150 years) and pre-settlement (>150 years) woodland trees.**

Characteristic	Relatively Young Trees (<150 years)	Relatively Old Trees (>150 years)
Juniper Crown Shape	Conical with pointed tip	Flattened, rounded or uneven top
Pinyon Crown Shape	Conical with pointed to slightly rounded tip	Flatten, rounded or uneven top
Juniper Branch Structure	Branches become progressively smaller from bottom to top of tree	In open stands, large branches near the base
Pinyon Branch Structure	Branches become smaller from bottom to top of tree, general orientation is vertical	In open stands branches large near base and remain relatively large well into the crown, more randomly oriented.
Dead Wood	Little dead wood in bole, few dead branches, little or no foliose lichen on juniper	Dead branches, bark missing, juniper covered by a light green lichen
Juniper Bark	Flaky, relatively thin with limited or shallow vertical rows	Thick, fibrouse with well-developed vertical furrows
Pinyon Bark	Relatively thin, flay, with weak vertical furrows	Thicker, more plate-like structure than furrowed
Juniper Leader Growth	Terminal leader growth in the upper 1/4 of the tree, usually >2 in. In open stands, leader growth >2 in. from bottom to top	Leader growth in the upper 1/4 of the tree usually <1 in.
Pinyon Leader Growth	Leader growth in pinyon similar to juniper but not directly visible. Must look for bud scale scars to determine length	Leader growth in upper 1/4 of tree usually <2 in.

Ponderosa pine is a very small component of the forested landscape. Removal of pinyon/juniper and other ladder fuels, regardless of tree density/age, would help this important landscape component persist.

The proposed action would decrease opportunities for fuel wood gathering within the Kanab Field Office Portion of the project area.

Overall, treatment of pinyon/juniper sites would help move areas within the UKCWVMP area toward the desired future condition.

***Alternative B. No Action*****Direct/Indirect Impacts**

No alternation in the current processes (p/j infilling and encroachment) or trends would be initiated through management actions. Pinyon pine mortality due to the pinyon engraver beetle could increase over time, as trees become more stressed due to drought and closed canopy conditions. Pinyon and juniper will continue to increase in density (number of stems per acre) and can be expected to continue to replace sagebrush and grasslands in some areas. In some pinyon/juniper areas, where there is still a grass and forb understory, seeding may not be needed. In the event that this component disappears, treatment costs would increase dramatically.

The presence of Ponderosa Pine, already diminished in this area, may disappear from the landscape, from uncontrolled wildfire events (carried by ladder fuels) and/or competition from other woodland species.

***Alternative C. UKCWVMP – Kanab Field Office Portions Only*****Direct/Indirect Impacts**

The impacts under Alternative C. would be the same as those described under the proposed action, Alternative A.

***Alternative D. UKCWVMP – Grand Staircase Escalante National Monument Portion Only*****Direct/Indirect Impacts**

The impacts under Alternative C are the same as those described under the proposed action, Alternative A, with the follow additions:

This GSENM portion of this project represents that largest contiguous acres of areas where pinyon/juniper has encroached and infilled. In general, these treatments would be more effective to implement due to the presence of existing understory vegetation and the opportunity to restore larger treatment polygons.

All of the treatment methods would be effective, with little impact to the small portion of adjacent private lands.

In general, these areas represent the most productive areas for treatments proposed that are specific to pinyon/juniper removal (pinyon/juniper treatment and vegetation re-treatment).

**4.2. Cumulative Impacts Analysis**

“Cumulative impacts” are those impacts resulting from the incremental impact of an action when added to other past, present, or reasonably foreseeable actions regardless of what agency or person undertakes such other actions.

**4.2.1. Cultural Resources**

These alternatives would not contribute to the impacts of other past, present and reasonably foreseeable future actions. Thus, there would be no project-related cumulative impacts to archaeological resources



#### **4.2.2. Fire and Fuels**

Implementing this project at a watershed level provides a logical boundary in which to manage fuels, as there are similar conditions, resources and issues. Established vegetation treatments, within the context of this EA would help to prevent erosion following fire and/or scheduled treatments and help toward establishing more traditional fire regimes.

#### **4.2.3. Greenhouse Gas Emissions**

Rangelands, and to a broader extent sagebrush steppe ecosystems, are important for carbon sequestration, primarily because of the significant carbon stored as soil organic matter and the magnitude of the rangelands that occur within the United States (roughly one-third of total lands, excluding Alaska) (Svejcar, et. al, 2008). Conversion of sagebrush steppe to annual vegetation dominance (such as cheatgrass) is associated with 1) volatilization of carbon in woody shrubs during wildfires (carbon source); 2) loss of surface soil organic matter layer due to erosion after a wildfire, 3) reduction in net carbon stored in deeper soils; and 4) reduction in net carbon exchange in annual grasslands compared to sagebrush steppe lands (Bradley, et. al. 2006). Conversion of sagebrush steppe to annual vegetation dominance would be cumulative with such events occurring throughout much of the western United States.

#### **4.2.4. Range/Livestock (including Socioeconomics)**

Livestock grazing in the region has evolved and changed considerably since it began in the 1870's and is one factor that has created the current environment. At the turn of the century, large herds of livestock grazed on unreserved public domain in uncontrolled open range. Eventually, the range was stocked beyond its capacity, causing changes in plant, soil and water relationships. Some speculate that the changes were permanent and irreversible, turning plant communities from grasses and other herbaceous species to shrubs and trees. Protective vegetative cover was reduced, and more runoff brought erosion, rills and gullies.

In response to these problems, livestock grazing reform began in 1934 with the passage of the Taylor Grazing Act. Subsequent laws, regulations and policy changes have resulted in adjustments in livestock numbers, season of use and other management. Given the past experiences with livestock impacts to resources on Public Lands, as well as the cumulative impacts that could occur on the larger ecosystem from grazing on various public and private lands in the region, proper management of livestock grazing is an important factor in ensuring the protection of public land resources.

The effects of the vegetative treatments in relation to rangeland conditions and livestock grazing management on the allotments within the UKCWVMP area have been analyzed under the Environmental Consequences Section for Alternatives A, B, C and D.

The No Action Alternative would not change the current ecological conditions or livestock grazing management from a short-term perspective. Alternative A would provide a greater opportunity at reducing any potential livestock grazing impacts by increasing the quantity and quality of available forage and improving overall long-term socio-economics. Alternative A would also promote a gradual improvement in long-term ecological conditions and rangeland health and provide a greater opportunity for the allotments to conform to the Utah Standards for Rangeland Health and the Fundamentals of Rangeland Health. Alternatives A also provides an

opportunity to promote an overall resource improvement within the UKCWVMP. The long term impact of this project, when considered in light of other like projects (Greenville Bench, Parowan Front Fuels Projects, South Beaver, etc.) greatly outweighs the short-term inconvenience to permittees.

#### **4.2.5. Recreation**

There would be no reasonably foreseeable cumulative impacts of noteworthy significance, in either the action or no action alternative, pertaining to recreation resources and activities. With the limited nature of the proposed treatments in comparison to the immense surrounding areas of untreated landscape, and considering potential future projects, cumulative impacts are likely negligible.

#### **4.2.6. Soils**

Because a watershed consists of an area in which there are interrelated processes (soils, water, vegetation and wildlife), they provide both a logical and political boundary in which to work. The potential for long-term restoration of the UKCWVMP area is excellent, especially where entire watersheds/sub-watersheds are improved holistically. Positive cumulative impacts, such as reduced soil erosion, increased water quality and quantity and improved air quality (dust reduction) can be achieved, especially when federal land treatments are coordinated with adjacent private land treatments.

Under the no action alternative, soil loss and reduced infiltration rates would continue. Upland erosion would continue to increase through gully forming and headcutting, further impacting the watershed and limited riparian resources. These negative actions would be exacerbated by existing soil and water movement occurring within the watershed.

Implementing treatment projects only on the Kanab Field Office Portion of the *UKCWVMP* would not be as beneficial as looking at the watershed as a whole. Because a watershed consists of an area in which there are interrelated processes (soils, water, vegetation and wildlife), they provide both a logical and political boundary in which to work. The potential for long-term restoration of the uplands under this alternative is excellent; however, the overall watershed benefits of reduced soil erosion, increased water quality and quantity and improved air quality will be more difficult to achieve, because of the smaller landscape scale

Implementing treatment projects only on the Grand Staircase Escalante National Monument portion of the UKCWVMP would not be as beneficial as looking at the watershed as a whole. Because a watershed consists of an area in which there are interrelated processes (soils, water, vegetation and wildlife), they provide both a logical and political boundary in which to work. The potential for long-term restoration of the uplands under this alternative is excellent; however, the overall watershed benefits of reduced soil erosion, increased water quality and quantity and improved air quality will be more difficult to achieve, because of the smaller landscape scale.

#### Biological Soil Crusts

Long-term, removal of pinyon/juniper may provide for future opportunities for establishment and more relative cover of biological soil crusts ((BLM Tech. Ref. 1730-2. 2001). Such

establishment would provide little fuel to carry a fire through interspaces, thereby acting as a “refugia” to slow the spread and decrease the intensity of a future wildfire.

Overall, the objective of this plan is to improve ecological condition of a site versus managing for individual plant/animal species. As such, if ecological conditions are improved based on management actions, biological crusts would also be in dynamic equilibrium within the watershed.

Under the No Action, cumulative impacts of losing BSC on the landscape would result in less carbon fixing, less sequestering of organic carbon in the soil, less stabilized soil surfaces and less buffering from wind and water erosion (Hilty, 2004).

#### **4.2.7. Visual Resource Management (VRM)**

There would be no reasonably foreseeable cumulative impacts of noteworthy significance in the no action alternative, pertaining to visual resources. Natural processes would be allowed to proceed as they have for previous generations. Under the action alternative, there could be potential for greater cumulative impacts to visual resources if no constraints are placed on the location, size and treatment method of this and future treatments. However, with the limited nature of the proposed treatments in comparison to the immense surrounding areas of untreated landscape, the long-range plan for future treatments, and the planning constraints tied to those treatments, there is only a negligible chance for adverse cumulative impacts connected to the action alternative.

#### **4.2.8. Natural Areas (KFO), WSA (GSENM)**

Under the no action alternative, there is a chance that more devastating wildfire activity could cumulatively alter enough of the landscape that natural areas could be negatively impacted due to excessive loss of solitude opportunities. However, such impacts from wildfires would not affect the naturalness of the landscape. Under the action alternative, there could be potential for greater cumulative impacts to natural areas if no constraints are placed on the location, size and treatment method of this and future treatments. However, with the limited nature of the proposed treatments in comparison to the immense surrounding areas of untreated landscape, the long-range plan for future treatments, and the planning constraints tied to those treatments, there is only a negligible chance for adverse cumulative impacts connected to the action alternative.

#### **4.2.9. Wildlife (including Special Status species)**

The effects of past and present actions were discussed in the Affected Environment and Environmental Consequences section of this document. The effects of reasonable and foreseeable future actions are as follows: Establishment of wildlife guzzlers, riparian exclosures, vegetation rehabilitation treatments, sage grouse habitat improvement projects, and invasive weed treatment would be beneficial to wildlife habitat throughout the project area. These projects would provide for the long-term sustainability and health of wildlife due to increased forage production and water availability, which would lead to the attainment of the Standards and Guidelines for Healthy Rangelands.

Wildfire suppression would be beneficial to wildlife including migratory birds by providing a means to control the number of acres that are burned thereby eliminating habitat fragmentation

and alteration to an undesirable community. Following a wildfire, rehabilitation of the burned area would occur which is expected to improve wildlife habitat through the prevention of cheatgrass and other invasive species.

Declines in migratory bird populations are becoming well documented through cooperative efforts among conservation groups, federal, and state agencies and can be attributed to many factors such as habitat fragmentation (breeding and non-breeding habitats), alteration of vegetative communities, urban expansion, natural disasters, and brood parasitism

#### **4.2.10. Woodland/Forestry**

The public lands within this analysis area have been managed and the vegetation has been modified in excess of 100 years (since pioneer settlement). Modifications have included removal of forest and woodland products, livestock grazing and improvements (fencing, water developments), chainings of pinyon/juniper for rangeland improvement, and fire suppression. Except for the chainings and some site-specific developments, management has not been “intensive.”

In the larger landscape, outside of the analysis area and within the analysis area on non-public lands, these vegetative treatments proposed will add to modifications done by State and private interests and by Federal land managers on public lands (typically less than 1,000 acres at any given time).

The continued increase in pinyon/juniper woodlands and subsequent decrease in sagebrush-steppe types, would be cumulative with similar processes occurring throughout the western United States. These processes have been associated with a decline in wildlife species dependent on sagebrush ecosystems, increases in invasive plant establishment, increased fire risk and severity, increased erosion and soil loss, and decreases in carbon sequestration potential.

### **4.3. Monitoring and/or Compliance**

In order to determine the success of various seed mixes and treatments, monitoring would be conducted by BLM personnel or contractors. Monitoring would consist of nested frequency or other BLM monitoring techniques and photopoints.

Information would continue to be collected from existing BLM and DWR studies, which include vegetation trend and deer/elk pellet counts. Monitoring sites established outside of treatment areas could be used to compare results on treated vs. untreated areas. Additional monitoring sites would be established by DWR and BLM as deemed necessary to monitor success.

#### Wildlife

There would be regular monitoring under alternatives, (A, C, and D) with annual monitoring of actual use and utilization, and trend monitoring every three to five years as staffing and funding permit. The purpose of this monitoring would be to ensure that the overall upland ecological sites and project resource objectives are met.

### Range

The Kanab Field Office has established nested frequency plot studies and continues to monitor upland sites in all of the affected allotments every 5 years. In addition to the existing monitoring sites, as projects are implemented a nested frequency plot study will be established in each treatment area to measure success and long term stability of the site.

Trend monitoring occurs on Allotments within the Monument approximately every five years. Monitoring studies will be conducted on all vegetation treatments that occur on the Monument to study the changes in vegetation composition over time as a result of the treatments. Monitoring techniques could include photo points, nested frequency, line intercept, etc. The type of study may vary by site and by treatment

## **4.4. Reasonably Foreseeable Action Scenario (RFAS)**

There is no way to predict when wildland fire will occur. However, based on recent large-scale wildland fires throughout southern Utah, within similar types of habitats in counties surrounding the project area, it is not a matter of if a fire will occur, but when.

Reasonably foreseeable actions under the No Action Alternative would conclude that if vegetation cover and vegetation types such as pinyon/juniper and cheatgrass continue to increase, a large-scale wildland fire would destroy wildlife habitat, increase erosion potential and place communities and firefighters at increased risk.

In the absence of fire, wildlife habitat would continue to decline under the current conditions. Deer and sage grouse, which have already experienced decreases in numbers due to lost and degraded habitat and drought, could decline beyond the point at which they could recover. The actions proposed as part of the UKCWVMP would help ensure long-term viability for wildlife.

Some of the permittees within the project area have taken temporary reductions in livestock numbers due to degraded vegetation and drought conditions on their allotments. If conditions continue to decline at the current rate, it is more likely that some of these temporary conditions may become permanent reductions.

If increases in pinyon/juniper communities, and subsequent declines in sagebrush-steppe communities continue at current rates (estimated at ½ to 1% decline per year in Utah) (Utah Forest Health Report (1999-2001), it is increasingly more apparent that something must be done to promote habitat for sagebrush-obligate species, such as sage grouse, and other species that utilize sagebrush areas during a portion of the year, such as deer and elk. Table 14 summarizes the past, present and reasonably foreseeable future actions applicable to the assessment area.

**Table 14. Past, Present and Reasonably Foreseeable Future Actions applicable to the Upper Kanab Creek Vegetation Watershed Management area.**

Project/Action	Name or Description	status (x)		
		Past	Present	Future
Alton Coal Lease by Application EIS	Coal development on some private and public lands within the Kanab Field Office portion of the project area		X	
Construction of Fences	Construction of fences throughout the project area influence grazing management and wildlife movement	X	X	X
Development of Water Facilities and Pipelines	Construction of water facilities and pipelines throughout the project area influence grazing management and wildlife movement	X	X	X
Farming	Farming and range improvements on private lands throughout the Kanab Field Office portion of the project	X	X	X
Grazing Permits	Issuance of ten year grazing permits for the allotments throughout the Cedar City Field Office area.	X	X	X
GSENM established	GSENM established by the President of the United States, on September 18, 1996.	X		
GSENM Plan of 2000	Provides guidance for the GSENM portion of the project area	X		
Historic Livestock Grazing (1870's)	1870's to 1934 unregulated grazing on public lands led to vegetative community changes.	X		
Invasive Weed Treatment	Invasive weed treatment throughout the Cedar City Field Office area	X	X	X
Kanab Field Office RMP of 2008	Provides guidance for the Kanab FO portion of the project area in Kane and Garfield Counties, in south-central Utah.	X		
Livestock Management	Current, past, and future grazing on allotments within the project area	X	X	X
Off Highway Vehicle (OHV) use	Regulated OHV use throughout the project area	X	X	X
Range Improvements	Maintenance and construction of range improvement projects throughout the project area	X	X	X
Sage Grouse MOU - 1999	Signed by members of the Western Association of Fish and Wildlife Agencies (WAFWA) to promote conservation and management of sage-grouse and their habitats. (Thirteen states, including Utah, and two Canadian provinces)	X	X	X
Sage Grouse MOU - 2000	MOU between WAFWA, USFS< BLM and the USFWS - provides for cooperation among state, provincial and federal agencies in the development of a rangewide strategy to direct conservation of sage-grouse and their sagebrush habitats.	X	X	X
State of Utah School and Institutional Trust Lands Administration (SITLA)	Established in 1994 to administer trust lands granted to Utah by the United States Government. Management and periodic disposal of trust lands is ongoing.	X	X	X
Taylor Grazing Act (1934)	1934 regulated grazing on public lands led to livestock grazing reform.	X		
Vegetation Manipulation Projects	Alteration of native pinyon – juniper and sagebrush types to grassland types modify ecological condition	X	X	X
Vegetative and Wildlife Habitat Improvements Projects	Habitat Improvement Projects throughout the Cedar City Field Office area	X	X	X
Wildfire Suppression and Rehabilitation	Wildfire Suppression and Rehabilitation activities throughout the Color Country District and GSENM	X	X	X

## 5.0 CONSULTATION AND COORDINATION

### 5.1 Introduction

The issue identification section of Chapter 1 identifies those issues analyzed in detail in Chapter 4. Appendix 1 provides the rationale for issues that were considered but not analyzed further. The issues were identified through the public and agency involvement process described in sections 5.2 and 5.3 below.

### 5.2 Persons, Groups, and Agencies Consulted

During preparation of the EA, the public was notified of the proposed action by posting on the ENBB on December 08, 2008. Southern Utah Wilderness Alliance and the Kane County Conservation District requested site tours. These tours were held April 10, 2009 and September 17, 2009, respectively. Approximately 20 individuals attended the site visit on September 17. The following persons, groups and agencies were consulted or requested consultation with the BLM regarding the UKCVMP.

Gary Bezzant	Utah Division of Wildlife Resources
Dustin Schaible	Utah Division of Wildlife Resources
Local working group	Kane County Conservation District
Local working group	Friends of the Paunsagunt
Local working group	Color Country Adaptive Resource Management Sage Grouse Working Group
Southern Region	Utah Partners for Conservation and Development
Tiffany Bartz	Southern Utah Wilderness Alliance
Bruce Bunting	Pine Point, Johnson Canyon Allotments
Shadan LeBaron	Black Rock, First Point, Ford Well, Second Point Allotments
Lane Little	Timber Mountain Allotment
Heaton Livestock	Alton, Isolated Tracts and Lower Sink Valley Allotments
Roy Mackelprang	Bald Knoll Allotment
Mike Noel (Mongini Lease)	Bald Knoll Allotment
Leon Brinkerhoff	Black Mountain Allotment
Mark and Dale Spencer	Buck Knoll, Spencer Bench Allotments
Brent Owens	Burnt Cedar Point Allotment
Dennis Macdonald	Coal Hollow Allotment
Merlin Esplin	Cottonwood Springs Allotment
John Bramall	LeVanger Lakes Allotment
Kurt Brinkerhoff	Mill Creek Allotment
Julie Brinkerhoff	Red Hollow Allotment
Burton Pugh	Robinson Creek Allotment
Derikson Brinkerhoff	Rockingchair Allotment
Brigham Johnson	Syler Knoll Allotment
Trevor Leach	Upper Place Allotment
David Johnson	Upper Sink Valley Allotment
Darlynn Sorenson and Ray Spencer	Elbow Springs Allotment

Nichole Frey	Utah State University Extension
Jake Schoppe	United States Forest Service
Kristi Hatch	Natural Resource Conservation Service
Jim Matson/Kevin Williams	Color Country Resource Conservation and Development
See EA and checklist	U.S. Fish and Wildlife Service
See EA and checklist	Utah State Historic Preservation Office (SHPO)

### 5.3. Summary of Public Participation

#### 5.3.1. Comment Analysis

Southern Utah Wilderness Alliance provided scoping comments and project design recommendations.

Utah Division of Wildlife Resources, Utah Partners for Conservation and Development, and Color country Adaptive Resource Management Sage Grouse Working Group provided guidance in project design for wildlife, specifically mule deer and sage grouse.

#### 5.3.2. Response to Public Comments

A 30 day comment period will be held. All comments will be analyzed during the comment period.

#### 5.3.3. List of Preparers

Also see – IDT checklist (Appendix 1).

Specialist	Resources Analyzed
Carson Gubler	Air Quality, Floodplains, Threatened, Endangered or Candidate Plant Species, Water Quality, Rangeland Health Standards and Guidelines, Vegetation, including special status plant species
Tom Christensen, Allysia Angus	Areas of Critical Environmental Concern, Wild and Scenic Rivers, Wilderness, Recreation, Visual Resources, Wilderness Characteristics
Noel Logan, Matt Zweifel	Cultural Resources
Keith Rigtrup	Environmental Justice, Socioeconomics
John Reese	Farmlands, Livestock Grazing, Woodland Forestry, Soils, Wild Horse and Burros
Brian Taylor	Invasive, non-native species, Rangeland Health Standards and Guidelines, Livestock Grazing, Woodland/Forestry
Allan Bates	Invasive, non-native species, Rangeland Health Standards and Guidelines, Livestock Grazing, Woodland/Forestry
Dustin Rooks	Threatened, Endangered and Candidate Plant Species, Vegetation including special status plant species



Lisa Church, Cameron McQuivey	Threatened, Endangered or Candidate animal species, wetlands/riparian zones, Fish and Wildlife Including Special Status Species
Cameron McQuivey	Threatened, Endangered or Candidate animal species, wetlands/riparian zones, Fish and Wildlife Including Special Status Species
Doug Powell	Wastes, Geology/Mineral Resources/Energy Production
Hugh Wolfe	Lands/Access
Vicki Tyler	ID Team Leader, Fuels/Fire Management, Soils, Woodland/Forestry
Kim Anderson	Woodland/Forestry, Cryptobiotic Soils

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## 6.2. Glossary of Terms

**Animal Unit Months (AUM's)** - the amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month.

**Cumulative Effects.** Cumulative effects result from the incremental effect of the Original Proposed Action when added to other past, present or reasonably foreseeable future actions, regardless of who is taking the action.

**Direct, Indirect Effects.** Direct Effects are those occurring at the same time and place as the triggering action. Indirect effects are those caused by the action, but that occur at a later time, or at a distance from the triggering action.

**Defensible Fire Space (DFS).** A designated band of land managed to reduce risk of wildfire from reaching private lands or other areas where fire may impact human resources.

**Fire Regime Condition Class (FRCC).** Describes the degree of departure for vegetation from reference conditions, with Condition Class 3 representing the greatest degree of departure.

**Fire Tolerant Species.** A fire tolerant tree species is one that can withstand fire to a certain intensity or frequency. A fire intolerant species readily succumbs to a fire, and usually has lots of limbs and branches that carry fire in to the tops of trees where living needles are burned, causing the tree to die.

**Fuels.** Fuels include both living and dead plants, as well as wood already lying on the ground, that are capable of burning. High fuel loads can contribute to hot, destructive fires.

**Healthy Forest Initiative.** On December 3, 2003, President Bush signed into law the Healthy Forest Restoration Act of 2003 to reduce the threat of destructive wildfires while upholding environmental standards and encouraging early public input during review and planning processes. The legislation pledges to care for America's forests and rangelands, reduce the risk of catastrophic fire to communities, help save the lives of firefighters and citizens, and protect threatened and endangered species by encouraging public participation to help develop high priority forest health projects, reduce the complexity of environmental analysis, and provide for a more effective appeal process.

**Ladder Fuels.** Ladder fuels are those fuels that extend from the ground and lower tree branches into the tree canopy. Ladder fuels, like surface fuels, help a fire spread more quickly, causing a greater resource damage and increasing firefighter risk.

**National Fire Plan (NFP).** The National Fire Plan provides national direction for hazardous fuels reduction. This direction emphasizes measures to reduce the risk to communities and the environment. The primary elements applicable to the Upper Kanab Creek Vegetation Enhancement Project are to: 1) improve prevention and suppression efforts; 2) reduce hazardous fuels; restore fire-adapted ecosystems.

### 6.3. List of Acronyms Used in this EA

AMR	Appropriate Management Response
BLM	Bureau of Land Management
BSC	Biological Soil Crusts
CCI	Cooperative Conservation Initiative
CCS	Challenge Cost Share
CFR	Code of Federal Regulations
DDT	d chloro diphenyl trichloroethane
DR	Decision Record
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FMP	Fire Management Plan
FMU	Fire Management Unit
FONSI	Finding of No Significant Impact
FRCC	Fire Regime Condition Class
GSENM	Grand Staircase Escalante National Monument
HFI	Healthy Forest Initiative
HUC	Hydrologic Unit Category
IDT	Interdisciplinary Team
KFO	Kanab Field Office
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act
NF&WF	National Fish and Wildlife Foundation
NRCS	Natural Resources Conservation Service
RMRS	Rocky Mountain Research Station
SITLA	School and Institutional Trust Lands Administration
SURWPP	Southern Utah Regional Wildfire Protection Plan
SUSA	Southern Utah Support Area
UDWR	Utah Division of Wildlife Resources
UKCWVMP	Upper Kanab Creek Watershed Vegetation Management Project
UPCD	Utah Partners for Conservation and Development
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
UWRI	Utah's Watershed Restoration Initiative
WAFWA	Western Association of Fish and Wildlife Agencies
WSA	Wilderness Study Area
WUI	Wildland Urban Interface

## 7.0 APPENDICES

### Appendix 1. Interdisciplinary Team Analysis Checklist

## INTERDISCIPLINARY TEAM ANALYSIS RECORD CHECKLIST

**Project Title:** Upper Kanab Creek Project

**NEPA Log Number:** UTC-040-09-03

**File/Serial Number:**

**Project Leader:** Vicki Tyler, Natural Resource Specialist, Fuels

### DETERMINATION OF STAFF: (Choose one of the following abbreviated options for the left column)

NP = not present in the area impacted by the proposed or alternative actions

NI = present, but not affected to a degree that detailed analysis is required

PI = present with potential for significant impact analyzed in detail in the EA; or identified in a DNA as requiring further analysis

NC = (DNAs only) actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section C of the DNA form.

Determination	Resource	Rationale for Determination*	Signature	Date
<b>CRITICAL ELEMENTS</b>				
PI	Air Quality	Air Quality issues are discussed as Greenhouse Gas Emissions write up in this EA.	/s/ C. Gubler	5/5/2009
NP	Areas of Critical Environmental Concern	There are no areas of Critical Environmental Concern Located in the project area.	/s/ T. Christensen	12/5/08
PI	Cultural Resources	Cultural resource issues will be discussed as part of the <b>Cultural Resource</b> write-up in this EA.	/s/Noel Logan	3/31/09
NP	Environmental Justice	There are no low or minority populations in the project area	/s/K. Rigtrup	4/13/09
NP	Farmlands (Prime or Unique)	A resource assessment was completed for Kane County during August 2005. From this assessment 16 acres are designated as Prime & Unique Farm Land in Kane County. None of these acres are on federal land and none are within the project area.	/s/ J. Reese	12/5/08
NI	Floodplains	No impacts to flood plains are anticipated as a result of this action.	/s/ C. Gubler	12/22/08
PI	Invasive, Non-native Species	Short term impacts may occur as desirable species get established, however precaution to avoid the introduction of nonnative species should be taken by pressure washing equipment. Additional impacts, including issues related to cheatgrass are discussed as part of the range, vegetation and fuels resource write-ups in this EA.	/s/ C. Gubler /s/ B. Taylor	12/22/08 4/28/09
NI	Native American Religious Concerns	When specific actions have been identified, the project areas will be included in Native American consultation. Such consultations will be completed prior to initiation of ground-disturbing actions so that any Native American concerns can be	/s/ Matt Zweifel	7/23/09



Determination	Resource	Rationale for Determination*	Signature	Date
		identified and addressed in a timely manner.		
NP	Threatened, Endangered or Candidate Plant Species	No known Threatened, Endangered or Candidate Plant Species are known to exist within the project area.	/s/ C. Gubler /s/ D. Rooks	12/22/08 4/3/2009
NI	Threatened, Endangered or Candidate Animal Species	There are no known populations of t&e species within the monument portion of the project boundary and there is no critical habitat that has been set aside for SWWFL, Mexican Spotted Owl, or Utah Prairie Dog. Clearances would be required prior to project implementation.	/s/ L. Church /s/ C. McQuivey	1/5/09 3/24/09
NI	Wastes (hazardous or solid)	No anticipated impacts relating to solid or hazardous wastes	/s/ Doug Powell	12/5/2008
NI	Water Quality (drinking/ground)	Impacts to water quality would be minimized on a case by case basis as the individual treatments are planned and carried out. Overall the project will improve water quality.	/s/ C. Gubler	12/22/08
NI	Wetlands/Riparian Zones	Riparian zones could benefit from the reduction of sedimentation into the Upper Virgin River Watershed and Kanab Creek, project design would aid in reduction of overland flow.	/s/ L. Church	1/5/09
NP	Wild and Scenic Rivers	Not present	/s/ T. Christensen	12/5/08
NP	Wilderness	Not present	/s/ T. Christensen	12/5/08
<b>OTHER RESOURCES / CONCERNS**</b>				
PI	Rangeland Health Standards and Guidelines	Standards and Guides would be impacted as a result of this action. In the short term the impacts may be negative, however in the long term impacts to standards and Guides would be a positive change. Additional impacts are discussed as part of the specialist report.	/s/ C. Gubler /s/ B. Taylor	5/5/2009 5/5/2009
PI	Livestock Grazing	In the short term the proposed project would have some negative impact on livestock grazing during the required rest period (minimum of two years for seeding establishment). However long term, the proposed project would greatly benefit livestock grazing by providing more forage across the landscape. Additional impacts are carried forward and discussed as part of this EA.	/s/ J. Reese /s/ B. Taylor	12/5/08 4/28/09
PI	Woodland / Forestry	The proposed project will have some impact on woodland/forestry, however over all it will not be a negative impact. The project may provide some opportunity for fuel wood harvest and there are plenty of trees that will be left for continued harvest. Additional impacts are carried forward and discussed as part of this EA.	/s/ J. Reese	12/5/08
NI	Vegetation including Special Status Plant Species other than FWS candidate or listed species	There are three species found within the project area that are listed as BLM sensitive species; <i>Phacelia pulchella</i> var. <i>atwoodii</i> , <i>Phacelia cronquistiana</i> , and <i>Cammissonia exilis</i> . All of these species are closely tied to the gypsum barrens of the Carmel formation within the project area. None of the treatments proposed will affect the gypsum barrens habitat.	/s/ C. Gubler /s/ D. Rooks	12/22/08 4/3/09
PI	Fish and Wildlife Including Special Status Species other than FWS candidate or listed species e.g. Migratory birds.	The proposed project will impact big game species such as mule deer and elk in the short term as portions of their habitat will undergo various treatments causing noise and human disturbance. In the long term the project should be beneficial to these species as it should rejuvenate the herbaceous and shrub communities that these species rely on especially during	/s/ L. Church /s/ C. McQuivey	1/5/09 2/17/09

Determination	Resource	Rationale for Determination*	Signature	Date
		migration and the winter months. The project has the potential to impact migratory bird species that rely on pinyon/juniper woodland and sagebrush steppe habitats for foraging and nesting. Additional impacts are carried forward and discussed as part of this EA.		
PI	Soils	A soil survey is available for the entire project area. Soils may be impacted depending on the timing and potential treatment methods. Additional impacts are carried forward and discussed as part of this EA.	/s/ J. Reese	12/5/08
PI	Recreation	Potential impacts to recreating public during treatment, and to recreation opportunities within treatment area. Additional impacts are carried forward and discussed as part of this EA.	/s/ T. Christensen	12/5/08
PI	Visual Resources	VRM class II and III areas are located within proposed treatment area. Additional impacts are carried forward and discussed as part of this EA.	/s/ T. Christensen	12/5/08
NI	Geology / Mineral Resources/Energy Production	No anticipated impacts to geologic, mineral or energy resources.	/s/ Doug Powell	12/5/2008
NI	Paleontology	Project includes areas around Alton and the Upper Skutumpah Creek with outcrops of Cretaceous rocks (Dakota, Tropic, and Straight Cliffs formations) known to yield significant vertebrate fossils. Surveys would be conducted on these outcrop areas before any surface disturbing activities would begin. Significant sites would be avoided as part of the project design.	/s/ Alan Titus	7/24/2009
NI	Lands / Access	No impacts to lands or access to public lands are anticipated by this project	/s/ Hugh Wolfe	12/5/2008
PI	Fuels / Fire Management	This area has been frequented by past wildfires. Several communities at Risk are located in or adjacent to the project area. Additional impacts are carried forward and discussed as part of this EA.	/s/ Vicki Tyler	3/27/09
PI	Socio-economics	Project would have beneficial long term effects by reducing chances of wildland fire and improving rangeland health. In the short term, the proposed project would have some negative impact on livestock grazing operations during the required rest period (minimum of two years for seeding establishment). Additional impacts are carried forward and discussed as part of this EA.	/s/ K. Rigrup	4/13/09
NP	Wild Horses and Burros	No wild horses and burros exist in the project area	/s/ J. Reese	3/27/09
PI	Wilderness characteristics	Non-WSA lands with wilderness characteristics are located within boundary of proposed treatment area. Additional impacts are carried forward and discussed as part of this EA.	/s/ T. Christensen	12/5/08

**FINAL REVIEW:**

Reviewer Title	Signature	Date	Comments
NEPA / Environmental Coordinator	/s/ Dennis Pope /s/ Paul Chapman	10/1/09 10/28/09	
Authorized Officer	/s/Todd Christensen /s/ Rene' Berkhoudt	11/12/09 11/13/09	

**Appendix 2. Fundamentals of Rangeland Health (43 CFR 4180) and Utah Standards for Rangeland Health (1997).**

**Fundamentals of Rangeland Health**

The Fundamentals of Rangeland Health stated in 43 CFR 4180 are:

1. Watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian-wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity and the timing and duration of flow.
2. Ecological processes, including the hydrologic cycle, nutrient cycle and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.
3. Water quality complies with State water quality standards and achieves, or is making significant progress toward achieving, established Bureau of Land Management objectives such as meeting wildlife needs.
4. Habitats are, or are making significant progress toward being, restored or maintained for Federal threatened and endangered species, Federal Proposed, Category 1 and 2 Federal candidate and other special status species.

The fundamentals of rangeland health combine the basic precepts of physical function and biological health with elements of law relating to water quality, and plant and animal populations and communities. They provide direction in the development and implementation of the standards for rangeland health.

## Utah Standards for Rangeland Health (1997)

**Standard 1. Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform.**

*As indicated by:*

- a) Sufficient cover and litter to protect the soil surface from excessive water and wind erosion, promote infiltration, detain surface flow, and retard soil moisture loss by evaporation.
- b) The absence of indicators of excessive erosion such as rills, soil pedestals, and actively eroding gullies.
- c) The appropriate amount, type, and distribution of vegetation reflecting the presence of (1) the Desired Plant Community [DPC], where identified in a land use plan, or (2) where the DPC is not identified, a community that equally sustains the desired level of productivity and properly functioning ecological conditions.

**Standard 2. Riparian and wetland areas are in properly functioning condition. Stream channel morphology and functions are appropriate to soil type, climate and landform.**

*As indicated by:*

- a) Streambank vegetation consisting of, or showing a trend toward, species with root masses capable of withstanding high streamflow events. Vegetative cover adequate to protect stream banks and dissipate streamflow energy associated with high-water flows, protect against accelerated erosion, capture sediment, and provide for groundwater recharge.
- b) Vegetation reflecting: Desired Plant Community, maintenance of riparian and wetland soil moisture characteristics, diverse age structure and composition, high vigor, large woody debris when site potential allows, and providing food, cover and other habitat needs for dependent animal species.
- c) Revegetating point bars; lateral stream movement associated with natural sinuosity; channel width, depth, pool frequency and roughness appropriate to landscape position.
- d) Active floodplain.

**Standard 3. Desired species, including native, threatened, endangered, and special-status species, are maintained at a level appropriate for the site and species involved.**

*As indicated by:*

- a) Frequency, diversity, density, age classes, and productivity of desired native species necessary to ensure reproductive capability and survival.

- b) Habitats connected at a level to enhance species survival.
- c) Native species reoccupy habitat niches and voids caused by disturbances unless management objectives call for introduction or maintenance of nonnative species.
- d) Appropriate amount, type, and distribution of vegetation reflecting the presence of (1) the Desired Plant Community [DPC], where identified in a land use plan conforming to these Standards, or (2) where the DPC is identified a community that equally sustains the desired level of productivity and properly functioning ecological processes.

**Standard 4. BLM will apply and comply with water quality standards established by the State of Utah (R.317-2) and the Federal Clean Water and Safe Drinking Water Acts. Activities on BLM Lands will support the designated beneficial uses described in the Utah Water Quality Standards (R.317-2) for surface and groundwater. <sup>1</sup>**

*As indicated by:*

- a) Measurement of nutrient loads, total dissolved solids, chemical constituents, fecal coliform, water temperature and other water quality parameters.
- b) Macro-invertebrate communities that indicate water quality meets aquatic objectives.

<sup>1</sup> BLM will continue to coordinate monitoring water quality activities with other Federal, State and technical agencies.

**Appendix 3. Sample of non-use agreement to be used prior to treating specific project units. Non-use agreements are specific to the individual permittee utilizing the area being treated (allotment).**

**Bureau of Land Management**  
Upper Kanab Creek Watershed Vegetation Management Project

This non-use agreement between the Bureau of Land Management \_\_\_\_\_ (BLM office) and \_\_\_\_\_, permittees of the \_\_\_\_\_ Allotment to ensure the establishment, protection and long-term viability of vegetation within the Upper Kanab Creek Watershed Vegetation Management Project area.

Specific treatments include: (brief description of portion being treated):

The treatment areas would need to be rested from livestock grazing for a minimum of two growing seasons, \_\_\_\_\_(month/year) and \_\_\_\_\_(month/year). The rest period is necessary to enhance the establishment, health, vigor and production of vegetative communities in seeded areas and is consistent with policy for expenditure of agency and partner funds. Vegetative establishment on the treatment areas would be evaluated following the spring growing season in order to determine whether or not livestock grazing can be re-instated during the subsequent fall/winter.

**AGREEMENT**

We, \_\_\_\_\_, permittees on the \_\_\_\_\_ Allotment, hereby agree to rest treatment areas of said allotment, identified on the attached map, from livestock grazing for a minimum of two growing seasons in order to help ensure the establishment, protection and long-term viability of vegetation within the Upper Kanab Creek Watershed Vegetation Management Project area. Vegetative establishment on the treatment areas would be evaluated following the \_\_\_\_\_ spring growing season and the rest period will remain in effect until the authorized officer has determined that recovery efforts have met the objectives outlined for this project.

I understand that the permitted stocking rate and season of use following establishment of the vegetative treatments will remain within the limits outlined on my current ten-year term permit. I also understand that if I request changes to my term grazing permit, the change request would be done at the beginning of the permit renewal process.

Permittee concurrence:

\_\_\_\_\_  
Permittee

\_\_\_\_\_  
Date

\_\_\_\_\_  
Field Manager

\_\_\_\_\_  
Date

**Appendix 4. Fuels Treatment Specifications for treatments.**

<b>Treatment Method</b>	<b>Treatment Specifications</b>
Treatment Methods Common to all Units	<p>Only pinyon and junipers trees shall be targeted for treatment</p> <p>Stump height not to exceed 6”</p> <p>All live limbs shall be removed from stumps</p> <p>Areas where no treatment will occur shall be identified on maps and with flagging within project units. These may include leave islands, riparian areas, individual trees, pinyon trees under seven feet tall that have Christmas tree characteristics, wildlife travel corridors, cultural and Special Status species areas</p> <p>Implementation shall cease whenever snow is crusted and depth is greater than 6”, or when temperatures are less than 10 degrees Fahrenheit</p> <p>Existing vegetation/wildlife study locations will be located and protected so that markers and witness posts are not disturbed</p>
Hand Cutting: Lop / Scatter	<p>Cut material shall be scattered so as not to exceed 24” height above ground level</p> <p>Cut material shall be placed in ephemeral washes and draws where possible, to reduce erosion.</p> <p>All cut material shall be bucked so as to not exceed 4’ in length</p>
Mechanical Chipper / Shredder	<p>Mulch depth shall not exceed 6 inches</p> <p>The machinery would be utilized when conditions would limit the amount of soil disturbance and compaction from the operation of the machinery (for example: dry well-drained soils, frozen ground, or snow covered ground)</p> <p>The machinery would not be used on saturated soils or in muddy conditions (rut depth must not exceed 6” in depth).</p> <p>The machinery would not be operated on slopes <math>\geq</math> 25 percent</p> <p>The machinery will not be operated within 25’ of riparian vegetation.</p>
Hand Cutting: Pile Burning	<p>All cut material shall be cut so as to not exceed 4’ in length</p> <p>Cut material shall be placed in piles no bigger than 5’x5’x5’</p> <p>Piles shall be placed at least 20’ from all leave trees and if possible piles shall be placed so as to minimize impacts to surrounding vegetation</p> <p>Pile burning would be conducted according to the Southern Utah Support Area Pile Burn Plan</p> <p>Pile burning would only occur within the 100 meters of the riparian corridor when a road or other surface feature is between pile burn sites and the riparian area.</p>

**Appendix 5. Potential Species to be seeded as part of the action alternatives.**

Potential Species to Be Seeded	Kanab Field Office	GSENM	
		previously seeded areas	Non-disturbed areas
Hycrest Crested Wheatgrass	X	X	
Siberian Wheatgrass	X	X	
Pubescent Wheatgrass	X	X	
Arriba Western Wheatgrass	X	X	X
Secar Snake River Wheatgrass	X	X	X
Russian Wildrye	X	X	
Rimrock Indian Ricegrass	X	X	X
Ladaka Alfalfa	X	X	
Delar Small Burnet	X	X	
Yellow Sweetclover	X	X	
Antelope Bitterbrush	X	X	X
Wyoming Sagebrush	X	X	X
Forage Kocia	X	X	
Intermediate Wheatgrass	X	X	
Western Yarrow	X	X	X
Sideoats Grama	X	X	X
Flax	X	X	X
Nazpar Indian Ricegrass	X	X	X
Palmer Penstemon	X	X	X
Needle and Thread	X	X	X
Paloma Indian ricegrass	X	X	X
Thickspike wheatgrass	X	X	X
Smoothe brome	X	X	



**Appendix 6. Fire Regime Condition Classes (FRCC).**

**CONDITION CLASS**

**Condition class descriptions:** Condition classes are a function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire exclusion, timber harvesting, grazing, introduction and establishment of exotic plant species, insects and disease (introduced or native), or other past management activities.

<b>Condition class</b>	<b>Attributes</b>	<b>Example management options</b>
Condition Class 1	<ul style="list-style-type: none"> <li>• Fire regimes are within or near an historical range.</li> <li>• The risk of losing key ecosystem components is low.</li> <li>• Fire frequencies have departed from historical frequencies by no more than one return interval.</li> <li>• Vegetation attributes (species composition and structure) are intact and functioning within an historical range.</li> </ul>	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as fire use.
Condition Class 2	<ul style="list-style-type: none"> <li>• Fire regimes have been moderately altered from their historical range.</li> <li>• The risk of losing key ecosystem components has increased to moderate.</li> <li>• Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. This results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns.</li> <li>• Vegetation attributes have been moderately altered from their historical range.</li> </ul>	Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.
Condition Class 3	<ul style="list-style-type: none"> <li>• Fire regimes have been significantly altered from their historical range.</li> <li>• The risk of losing key ecosystem components is high.</li> <li>• Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns.</li> <li>• Vegetation attributes have been significantly altered from their historical range.</li> </ul>	Where appropriate, these areas may need high levels of restoration treatments, such as hand or mechanical treatments. These treatments may be necessary before fire is used to restore the historical fire regime.

## Appendix 7. Repeat photos for the Upper Kanab Creek Watershed Vegetation Management Project Area



Plate 467X. Skutumpah Canyon 1931 – 2004 Viewed north-northeast up Skutumpah Canyon. Johnson Wash enters on the left. Note the person in the original photograph for scale. According to the caption on the 1931 image, the valley floor was flat and level when the area was first settled by Europeans in 1870. “Wagon roads which once crossed the valley can be seen to the edge of the cut and the re continuing on the other side.” Today, the cut banks have stabilized and the arroyos are more heavily vegetated than in the past. Pin yon and juniper have increased. The shrubs are mostly Wyoming big sage and rubber rabbitbrush, though, some sage has died during the recent drought. The most common native grass is needle and thread. Cheatgrass is also present. U.S. Forest Service photograph (264935) taken by Reed W. Bailey in 1931; retake by Charles E. Kay on June 6, 2004 -- Photo No. 5328-19. Section 24, Range 5 West, Township 41 South; UTM 378950 E, 4121100 N; elevation 5,750 ft. Original photograph held by the Utah Historical Society, Reed W. Bailey Collection (Box 2, C-439), Salt Lake City, UT.



Plate 468X. Skutumpah Canyon 1931 – 2004 Viewed northeast up Skutumpah Canyon. Johnson Wash crosses the photo from left to right. Fire has recently burned the area between the camera and Johnson Wash killing most shrubs. Cheatgrass now dominates that area, although, some crested wheatgrass has become established. Pinyon and juniper have increased. Beyond Johnson Wash, Wyoming big sage is the most common shrub, but some plants have died during the recent drought. The area had not been grazed by livestock when rephotographed in 2004. Globe mallow, rubber rabbitbrush, and needle and thread are also present. U.S. Forest Service photograph (264934) taken by Reed W. Bailey in 1931; retake by Charles E. Kay on June 6, 2004 -- Photo No. 5328-27. Section 24, Range 5 West, Township 41 South; UTM 378900 E, 4121300 N; elevation 5,760 ft. Original photograph held by the Utah Historical Society, Reed W. Bailey Collection (Box 2, C-439), Salt Lake City, UT. For a 1985 repeat, see Webb et al. (1991:42)



Plate 475X. Johnson Canyon 1921 – 2004 Viewed north up Johnson Canyon. Johnson Canyon turns to the left, Mark Point (6,321 ft.) is in the center, and Skutumpah Canyon is on the right. The original image was made to document the lava flow in this part of Johnson Canyon -- see Plate 466x. Wyoming big sage has increased except where it has been burned in the distance -- photo right-center. Pinyon and juniper have also increased. The dark-colored shrubs on top of the lava flow are skunk brush (*Rhus trilobata*). Original photograph taken by R.C. Moore (No. 10) in 1921; retake by Charles E. Kay on June 6, 2004 -- Photo No. 5330-31A. Section 25, Range 5 West, Township 41 South; UTM 378300 E, 4119800 N; elevation 5,660 ft. Original photograph held in the U.S. Geological Survey Photograph Library, Denver, CO.



Plate 476X. Johnson Canyon 1931 – 2004 Viewed southeast down the West Fork of Johnson Canyon. Johnson Wash has stabilized and is more heavily vegetated today than it was in the past. Wyoming big sage is the most abundant shrub, but some plants have died during the recent drought. Pinyon and juniper have increased. Rubber rabbitbrush, globe mallow, cheatgrass, and needle and thread are the other most common species. U.S. Forest Service photograph (264933) taken by Reed W. Bailey in 1931; retake by Charles E. Kay on June 6, 2004 -- Photo No. 5332-3. Section 11, Range 5 West, Township 41 South; UTM 377900 E, 4124200 N; elevation 5,950 ft. Original photograph held by the Utah Historical Society, Reed W. Bailey Collection (Box 2), Salt Lake City, UT.



Plate 477X. Skutumpah Creek 1940 – 2004 Viewed south down Skutumpah Creek to the upper end of Skutumpah Canyon. The area in the foreground is private and has been cultivated at various points in the past. Additions have been made to the barn and ranch house. This site was originally homesteaded by John D. Lee during the 1870's. Pinyon and juniper have increased on the distant hills, as has ponderosa pine. Wyoming big sage and green rabbitbrush are the most common shrubs in the foreground, while crested and western wheat are the most common grasses. There is very little cheatgrass. Original photograph taken by H.E. Gregory (No. 997) in 1940; retake by Charles E. Kay on June 6, 2004 - - Photo No. 5332-8. Section 5, Range 4 ½ West, Township 41 South; UTM 381350 E, 4126650 N; elevation 6,010 ft. Original photograph held in the U.S. Geological Survey Photograph Library, Denver, CO



Plate 518X. Upper Johnson Wash 1938 – 2004 Viewed northwest across one of the upper branches of Johnson Wash. The area on both sides of the arroyo has been root-plowed and planted with crested wheatgrass to improve range conditions. Nevertheless, sagebrush has begun to reinvade the site. The gully has been plugged but the arroyo has eroded along the plug's right edge and continued to downcut. Pinyon and juniper have increased except where they were removed when the bottoms were treated. Utah serviceberry, bitterbrush, and birchleaf mountain mahogany occur on the steeper slopes. Original photograph taken by H.E. Gregory (No. 831) in 1938; retake by Charles E. Kay on June 29, 2004 - - Photo No. 5349-28. Section 31, Range 5 West, Township 40 South; UTM 371350 E, 4128600 N; elevation 6,540 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO



Plate 519X. Upper Johnson Wash 1939 – 2004 Viewed north-northwest on one of the upper branches of Johnson Wash. Pinyon, juniper, and mountain big sage have all increased. Utah serviceberry, bitterbrush, and birchleaf mountain mahogany occur on the steeper slopes. Original photograph taken by H.E. Gregory (No. 929) in 1939; retake by Charles E. Kay on June 29, 2004 -- Photo No. 5349-33. Section 32, Range 5 West, Township 40 South; UTM 371900 E, 4128000 N; elevation 6,380 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO



Plate 520X. Glendale Bench 1939 – 2004 Viewed southeast across Glendale Bench to Three Mile Hollow and Skutumpah Terrace. Pinyon and juniper have increased except in the foreground and across the road where they have been chained, pushed, or cut. Utah serviceberry and oakbrush have also increased. Original photograph taken by H.E. Gregory (No. 940) in 1939; retake by Charles E. Kay on June 29, 2004 - - Photo No. 5351-0. Section 29, Range 6 West, Township 40 South; UTM 362290 E, 4130100 N; elevation 6,600 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO.



Plate 523X. Johnson Wash 1939 – 2004 Viewed north across one of the upper branches of Johnson Wash to the Pink Cliffs. This area has not been treated or reseeded, most likely due to the exposed lava. The county road has been realigned. Sagebrush appears largely unchanged except there was more grass cover, primarily needle and thread and Indian rice grass, in 2004 despite the extended drought. Pinyon and juniper have increased in the distance. Johnson Wash appears more heavily vegetated today than it did in earlier times. Original photograph taken by H.E. Gregory (No. 930) in 1939; retake by Charles E. Kay on June 29, 2004 - - Photo No. 5351-16. Section 11, Range 5 West, Township 41 South; UTM 377300 E, 4124900 N; elevation 6,030 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO.



Plate 525X. Black Knoll 1931 – 2004 Viewed west-northwest across the Sink and Kanab Creeks to Black Knoll (6,760 ft.). The foreground has been root-plowed and reseeded with crested wheatgrass to improve range conditions. Despite that treatment, rubber rabbitbrush has increased and sagebrush has begun to reinvade the site. Pinyon, juniper, and oakbrush have increased except where they have been chained, pushed, or cut. Original photograph taken by H.E. Gregory (No. 673) in 1931; retake by Charles E. Kay on June 30, 2004 - - Photo No. 5351-26. Section 36, Range 5 West, Township 40 South; UTM 368450 E, 4128600 N; elevation 6,260 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO.



Plate 526X. Black Knoll 1936 – 2004 Viewed west across the Sink and Kanab Creeks to Black Knoll (6,760 ft.). The foreground has been root-plowed and reseeded with crested wheatgrass to improve range conditions. Despite that treatment, rubber rabbitbrush has increased and sagebrush has begun to reinvade the site. Pinyon, juniper, and oakbrush have increased except where they have been chained, pushed, or cut. Original photograph taken by J.C. Anderson (No. 15) in 1936; retake by Charles E. Kay on June 30, 2004 - - Photo No. 5351-28. Section 36, Range 5 West, Township 40 South; UTM 368450 E, 4128600 N; elevation 6,260 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO.



Plate 534X. Alton, UT 1940 – 2004 Plates 534x and 535x were originally taken from the same photopoint and form a panorama over Alton, UT. However, pinyon and juniper now block the original camera station, so the retakes were made from the nearest open areas. The retakes, though, could not be made from the same photopoint, but instead had to be reshoot from about 100 feet apart. Thus, the perspective in the 2004 images is somewhat different from the originals. Plate 534x is viewed east to the Sunset Cliffs. Pinyon, juniper, and oakbrush have increased except where they have been chained, bulldozed, or cut. Utah serviceberry, bitterbrush, and birchleaf mountain mahogany have also increased. Original photograph taken by H.E. Gregory (No. 1004) in 1939; retake by Charles E. Kay on June 30, 2004 - - Photo No. 5356-14. Section 2, Range 6 West, Township 39 South; UTM 367900 E, 4144850 N; elevation 7,400 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO



Plate 535X. Alton, UT 1940 – 2004 Plates 534x and 535x were originally taken from the same photopoint and form a panorama over Alton, UT. However, pinyon and juniper now block the original camera station, so the retakes were made from the nearest open areas. The retakes, though, could not be made from the same photopoint, but instead had to be reshot from about 100 feet apart. Thus, the perspective in the 2004 images is somewhat different from the originals. Plate 535x is viewed southeast to the Sunset Cliffs. Pinyon, juniper, and oakbrush have increased except where they have been chained, bulldozed, or cut. Utah serviceberry, bitterbrush, and birch leaf mountain mahogany have also increased. Original photograph taken by H.E. Gregory (No. 1003) in 1939; retake by Charles E. Kay on June 30, 2004 - - Photo No. 5356-17. Section 2, Range 6 West, Township 39 South; UTM 367900 E, 4144850 N; elevation 7,400 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO.



Plate 555X. Alton, UT 1909 – 2004 Viewed northeast to Alton, UT. The Paunsaugunt Plateau is on the skyline. Pinyon and juniper have increased as have ponderosa pine, white fir, limber pine, and Douglas fir. Oakbrush too has increased except where fields have been cleared around Alton. Utah serviceberry, greenleaf manzanita, sagebrush, and bitterbrush have also increased, except when excluded by competing conifers. The area is grazed by cattle, mule deer, and elk. Most of the land in this photoset is private. The town has expanded. Original photograph taken by G.B. Richardson (No. 195) in 1909; retake by Charles E. Kay on August 6, 2004 - - Photo No. 5367-14. Section 14, Range 6 West, Township 39 South; UTM 367100 E, 4142950 N; elevation 7,670 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO





Plate 556X. Alton, UT 1909 – 2004 Viewed northeast over the head of Long Canyon to Alton, UT. The Paunsaugunt Plateau is on the skyline. Pinyon and juniper have increased as have ponderosa pine, white fir, limber pine, and Douglas fir. Oakbrush too has increased except where fields have been cleared around Alton. Utah serviceberry, greenleaf manzanita, sagebrush, and bitterbrush have also increased, except when excluded by competing conifers. The area is grazed by cattle, mule deer, and elk. Most of the land in this photoset is private. The town has expanded. Original photograph taken by G.B. Richardson (No. 194) in 1909; retake by Charles E. Kay on August 6, 2004 - - Photo No. 5367-21. Section 15, Range 6 West, Township 39 South; UTM 366100 E, 4141650 N; elevation 7,841 ft. Original photograph held in the U.S. Geological Survey Photographic Library, Denver, CO.



Plate 893X. Orderville, UT 1915 – 2005 Viewed southeast to the Elkheart Cliffs east of Orderville, Utah. Cottonwoods have increased along the East Fork of the Virgin River. Pinyon and juniper have increased in the distance. The retake was made with an 85 mm lens. Original photograph taken ca. 1915; retake by Charles E. Kay on June 21, 2005 - - Photo No. 5463-23. Section 4, Range 7 West, Township 41 South; UTM 354200 E, 4126350 N; elevation 5,460 ft. Original photograph held by the Kanab Museum, Kanab, UT.

**Appendix 8. Draft\* implementation schedule (based on 15 years) for all three treatment types (P/J Treatment, Vegetation Retreatment, Sagebrush Treatment),.**

Year	Field Office	Previously Treated	PJ Treatment	Sagebrush Treatment	Total/yr	Year	Field Office	Previously Treated	PJ Treatment	Sagebrush Treatment	Total/yr
2010	GSENM	1,115.53			1115.53	2018	GSENM	17.37	3,500.38		3517.75
	Kanab Field Office	1,371.67		686.9	2,058.57		Kanab Field Office				0.00
	<b>Total</b>				<b>3174.1</b>		<b>Total</b>				<b>3517.75</b>
2011	GSENM				0	2019	GSENM		2,405.37		2405.37
	Kanab Field Office	347.89	2,488.79		2,836.68		Kanab Field Office		2215.04		2,215.04
	<b>Total</b>				<b>2836.68</b>		<b>Total</b>				<b>4620.41</b>
2012	GSENM	1138.29		97.6	1235.89	2020	GSENM	2,036.05			2036.05
	Kanab Field Office		410.42	1,695.15	2,105.57		Kanab Field Office	161.12	2015.16		2,176.28
	<b>Total</b>				<b>3341.46</b>		<b>Total</b>				<b>4212.33</b>
2013	GSENM	1,173.67	334.92	178.89	1687.48	2021	GSENM		368.32		368.32
	Kanab Field Office	65.64	665.71	665.61	1,396.96		Kanab Field Office		4886.93		4,886.93
	<b>Total</b>				<b>3084.44</b>		<b>Total</b>				<b>5255.25</b>
2014	GSENM		5,043.13	72.23	5115.36	2022	GSENM	479.85			479.85
	Kanab Field Office				0.00		Kanab Field Office	554.7			554.70
	<b>Total</b>				<b>5115.36</b>		<b>Total</b>				<b>1034.55</b>
2015	GSENM				0	2023	GSENM	387.62	2,059.03		2446.65
	Kanab Field Office		2252.81	757.4	3,010.21		Kanab Field Office	279.69	331.89		611.58
	<b>Total</b>				<b>3010.21</b>		<b>Total</b>				<b>3058.23</b>
2016	GSENM				0	2024	GSENM				0
	Kanab Field Office		3589.98		3,589.98		Kanab Field Office	2118.01			2,118.01
	<b>Total</b>				<b>3589.98</b>		<b>Total</b>				<b>2118.01</b>
2017	GSENM				0						
	Kanab Field Office	161.53		3461.63	3,623.16						
	<b>Total</b>				<b>3623.16</b>						

\*Fewer acres may be treated per year, based on treatment type, project funding and the logistics of implementing a specific treatment type (allotment use, sufficient acres for equipment mobilization, etc.). Average acres treated each year are 2600.

**Appendix 9. Preliminary thinning guidelines for areas to be managed as pinyon-juniper.**

**PRELIMINARY THINNING GUIDELINES  
FOR PINYON-JUNIPER ECOSYSTEMS**

**Doug Page  
Bureau of Land Management  
Southwest Utah Zone Forester  
Cedar City, Utah**

*Last updated May 10, 2005*

Most management and research in pinyon-juniper ecosystems has focused on removal of pinyon and juniper to favor understory and rangeland species. There are limited information and management practices on thinning pinyon-juniper stands for health of forest/woodland ecosystems. The following are preliminary thinning guidelines for forest health based upon what research there is and upon standard forest ecological principles.

Stand Density Index (SDI) is an index of competitive interaction. Expressed as a maximum, it indicates the maximum density that a given species can attain at a given reference diameter. At 25% of maximum SDI, trees begin competing with each other (and begin to out compete understory species)<sup>13</sup>. At 35% of maximum SDI, trees fully occupy the site. At higher densities competition between trees either results in reduced growth and vigor on individual trees or may result in competitive stress and tree mortality (perhaps due in part to secondary agents such as insects that are attracted to stressed trees).

The maximum SDI's for pinyon and juniper are still being studied<sup>14</sup>, and current literature should be consulted to determine if the numbers below should be modified prior to implementing a thinning strategy. SDI's have been developed for Rocky Mountain juniper and Colorado pinyon, but not for Utah juniper or singleleaf pinyon to date. Research by Schuler and Smith suggests that the maximum SDI for mixed pinyon-juniper stands is higher than for single-species stands of either species. Speculation is that this may be (in part) a factor of differing rooting depths of the two species.

When initiating a thinning program, it may be desirable to try several different residual densities, and to monitor these over a several year period to determine which residual density seems the best fit for a given site and set of management objectives. For the purposes of this paper, maximum SDI's of 360 for pure stands (pinyon or juniper) and 415 for mixed stands have been selected, and the examples presented below are for mixed species stands. It is recommended that

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<sup>13</sup> Long, J.N. 1985. A Practical Approach to Density Management. The Forestry Chronicle 61:23-27.

<sup>14</sup> Sources for information on SDI for pinyon and juniper include:

- a. Schuler, Thomas M., and Frederick W. Smith. 1988. Effect of Species Mix on Size/Density and Leaf-area Relations in Southwest Pinyon/Juniper Woodlands. Forest Ecology and Management 25(3,4): 211-220.
- b. Shaw, John D. 2004. Personal communication. USDA-Forest Service, Forest Inventory and Analysis, Ogden, Utah.
- c. The Forest Vegetation Simulator.

when faced with a choice of maximum SDI's, the user select the lower SDI as the more conservative approach.

Both uneven-aged and even-aged silvicultural systems may be used. Use of an uneven-aged system allows for balancing size/age classes within individual stands. Use of an even-aged system will require balancing size/age classes on an area basis, each stand representative of one size/age class.

The following sample guidelines assume some specific management goals and desired future conditions: multiple age classes of pinyon/juniper are desirable, with open areas between trees occupied by grasses, forbs, and/or shrubs. Wildlife corridors allow utilization of a variety of plant species. Vegetation will occur in a mosaic pattern with greater amounts of edge space for wildlife use. The treatment of pinyon-juniper areas should be designed for long-term enhancement of the ecosystem, but should also be designed to avoid undue short term increases in erosion. Should areas identified for treatment lack sufficient understory species to prevent undue erosion, sufficient tree cover and litter should be maintained to protect soils, while opening the canopy enough to allow understory species to become established (at least for the initial treatment).

Stand Density Index (SDI) can be used as a guideline to residual develop desired stand structure goals. Thinning pinyon-juniper stands to approximately 25% of maximum SDI will maintain the site in tree cover (providing root mass and cover to protect soils), but still open the canopy sufficiently to allow understory species to increase or become established in the canopy gaps between trees. Debris from cut trees may be scattered in created openings to enhance soil protection and provide for microsite protection for establishing vegetation. However, use of green pinyon pine material >3" in diameter should be limited (see discussion below on "timing and treatment of pinyon slash" and *Ips* beetles). To maintain diversity, trees selected to be retained should be of good form and vigor, of various size/age classes, and be a mix of both pinyon and juniper. Table 1 below gives a general idea of the numbers of trees necessary to obtain 25% max SDI in any one size class (i.e., each row represents 25% of max SDI, or a single, even-aged stand).

<b>SDI</b>	<b>DRC</b>	<b>TPA</b>	<b>BA</b>	<b>Spacing<sup>15</sup></b>
104	6	236	46.2	13.6
104	8	149	51.9	17.1
104	10	104	56.7	20.5
104	12	78	61.0	23.7
104	14	61	64.9	26.8
104	16	49	68.5	29.8

<sup>15</sup> It should be noted that the "spacing" column represents space between trees of the same size class. To obtain approximate spacing between trees of different size classes, divide the figure for each size class by two then add these figures together.

<b>TABLE 1</b>				
<b>TPA, BA, and Spacing Between Trees based on SDI and Diameter</b>				
<b>(Stand SDI = 104 or 25% of maximum SDI)</b>				
<b>SDI</b>	<b>DRC</b>	<b>TPA</b>	<b>BA</b>	<b>Spacing<sup>15</sup></b>
104	18	41	71.8	32.8
104	20	34	74.8	35.6
104	22	29	77.8	38.5
SDI Stand Density Index (an index of competitive interaction)				
TPA Trees Per Acre				
BA Basal Area per acre in square feet of stem surface at DRC				
DRC Diameter at Root Collar				

If multiple size classes are to be maintained, the total stand SDI should be apportioned among size classes (Table 2). For practical application, size classes may be rather broad, with perhaps no more than 3 to 4 classes (or implementation may get too complex to be practical). For example, it may be desirable to subdivide a multi-aged stand into the following classes<sup>16</sup>: regeneration (<3" DRC); young/small (3-6"); mid-sized (6-9"); and large (>9" DRC). The target residual stand may look like Table 2 (using the upper end of the size range to calculate density).

<b>TABLE 2</b>				
<b>Target After-Treatment Stand (at 25% of max SDI)</b>				
<b>Size Class<sup>17</sup></b>	<b>SDI</b>	<b>TPA</b>	<b>BA</b>	<b>Spacing</b>
Regen (<3")	26	178	8.8	15.6
Small (3-6")	26	59	11.6	27.2
Mid (6-9")	26	31	13.6	37.6
Large (>9")	26	49	68.5	29.8
<b>Total</b>	<b>104</b>	<b>317</b>	<b>102.5</b>	--

However, based on research by Negron and Wilson<sup>18</sup>, this may leave stands that are still very susceptible to attack by the *Ips* beetle. Should this be a consideration, lower densities may be appropriate. Negron and Wilson recommended thinning the pinyon component to reduce the potential for *Ips* beetle attack to a total stand SDI of 20 or less<sup>19</sup> (or 5.6% of maximum SDI). Where stands are composed of mixed pinyon and juniper, a total SDI of 24 may be appropriate and will approximate the same competitive conditions. Table 3 displays other traditional measures of stand density for an SDI of 24 in any one size class (each row may be representative of a single even-aged stand).

<sup>16</sup> Diameter class breaks may be specific to a given site, and it may be desirable to use stand examination data to help set these breaks.

<sup>17</sup> Numbers calculated on larger trees in each size class: 3", 6", 9", and 16" DRC, respectively.

<sup>18</sup> Negron, Jose F., and Jill L. Wilson. 2003. Attributes Associated with Probability of Infestation by the Pinon *Ips*, *Ips confusus* (Coleoptera: Scolytidae), in Pinon Pine, *Pinus edulis*. Western North American Naturalist 63(4): 440-451.

<sup>19</sup> Negron's and Wilson's recommendation was done in metric units. The above is converted to English units.

<b>SDI</b>	<b>DRC</b>	<b>TPA</b>	<b>BA</b>	<b>Spacing</b>
24	6	54	10.7	28.3
24	8	34	12.0	35.6
24	10	24	13.1	42.6
24	12	18	14.1	49.3
24	14	14	15.0	55.8
24	16	11	15.8	62.0
24	18	9	16.6	68.2
24	20	8	17.3	74.2
24	22	7	17.9	80.1

As before, multi-aged/sized stands should have the total SDI apportioned among size classes (Table 4).

<b>Size Class<sup>20</sup></b>	<b>SDI</b>	<b>TPA</b>	<b>BA</b>	<b>Spacing</b>
Regen (<3")	6	41	2.0	32.5
Small (3-6")	6	14	2.7	56.6
Mid (6-9")	6	7	3.1	78.3
Large (>9")	6	3	3.9	124.1
<b>Total</b>	<b>24</b>	<b>65</b>	<b>11.7</b>	<b>--</b>

Pre-treatment stand examination inventories will need to be completed to determine if the stands to be treated currently contain sufficient stocking in the various size classes to make target residual densities feasible. Should exams reveal stocking deficiencies in any size class, adjustments in the adjacent smaller size class can be made to keep the overall density near the desired.

Various factors should be taken into account in the selection of trees to retain on the site ("leave trees"). Damaging agents, such as disease or physical damage (including logging damage), can weaken and stress trees, making them more susceptible to insects. Leave trees should be those that appear the healthiest trees with the least damage. If dwarf mistletoe (a parasitic plant species) is present on individual trees, these trees should not be favored for leave trees over adjacent uninfected and otherwise healthy trees. *Ips* beetles prefer trees with somewhat reduced crown ratios. Pinyon leave trees should be those with the higher percentage of crown-to-height ratio. *Ips* beetles prefer larger diameter pinyon trees, thus it may be desirable to retain older juniper "legacy" trees and remove any older/larger pinyon trees that show signs of declining vigor. Stand susceptibility to *Ips* is also influenced by stand composition, and those stands with a higher percentage of pinyon-to-juniper tend to be more susceptible to *Ips*-caused mortality. Thus it is desirable to maintain a good mix of species. If research plots are established, it may be

<sup>20</sup> Numbers calculated on larger trees in each size class: 3", 6", 9", and 16" DRC, respectively.

desirable to vary the treatments between the densities in the two tables above. Additionally, treatments may vary by size of pinyon leaf trees and percentage of pinyon-to-juniper leaf trees.

Timing of implementation and treatment of pinyon slash can be critical factors when *Ips* beetles are present in the general area. Green pinyon slash can serve as an attractant to beetles. Beetles can colonize slash during the spring and summer months and maturing beetles can emerge from this slash seeking new hosts, which will tend to be the nearest available suitable pinyon trees. Even chipped pinyon debris can attract beetles during the beetles' flight periods. *Ips* cannot colonize chips but may attack nearby pinyon trees. If chips or slash are to be left on the site, then treatment is best done in late fall, allowing the winter months for material to dry and become less attractive to beetles. Even then efforts should be made to increase drying rates on any remaining larger green pinyon material. Scattering pieces in sunny locations and damaging the bark to expose the phloem layer will help dry the phloem layer so it is no longer provides good habitat for bark beetles. If green pinyon material greater than 3" in diameter can be removed from the site within four to six weeks of cutting, then operations may be done at any time without risking increasing the incidence of *Ips* beetles. If neither can be practically accomplished, then mitigation for increased beetle activity may be either to leave more juniper and fewer pinyon or to leave more pinyon, realizing that many of these trees may be subsequently killed by *Ips* beetle attack. If retention of pinyon trees on the site is of prime concern, it may be best to delay thinning pinyon stands when *Ips* populations are high in the drainage where the treatment is to take place.

For practical implementation, it may be desirable to vary the spacing (density) within stands through the project area to achieve a mosaic of within-stand conditions. Groups of dense trees may be left interspersed with thinned trees and with small openings that will favor understory species. As root systems from individual pinyon and juniper trees may spread well beyond the crown spread, it may be desirable to vary opening sized from ¼ acre openings to openings that approximate 6 times the radial crown spread of adjacent trees.

Effectiveness monitoring of the treatment areas will need to be done for a period of years following treatment to help refine future thinning prescriptions. A minimum of five years is suggested. Items to be monitored should include the response of understory species and the incidence of post-treatment *Ips* beetle. Pine nut production and tree vigor, as compared to nearby untreated areas, may also be monitored. These items should be monitored as they relate to residual stand densities and species composition.

## **8.0 MAPS**

**Map 1. Upper Kanab Creek Watershed Vegetation Management Project, Proposed Action acres.**



**Map 2. Upper Kanab Creek Watershed Vegetation Management Project, No Action Alternative.**

**Map 3. Upper Kanab Creek Watershed Vegetation Management Project, Alternative C – Kanab Field Office Acres only.**

**Map 4. Upper Kanab Creek Watershed Vegetation Management Project, Alternative D – GSENM Acres only.**

**Map 5. Map of treatments scheduled for the Upper Kanab Creek Watershed Vegetation Management Project by year (2010-2024).**

**Map 6. Upper Kanab Creek Watershed Vegetation Management Project, showing the Visual Resource Management Classifications (VRM).**

