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# Gleason Creek and Smith Valley Watersheds Ecological Restoration Project Report

**Eastern Nevada Landscape Coalition**
**Ely, Nevada**

September 2007

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# Abstract

In 2003, the U.S. Department of Energy issued the Eastern Nevada Landscape Coalition (ENLC) funding to implement ecological restoration in Gleason Creek and Smith Valley Watersheds. This project was made possible by congressionally directed funding that was provided through the US Department of Energy, Energy Efficiency and Renewable Energy, Office of the Biomass Program. The Ely District Bureau of Land Management (Ely BLM) manages these watersheds and considers them priority areas within the Ely BLM district. These three entities collaborated to address the issues and concerns of Gleason Creek and Smith Valley and prepared a restoration plan to improve the watersheds' ecological health and resiliency. The restoration process began with watershed-scale vegetation assessments and state and transition models to focus on restoration sites. Design and implementation of restoration treatments ensued and were completed in January 2007. This report describes the restoration process ENLC undertook from planning to implementation of two watersheds in semi-arid Eastern Nevada.

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# Introduction

In 2003, the Eastern Nevada Landscape Coalition (ENLC) and the Ely District Bureau of Land Management (Ely BLM) launched the Gleason Creek and Smith Valley Watershed Restoration Projects with the objective of restoring sagebrush ecosystems to a healthy and resilient ecological condition. This project was made possible by congressionally directed funding that was provided through the US Department of Energy, Energy Efficiency and Renewable Energy, Office of the Biomass Program. In addition to the congressionally directed funds, additional funds were received from the Department of Interior, and other private and federal grants. Project implementation and post-treatment monitoring were completed in 2007, finalizing the first phase of restoration treatments in the Gleason Creek and Smith Valley watersheds.

The Ely BLM selected the Gleason Creek and Smith Valley watersheds as priority restoration sites primarily for their proximity to the town of Ely and their present ecological condition. Both watersheds were located less than 15 miles from the town of Ely, NV, which could be adversely affected if a large fire occurred in those watersheds. In addition, these watersheds were good candidates for restoration because they fit into a condition classification amenable to improvement measures. An assessment and evaluation of the watersheds demonstrated ecological processes were functioning, but were on a declining trajectory. Pinyon-Juniper tree cover was increasing in the woodlands and expanding into the sagebrush shrubland communities. Diverse native herbaceous species were present, but cover (or abundance) was decreasing. Fortunately, annual grass invasion was minimal. It was determined that we could successfully implement restoration treatments to reverse the declining trajectory, enhance resilience to disturbance of these ecological systems, and improve wildlife habitat.

In this document, we discuss the restoration process from watershed-scale assessment and evaluation, to administration, planning, design and implementation. We close discussing the monitoring plan, adaptive management and plans for future treatments. ENLC designed treatments with an experimental component to study different treatments and their effects on vegetation response. Subsequent reports will explain short-term and long-term results of the restoration treatments. We begin by explaining the process of assessing ecological condition of the watersheds in order to help us determine management action needed.

# Watershed Assessment and Evaluation

Our assumptions about the ecological condition of Gleason Creek and Smith Valley were validated through a watershed assessment procedure developed by ENLC, Ely BLM, and The Nature Conservancy (TNC). The vegetation data collection methods used to assess watershed condition is briefly described below.

The Ely BLM and the Rocky Mountain Elk Foundation provided ENLC with funding to complete vegetation inventories in Gleason Creek and Smith Valley in 2003. The data collected was used to do an initial watershed-scale assessment of the ecological condition. From this assessment, ENLC was able to discern vegetation types that were approaching the shrub state within their respective state and transition models.

The Ely BLM provided ArcView shapefiles with boundaries of major vegetation types. Within each major vegetation type, sampling sites were randomly located using ArcView and then the sites were located on the ground. At each site the vegetation was sampled along line transects. A belt transect was sampled for trees and at each sampling location the botanist performed a 10 minute walk through the plot. At each sampling location digital photographs were taken of the local landscape and of the vegetation. Vegetation cover data was collected from 50 randomly selected plots in the Gleason Creek watershed and 59 plots in Smith Valley in the summer of 2003.

In 2004, ENLC compiled the 2003 data from black sagebrush, Wyoming big sagebrush, mountain brush and pinyon-juniper plots throughout the watershed and classified the plots based upon the vegetation composition, vegetation on the ground, soils and ecological site information and climate. After grouping the plots by vegetation type, we summarized by life form and placed the summaries along the state and transition model continuum.

The state and transition models are important in considering how to spend limited money available for ecological restoration and gain the largest return. It is currently thought that aiming treatments at areas that are near or approaching a transition but still maintain the native understory is going to provide a large return for a given funding amount. A primary reason for this is that if the native understory can be released from competition then restoration efforts need focus on post treatment revegetation via seeding or transplanting. Restoration efforts conducted in areas that have gone far beyond a threshold will be more expensive. For example, treating a large area of sagebrush/grass that has become a cheatgrass (*Bromus tectorum*) monoculture will be more expensive than a brush mowing or prescribed fire in a sagebrush/grass community that has a native understory and perhaps a small amount of cheatgrass.

# Goals and Objectives

The primary goal is to restore the ecological health of Gleason Creek and Smith Valley Watersheds. This report defines ecological health as the ability of an ecological site to recover from, or resist change in the face of, disturbance. Re-establishing a mosaic of plant communities, each containing diverse assemblages of herbaceous and woody species will serve to enhance the ecological health of the watershed.

The second goal is habitat restoration, closely related to the first goal. The Greater sage grouse (*Centrocercus urophasianus*), a species of special concern, mule deer, elk, migratory birds, pygmy rabbits and domestic animals rely upon the ecological conditions within the watershed. Habitat requirements for all the above species are considered in the overall ecological restoration goals.

A third goal is a reduction in fire fuel buildup. Pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) have become dense and have increased their distribution by encroaching into sagebrush communities creating potentially dangerous fire conditions.

The fourth goal is to treat and study black sagebrush and Wyoming big sagebrush vegetation types. This information can help in supporting state and transition model concepts and how they may be applied to future vegetation treatments.

A fifth goal will be to establish a monitoring plan the Ely BLM will implement through time. In order to assess the results of the management, measurements are taken at regular time intervals. Monitoring is a necessary component of adaptive management.

All ecological goals of this project are consistent with the overall goals of the Great Basin Restoration Initiative (GBRI) and the Eastern Nevada Landscape Restoration Project (ENLRP). The GBRI is a BLM program with a mission to restore ecological health throughout the Great Basin. GBRI supports proactive efforts such as the one ENLC is implementing in Gleason Creek, rather than waiting until some catastrophic event forces ecological actions on the ground.

# Partners and Involved Agencies

Through an Assistance Agreement between the Ely BLM and ENLC, ENLC was charged with managing the watershed assessment and restoration projects. ENLC was awarded primary funding from the Department of Energy, and received grants from Intermountain Joint Ventures and the National Fish and Wildlife Foundation for restoration of sage grouse habitat within the Gleason Creek watershed.

ENLC recruited local agencies to implement restoration treatments, contracting The Nevada Division of Forestry (NDF) to hand-thin Pinyon pine and Utah juniper in the sagebrush communities and Tri-County Weed Program to map and treat invasive species within the treatment area. In addition, ENLC employed local residents to implement the remainder of the treatments including hand thinning, chaining, macerating, and brush mowing.

Gracian Uhalde, a private landowner and a livestock grazing permittee in both Gleason Creek and Smith Valley contributed labor and equipment, providing and operating a tractor to help implement mechanical brush mowing.

# Federal Regulations

The Ely BLM conducted cultural surveys in Gleason Creek and Smith Valley on at least 1000 acres within each watershed. Any sites to be excluded from treatment were noted and marked before implementation occurred.

The BLM completed the NEPA compliance and sent out the NEPA documents for public comment. The Gleason Creek project was approved in November 2003. Smith Valley was approved in 2005.

# Gleason Creek Watershed Restoration Project

Location

The project area was located in the 41,000 acre Gleason Creek Watershed in the Ely Bureau of Land Management District, Township 18 North, Range 62 East in White pine County, Nevada or 39° 20' north latitude and 115° 01' west longitude. The elevation of the restoration site ranged from 7000 to 7500 feet.

Ecology of the Gleason Creek Watershed

At the highest elevations, 7500 to 9000 feet, mountain big sagebrush, low sage, and antelope bitterbrush co-dominated the shrubland community and pinyon pine and juniper comprise the woodlands. Slightly lower in elevation, 7000 to 7500 feet, occurring on the piedmont benches were black sage shrublands. Wyoming big sagebrush shrublands occurred on the valley floors.

Precipitation and soil composition has been known to be the primary driver of vegetation community composition. In this watershed, precipitation varied from a yearly average of about 8 inches on the valley bottom to 16 inches on at the highest elevations. Precipitation occurred as winter snow or spring/fall thundershowers and rains. Average annual air temperature was from 42 to 48 degrees Farenheit.

We characterized two soil types in the project area. Shallow to moderately-deep calcareous loams were positioned on summits and sideslopes of rolling hills and fan piedmonts. Slope angle was typically 4-15% and elevation ranges 6000-7500 feet. Dominant vegetation in this soil type was black sagebrush, Indian ricegrass, Needleandthread grass, and Thurber needlegrass. The other type in this area supported Wyoming big sagebrush, Indian ricegrass and Needleandthread grass. Soils were loamy or gravelly clays, and generally occurred in the concave swales of the rolling hills or on the broad flats on the valley bottom.

Understanding the distribution of vegetation and soils allowed us to stratify the study into vegetation communities. The Natural Resource Conservation Service (NRCS) bases the vegetation communities on soil surveys and further breaks down the major soil units by ecological site. Ecological Site Descriptions set the standard or potential for vegetation on that site. We compared our vegetation surveys to these reference values to evaluate the condition of the watershed. The comparison was summarized by vegetation group.

Black Sagebrush: The black sagebrush vegetation community was at or near a threshold separating the herbaceous dominant state from the shrub dominant state. Grass and forb cover met the Ecological Site Guide standard, but tree and shrub cover was high. Mixed into the black sage were inclusions of woodland sites and much of the black sage around them was transitioning to the juniper dominant state. Cheatgrass was present with low cover.

| | 2003 data | 2003 data | From Ecological | From Ecological |
|---|---|---|---|---|
| | measured | measured | Site Guide | Site Guide |
| Functional Group | % cover avg | % cover stdev | low | high |
| Tree | 19.58 | 16.45 | 0 | 3.00 |
| Shrub | 33.67 | 15.13 | 5.25 | 9.00 |
| Perennial Grass | 20.33 | 12.38 | 7.50 | 15.00 |
| Forbs | 12.67 | 2.57 | 1 | 2 |
| Cheatgrass | 0.38 | 0.43 | NA | NA |

Comparison of measured coverage from 2003 and Ecological Site Guide cover ranges for Black Sagebrush ecological sites.

Wyoming Big Sagebrush: The Wyoming sagebrush west of Highway 50 (Copper Flat) was plowed and seeded with crested wheatgrass (*Agropyron cristatum*) and was considered as having crossed the threshold from perennial herbaceous state to the seeded perennial herbaceous state. The plowing and seeding was conducted several decades ago and, at this time was considered to be in the seeded herbaceous with sagebrush phase. The composition of the understory vegetation in the seeding was almost entirely *A. cristatum* with little other herbaceous coverage.

The remaining non-seeded Wyoming sagebrush community was at or approaching the threshold separating the perennial herbaceous state from the shrub state. Perennial understory was present but in low cover. There was high woody cover with encroaching junipers and decadent sage. Cheatgrass was present but in low cover.

| | 2003 data | 2003 data | From Ecological | From Ecological |
|---|---|---|---|---|
| | measured | measured | Site Guide | Site Guide |
| Functional Group | % cover avg | % cover stdev | low | high |
| Tree | 0.00 | 0.00 | 0.00 | 0.00 |
| Shrub | 26.50 | 4.50 | 3.5 | 16.5 |
| Perennial Grass | 8.10 | 6.74 | 5.0 | 11.00 |
| Forbs | 7.30 | 3.89 | 1 | 2 |
| Cheatgrass | 0.55 | 0.60 | NA | NA |

Comparison of measured coverage from 2003 and Ecological Site Guide cover ranges for Wyoming Sagebrush ecological sites. Crested wheatgrass was taken out of perennial grass calculations.

Mountain Brush: Native understory cover was highest in this community as compared to the other vegetation types in the watershed. This was the most species rich and diverse community in the watershed. In state and transition terms, the community was approaching the threshold separating perennial herbaceous-dominant state from the shrub-dominant state. Grass and forb cover and species diversity were high. Cheatgrass was in its greatest abundance in the watershed here.

| | 2003 data | 2003 data | From Ecological | From Ecological |
|---|---|---|---|---|
| | measured | measured | Site Guide | Site Guide |
| Functional Group | % cover avg | % cover stdev | Low | high |
| Tree | 6.11 | 6.66 | 0.00 | 3.00 |
| Shrub | 39.11 | 11.51 | 7.50 | 10.50 |
| Perennial Grass (Foliar) | 34.44 | 8.93 | 12.25 | 18.00 |
| Forbs | 10.94 | 3.32 | 2.5 | 3.5 |
| Cheatgrass | 3.70 | 3.36 | NA | NA |

Comparison of measured coverage from 2003 and Ecological Site Guide cover ranges for Mountain Brush ecological sites.

Pinyon-Juniper Woodland: The pinyon-juniper woodlands in Gleason Creek existed mostly in the tree-dominated phase with some perennial grass understory and some cheatgrass. Where the tree canopy was closed, the understory was depauperate. On north facing slopes and areas with deeper soils, the tree canopy was more open and the herbaceous understory was present. Cheatgrass was present in low cover.

| | 2003 data | 2003 data | From Ecological | From Ecological |
|---|---|---|---|---|
| | measured | measured | Site Guide | Site Guide |
| Functional Group | % cover avg | % cover stdev | low | high |
| Tree (medium) | 19.80 | 3.73 | 20.00 | 35.00 |
| Shrub | 14.00 | 7.64 | 2.50 | 7.50 |
| Perennial Grass | 12.50 | 5.28 | 1.75 | 8.25 |
| Forbs | 7.10 | 4.82 | .25 | 2.25 |
| Cheatgrass | 0.90 | 0.99 | NA | NA |

Comparison of measured coverage from 2003 and Ecological Site Guide cover ranges for Pinyon-Juniper ecological sites.

Summary of Watershed Analysis

We evaluated the Gleason Creek watershed to be in good ecological condition, but at a pivotal point, moving from a shrub-herbaceous state to shrub and tree state. Pinyon-juniper woodlands are becoming denser, encroaching into the shrublands and the shrublands are losing or have lost their herbaceous understory. However, cheatgrass has not yet invaded in most of the watershed and herbaceous species, though declining, are present and diverse. Conditions in Gleason Creek were deemed appropriate for management action. Action needed to be taken before the threshold was crossed or conditions were severely degraded with no hopes of returning to a healthy resilient state.

Treatment Design

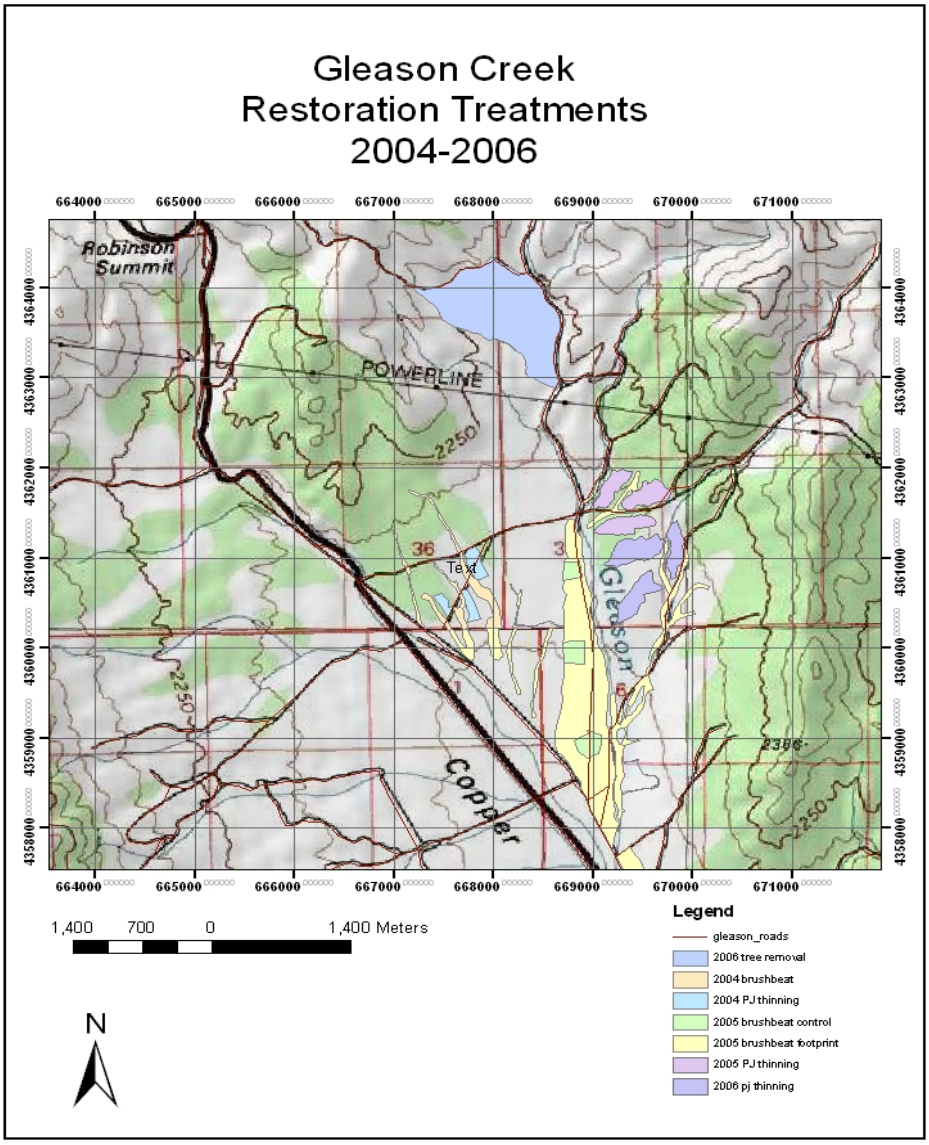
ENLC prescribed mechanical application of hand thinning and brush mowing treatments in a mosaic pattern in the north end of the watershed to best attain the goals for the watershed. We were limited to 1000 acres of impact on the ground by federal law within the cultural assessment area. Our targeted vegetation was Wyoming big sagebrush and black sagebrush shrublands, as these vegetation types were most imperiled by pinyon-juniper encroachment and loss of understory.

The archeological survey found a number of sites considered sensitive and eligible for listing with the national register of historic places. This excluded treatments involving tractors and implements that disturb the soil surface.

There were several fires in the recent past in this area and the post-fire vegetation response has been positive. Native herbaceous plant species made up the majority of the post-fire vegetation. Cheatgrass was present, but low in cover. Restoration treatments would add to the mosaic of uneven-aged sites across Gleason Creek, add resiliency, and allow natural disturbances to run their course without danger of catastrophic effects to the vegetation and soils.

We used ArcView GIS software to design the layout of the treatments. GIS layers used were the NRCS soil map for western White Pine County, aerial photographs, roads and trails, and topographic maps. Polygons were drawn in a mosaic pattern to simulate natural fire disturbance in priority vegetation types. Placement and size of polygons were limited by location of cultural sites, ecological conditions suitable for restoration, roads, and NEPA regulations. The table below shows treatment types, general location, date of implementation and acres.

| **Treatment** | **Location** | **Date** | **Acres** |
|---|---|---|---|
| Hand thinning | West Gleason | July, 2004 | 25 |
| Brush beating | West Gleason | July, 2004 | 42 |
| Hand thinning | East Gleason | Sept-Dec, 2004 | 66 |
| Brush beating | Central Gleason | Oct-Nov, 2005 | 450 |
| Hand thinning | North Gleason | April, 2006 | 245 |
| Hand thinning | East Gleason | May-July,2006 | 73 |
| **Total Acres** | | | **901** |




Treatment implementation

Treatment implementation began in 2004 with brush beating and hand thinning 67 acres in black sage vegetation on the west side of the treatment area. BLM fire crew completed the initial thinning. Subsequently the Nevada division of Forestry (NDF) hand-thinned with chainsaws the pinyon-juniper stands, leaving 10 trees per acre. NDF cut trees to a 6 inch or less stump height and removed and scattered limbs. The NDF crews applied the hand thinning in 2004 and 2005 at about $120 per acre.

Mowing operators were private landowner and allotment permittee, Gracian Uhalde and ENLC ecologist, Lee Turner. The use of brush beaters or mower type

devices is an option for sagebrush/grass community types where large trees do not occur. Mowing and brush beating reduce sagebrush as well as small trees and tree seedlings. Release of the understory and creation of mosaic of uneven aged patches within a vegetation type may be attained via this type of treatment. Mowing height in these sites was 6 to 8 inches. Mowing height varied from 8 to 14 inches in the units mowed in 2005.

We used a tractor rented from Wheeler Cat and a John Deere 20-foot flex-wing rotary cutter owned by the BLM. The flex-wing mower had three sets of blades that rotated in opposite directions to cut and mulch brush. Mowing height was adjusted between 1 and 16 inches from the ground. Cost per acre including labor, machinery, and fuel was approximately $20. Equipment repairs were costly. When our blade hit a rock, a new blade set cost $1,400. Generally, repairs run about $1000 to $1500 per 1000 acres mowed.

20-foot flex-wing rotary mower – September, 2004

The following winter of 2005 was a wet year, 300% of normal snowpack. The surplus moisture was a likely contributing factor to the copious herbaceous response observed at 2004 treatment sites. (See figure 6.) The roads across eastern Nevada did not dry out until late May, which halted access for early spring treatments of hoary cress.

Photo from June 2005 of sagebrush removal in 2004.

After migratory bird nesting season ended in mid-July and summer wildfires had abated, NDF crews began hand-thinning treatments in August, 2005. NDF crews are a crucial personnel resource to fighting wild fires throughout Nevada. When they became available, they started cutting trees from the Wyoming sagebrush flats to prepare it for brush beating and then moved on to tree thinning in the high-density black sagebrush shrublands to the east.

To prepare the black sagebrush shrublands on the east bench for hand thinning, we flagged boundaries, surveyed and seeded five plots in six 20-30 acre units. This vegetation community had low cover of perennial bunch grasses. The design called for seeding of native grasses on 100 square meter plots in each unit. Five random sites per unit were selected using ArcView random point generator. Navigating by GPS we located the sites, documented and photographed vegetation and seeded sites. "Leave" (mature to old growth) trees were flagged, about 10 per acre. Most trees at the sites were younger than 100 years and less than 12 inches diameter breast height (DBH). In September, crews began thinning these units. Trees were dense and work was slow. Three units totaling 65 acres were finished by the end of 2005.

ENLC finished mowing 450 acres of Wyoming sagebrush at the end of November. Mowing height varied between 8 and 14 inches. Rocky areas were left untreated, as well as the designated control sites.

NDF crews were unavailable the following season. In 2006, ENLC acquired chainsaws, chains, and safety gear to supply six crews to finish the hand thinning in Gleason Creek. Costs increased due to additional expenses for equipment, labor, maintenance, repair, insurance, etc.

After a below normal winter for precipitation, we began hand thinning in April 2006 on a 240 acre unit to the north of the lower treatment area. This low-tree density unit was completed in three weeks. The sawyers, an ENLC crew, mobilized to the east black sagebrush bench to finish the last three units. These units, totaling about 70 acres, were completed by the end of July.

Tri-county weeds treated 94.57 acres of hoary cress and bull thistle during 2006. The weed treatments were accomplished using appropriately applied chemicals using backpack sprayers, an ATV equipped with a spray system and where possible by a truck equipped with boom sprayers.

# Smith Valley Watershed Restoration Project

Location

The project area was located in the 37,000 acre Smith Valley Watershed in the Ely Bureau of Land Management District, Township 18 North, Range 62 East in White pine County, Nevada or 39° 25' north latitude and 114° 57' west longitude. The restoration site ranged from 6500 to 7500 feet in elevation.

Ecology of Smith Valley Watershed

The vegetation communities targeted in this project included black sagebrush (*Artemisia nova*) and mountain shrub (*Artemisia tridentata ssp. vaseyanna, Artemisia tridentata ssp. wyomingensis, Purshia tridentata)* communities. Both of these communities were experiencing encroachment of pinyon and juniper (*Pinus monophylla, Juniperus osteosperma*) trees and neared a threshold where the herbaceous understory was progressively decreasing in cover.

| | 2003 data | | From Ecological | |
|---|---|---|---|---|
| | measured | | Site Guide | |
| Functional Group | % ground cover ave.* | | Ave. range | |
| | Black Sagebrush | Mountain Big Sagebrush | Black Sagebrush | Mountain Big Sagebrush |
| Pinyon and/or juniper | 14.4 | 14.2 | < 1%** | <1%** |
| Shrub | 21.7 | 29.5.5 | 8.75 to 12 | 9 to 12 |
| Perennial Grass (Foliar) | 17.3 | 30.9 | No comparative figures | No comparative figures |
| Perennial Grass (Basal) | 5 | 12 | 8.75 to 12 | 16.5 to 22 |
| Forbs | 6.35 | 7.5 | 1 | 4 to 6 |
| Cheatgrass | 0.1 | .5 | NA | NA |

Comparison of measured vegetation coverage from 2003 Smith Valley Watershed Survey and the Ecological Site Guide cover ranges from a composite of black sagebrush and mountain big sagebrush ecological sites. * 80 % confidence level, except for grass basal cover estimates which are based on actual key area data. ** Only trees less than 4.5 feet tall

Black Sagebrush: This community showed increasing woody species, pinyon-juniper, as well as shrub cover, signaling that it is moving into a shrub/tree dominant state. Perennial grass cover did not meet the Ecological Site Guide standard, but forb cover was higher than expected (likely due to an above average precipitation in 2005.) Mixed into the black sage were inclusions of woodland sites and much of the black sage around them was transitioning to the juniper dominant state. Cheatgrass was present in low values (<1% up to 1% cover).

Mountain Brush: This community also showed an increase in woody species. Pinyon, juniper, sagebrush species, snowberry, serviceberry and antelope bitterbrush all contributed to the high cover. Perennial grasses were lower than potential as they are being out-competed by the shrubs and pinyon-juniper. Forb cover was exceptional due to the high precipitation year. This community was approaching the threshold separating perennial herbaceous dominant state from the shrub-tree dominant state. Grass and forb cover and species diversity are high. Cheatgrass was present in low cover.

Precipitation and air temperatures were similar to the Gleason Creek watershed. Soils were just slightly different. We characterized two major soil types in the project area from the NRCS Western White Pine County Soil Map. The first soil unit we targeted for restoration was SMU 283 with shallow to moderately deep, calcareous loams, positioned on upper and lower piedmont slopes. Slope angle was typically 2-15% and elevation ranges 5000-6500 feet. Dominant vegetation in this soil type was Black sagebrush, Indian ricegrass, and Needleandthread grass. The second major soil type, SMU 413, was dominated by antelope bitterbrush and mountain big sagebrush. Soils supporting this vegetation were gravelly clays and loams on gentle to steep slopes of piedmont hills and mountains, elevations ranging from 6300-8200 feet. Another soil/vegetation type component of the project area is Soil Map Unit 179. Dominating vegetation includes Wyoming big sagebrush, Basin big sagebrush, Great Basin wildrye, Indian ricegrass and Needleandthread grass. Soils were loamy, silty and deep, occurring on inset fans, floodplains, and stream terraces.

Summary of Watershed Analysis

We qualitatively and quantitatively conclude the Smith Valley watershed to be in good ecological condition, but at a pivotal point, moving from a shrub-herbaceous state to shrub and tree state. Pinyon-juniper woodlands are encroaching into the shrublands and the shrublands are losing or have lost their herbaceous understory. However, cheatgrass has not yet invaded in most of the watershed and herbaceous species, though declining, are present and diverse. Conditions in Smith Valley were appropriate for management action before the threshold was crossed or conditions were severely degraded with no hopes of returning to a healthy resilient state.

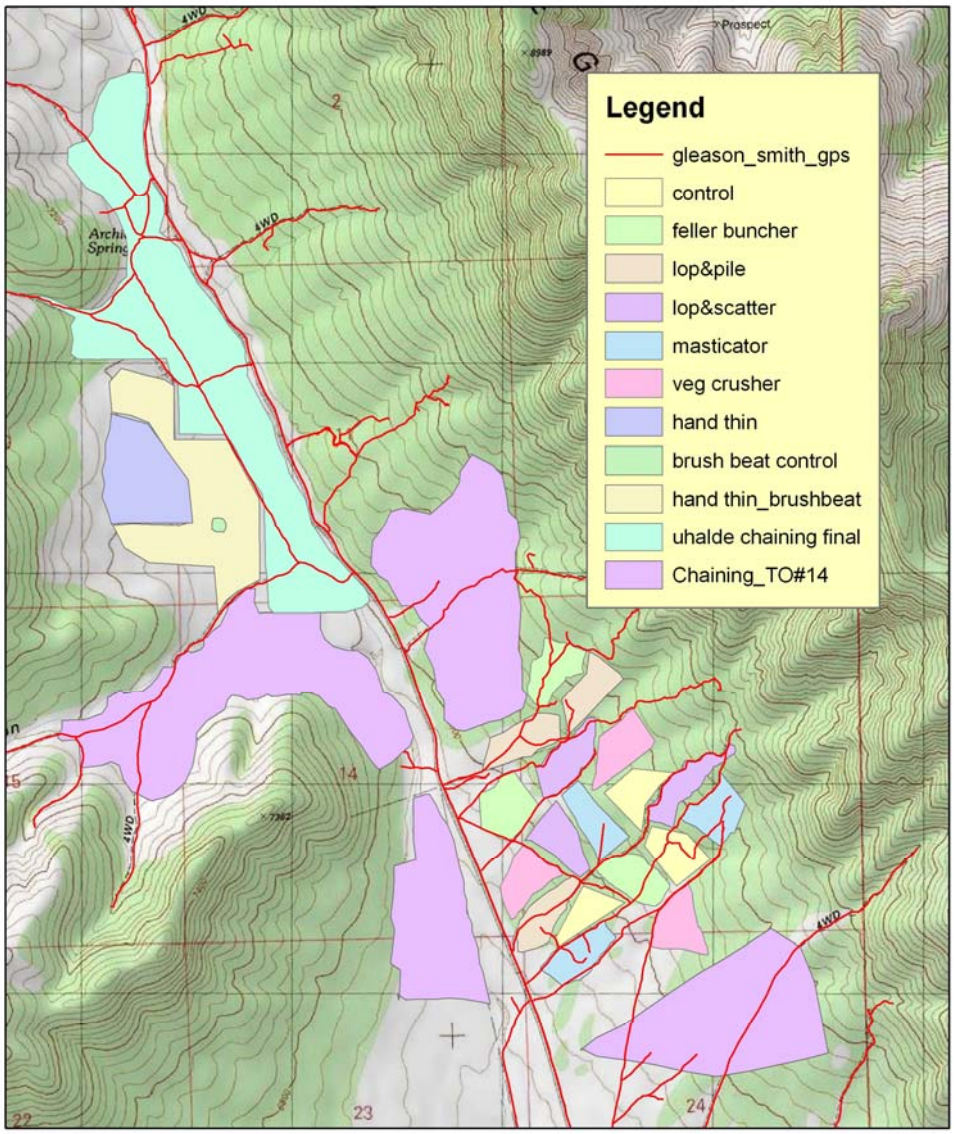
To mitigate this downward ecological trend, we decided to apply various mechanical and hand thinning treatments to the above-mentioned vegetation communities, resulting in a decrease in pinyon-juniper cover in shrubland communities, revitalization of new shrub growth and an increase herbaceous understory. While the primary purpose of this project is to maintain and restore ecological function to Smith Valley and provide firebreaks to slow down large catastrophic fires, it is also to explore different treatment methods and to assess success of these treatments to provide information for future restoration in eastern Nevada and the Great Basin.

Treatment Design

We used ArcView GIS software and watershed assessment data as tools to design the project. The GIS layers used were NRCS soil map for western White Pine County, aerial photographs, roads and trails, and topographic maps. A 6000-acre area in Smith Valley was determined to be in need of ecological restoration under the framework of state and transition models. The vegetation/soil types most in need of ecological restoration were the black sage and mountain sagebrush communities with dense encroachment of pinyon-juniper trees. From this area, the first site we chose had to fit the requirements of a randomized block experimental design. The research plots or treatment units were to study the effects and costs of five different mechanical treatments plus a control treatment. For a valid study, it was preferable that each of the treatment units were located on the same soil type and each block (one set of five different treatments plus a control) had similar attributes including elevation, slope angle, slope aspect, road disturbance, and vegetation composition. The area had to be on BLM managed lands and could not disturb cultural sites. Under the restraints of the categorical exclusion, (CX) NEPA document on 1000 acres could be mechanically manipulated. The location and shape of the plots was layout to facilitate control of wildfire in the valley. The black sagebrush vegetation type on Soil Map Unit 283 on the east side of Bothwick Road would be best fit all this criteria.

Limited by private land, NEPA and cultural regulations, we placed these treatment units around the research units in areas that would most benefit from treatments. The treatment sites are located on the east and west side of Bothwick Road which bisects Smith Valley running southeast to northwest. Approximately 240 acres on the east side are multiple-treatment study. Additional chaining treatments are located to the north and south end of the multiple treatment study area, and on the south side of the Jones Canyon road. Pre-treatment paired plot data was collected in the chaining units. Pinyon-Juniper hand thinning and brush beating treatments are on the north side of Jones Canyon road. See the following map.

# Smith Valley Watershed
# Ecolgogical Restoration Treatments



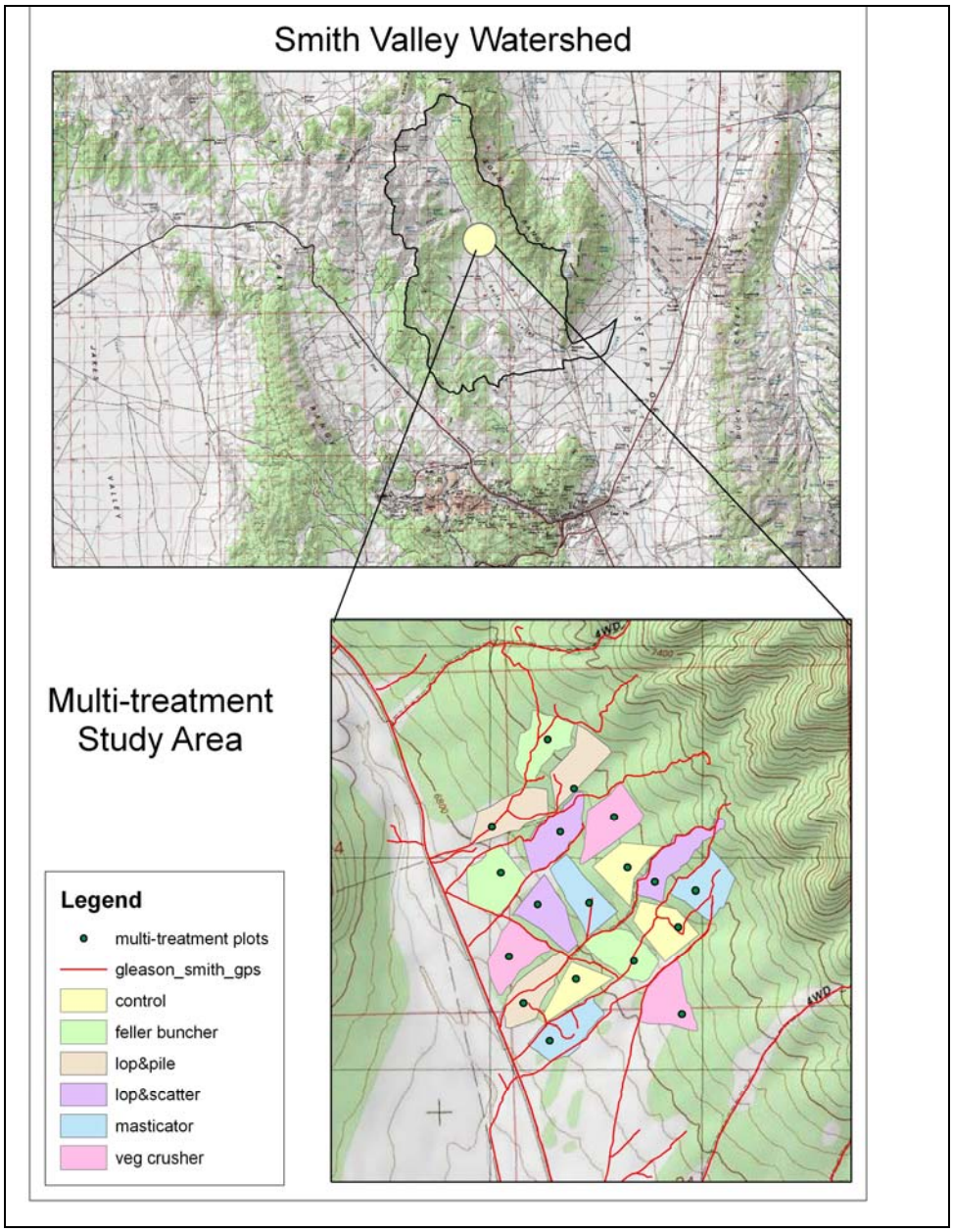
Multiple Mechanical Treatment Study

The research study area consisted of 18 13-acre units including controls sites. The units were located in a black sagebrush community with extensive pinyon and juniper encroachment. Tree cover varied slightly across the project study site. The majority of trees were under 10 inches diameter. Measured tree and shrub cover from 2003 in Smith Valley watershed indicated 36 percent average cover. Desired target cover is less than 2 percent cover of trees with diameter of less than 20 cm. base diameter, and shrub cover reduced to 15 to 20 percent. An increase in perennial grass cover to a range of 25 to 30 was targeted.

Environmental characteristics such as slope, aspect, elevation, position in slope and soils were consistent throughout the study area. Slope angle ranged from 4 to 15 percent on fan piedmonts. Elevation of each treatment unit ranged between 6800 and 7200 feet (2000 to 2200 meters). Soils were classified as shallow calcareous loams. One plot (200 point-intercepts) is located in each unit. Vegetation composition, cover, and tree height class data was collected for each plot. The five treatments compared at this study site were lop and scatter, feller buncher with chipper, bull hog masticator, lop and pile and burn the piles during the winter, and bulldozing without chain. All treatments involved removal of trees over 2 cm. diameter at the base. Stump height was not exceed 10 cm. from the soil surface or rock surface on the uphill side of the slope.

Description of Treatments

| |
|---|
| Lop and scatter: All trees are cut using chainsaws. The cut tree is left where it falls and will be delimbed and the slash scattered so that the slash does not stand over 50 cm. high. |
| Lop, pile and burn: All trees are cut using chainsaws. The cut trees are moved to nearby site within the treatment area and piled not more than two meters high by three meters wide. Piles are burned during winter. |
| Feller buncher and chipper: This mechanical treatment consists of two machines, the chipper following the feller buncher. Wood chips are left on site where they are broadcast but not over 10 cm. high. |
| Bull hog masticator: This mechanical treatment will leave tree debris at the tree site. Debris is not removed. |
| Veg crusher: D-8 CAT bulldozers are used to knock over trees instead of dragging chain between them to knock down trees. This method is used because of the small size of the research units and maneuvering constraints of dragging a smooth anchor chain. Small trees or seedlings may remain intact. |




Chaining Areas

Chaining areas outside of the research study area were on the east and west side of Smith Valley. (See project map on page 18.) An area consisting of approximately 114 acres was located in a black sagebrush community at the south end of the research area and another to the north approximately 145 acres. The area on the west side was 268 acres in an L shape south of Jones Canyon road. The vegetation community was a mixed mountain shrubland with significant pinyon-juniper encroachment. The area was

accessible from the main road by two-track roads. Chaining treatments involved tractors dragging a smooth anchor chain in a U or J shape between them, knocking over a swath of vegetation 30 meters wide, making only one pass. Small trees or seedlings remained in tact.

Chaining was also done on 214 acres of private land to the north of the project. Funding had already been awarded by the U.S. Fish and Wildlife Service for work on the private land.

Hand Thinning and Mowing

The site north of Jones Canyon road and west of the main road is approximately 150 acres. Mountain big sagebrush, Wyoming big sagebrush and antelope bitterbrush dominate the vegetative cover. Pinyon and juniper trees are encroaching and had over 4.2 percent cover. Desired tree cover for this vegetation community was < 2 percent. Shrub cover was at 35 percent and will be reduced to 8 to 15% cover for the total site area. (See project map on page 18.)

| |
|---|
| Lop and Scatter: All trees are removed using chainsaws. The cut tree remains where it falls and delimbed so that slash does not stand over 50 cm. high. |
| Brush Beating: This treatment involves mowing of shrubs in 20-foot swaths, covering approximately 115 acres, to encourage release (increased cover) of herbaceous species for sage grouse summer habitat. Rocks and drainages are marked with flags and avoided by the mower. |

Weed Control

All treatments were executed in nearly weed free areas. Cheatgrass *(Bromus tectorum)* is very sparse, less than one percent cover and typically only present along roadways. Patches of cheatgrass along roadways were avoided. Weeds treated were thistle and hoary cress. These weeds did not occur in the proposed treatment areas.

Treatment Implementation

Hand thinning pinyon and juniper trees began in July 2005 on the 115 acre unit to the west of Bothwick Road. Carson City Hot Shot crews were able to nearly finish the unit during a lay over waiting for prescribed fire conditions to improve in another site on the Ely BLM district. In October 2005 an ENLC employee using the BLM flex-wing mower attachment behind a tractor mowed the area cleared. Rocky terrain and tree slash was avoided resulting in shrub clearing of 75% of the 115 acres. One pre-treatment vegetation plot was taken in this site, as well as a plot in a control area.

Treatments continued in the summer of 2006. In August, ENLC employees continued hand thinning on 35 acres adjacent to the unit cleared and mowed in 2005. Also in August, chaining began on the west side and continued on the units on the east side of the road. Leftover funding from the U.S. Fish & Wildlife Service was available to continue restoration work on private lands. Gracian Uhalde approved chaining to be done on his private land north of the project area. (See Project Map). ENLC hired local residents skilled in operating large machinery to do the chaining treatment.

In late August, hand thinning crews moved over the multiple-treatment study units to begin lop and pile treatments, finishing in mid-October. Lop and scatter treatments began immediately after and were finished by the end of November.

When chaining was finished, machine operators moved over to the study area to implement the veg crushing treatment where bulldozers knock over trees without using the smooth chain. This treatment was finished by October 1. ENLC machine operators began bull-hog masticator treatment using Fecon bull-hog heads on skid steers. This method was fairly efficient except for frequent equipment breakdowns. More power and stability is required to operate bull-hog than was afforded with the skid steer.

A contractor from California implemented the feller-buncher/chipper treatment on 40 acres beginning in late December and finishing by mid-January 2007. This treatment was by far the most expensive. Following is a breakdown of the approximate amount of funding spent on labor and equipment for each treatment.

Treatment Costs

| **Treatment Methods** | **Acres** | **Mechanical Equipment** | **Labor and Equipment $/acre** | **Total Dollars Spent** | **Funded** |
|---|---|---|---|---|---|
| | | | | | |
| Lop and Scatter | 40 | 5 chainsaws (owned) | $525 | $21,000 | DOE |
| Lop, Pile, Burn | 40 | 5 chainsaws (owned) | $935 | $36,500 | DOE |
| Bull-hog Masticator | 40 | 2 bull hogs (rented) 2 skid steers (rented) | $460 | $18,400 | DOE |
| Chaining-DOE<br>Chaining-TO #14<br>Chaining-Private | 40<br>500<br>218 | 2 D8 Cats (rented) 1 90ft.smooth chain (donated) | $83 | $61,420 | DOE<br>Ely BLM<br>USFWS |
| Feller-buncher/ Chipper | 40 | Feller buncher chipper | $2,000 | $80,000 | DOE |

# Monitoring and Adaptive Management

In Gleason Creek, ENLC and TNC surveyed plots in Wyoming big sage and black sage vegetation types in 2003 and 2004 for monitoring purposes in addition to the watershed assessment data collected. In 2006, ENLC and TNC collected data at 36 sites in Smith Valley for monitoring purposes to establish a baseline for surveyed vegetation before treatments were applied. Vegetation data collection will be implemented at established plots at 2-3 year intervals to detect the return of native perennial understory

and to quickly detect the presence of Cheatgrass or other weeds so that treatments may be applied to slow the spread. Yearly observation for the first five years is recommended, but not feasible under our funding and staffing constraints.

Long-term monitoring will allow an assessment of vegetation trends and an evaluation of the success of treatments. Success is defined as achieving resilient and resistant vegetation communities across the watershed. Additionally, any adaptive management strategies will depend upon having data sets that establish both baseline and trends through time and space. All plot data for Gleason Creek and Smith Valley is available at the ENLC and Ely BLM offices.

In the summer of 2007 ENLC collected post-treatment data at plots in multiple treatment research units and chaining treatment units in Smith Valley and throughout the Gleason Creek restoration site. Pre-treatment and post-treatment data will be analyzed to evaluate treatment results and plan for further management. Fire may be applied to treated areas in the future to study fire behavior in treated areas and to remove biomass. Plans for this option have not been initiated.

# Summary

Partners involved ranged from conservation organizations to public land management agencies to private landowners. The cooperation and collaboration of all is an excellent example of groups and individuals coming together to work toward a common goal. Our common goals were to restore and maintain healthy ecological condition, a resilient state that would withstand and adapt to disturbance. Wildlife and people would benefit from the removal of trees to reduce fire hazard and encourage growth of herbaceous vegetation. The native herbaceous vegetation is the glue that holds the ecosystem together. Grasses and forbs hold the soil in place, increase infiltration, provide nutrition to many biological organisms, and help to foster a natural fire cycle that keeps the ecosystem in balance.

We have met our implementation goals using funding responsibly and efficiently and adhering to the time line. Problems were encountered along the way and were dealt with promptly. However, the success of the project that includes the response of the vegetation and wildlife to the treatments is yet to be seen. Post-treatment monitoring and data analysis will give us quantitative results that we can transfer to other projects and manage this project in the future. With many projects, the long-term monitoring and analysis is forgotten, mainly due short-term funding and personnel turnover. We are pursuing funding for a long-term monitoring plan and action and it remains a goal for these projects. It is an ongoing practical educational endeavor. The Gleason Creek and Smith Valley Watershed Restoration Projects have already served as a template or demonstration for restoration in Eastern Nevada and the Great Basin and will continue to offer an educational forum in natural resource management.