

## **Practice Specification Brush Management (Code 314)**

---

### **I. SCOPE**

The work shall consist of removing pinyon pine and/or juniper within sagebrush steppe and associated rangeland habitats consistent with the goals and objectives for this practice. This specification applies to those areas where understory sagebrush steppe plant species remain intact on site and where removal of pinyon pine and/or juniper is most likely to facilitate recovery of the desired habitat. Standing dead trees, seedlings, and saplings will be treated as well.

### **II. PROJECT AREAS AND TIMING**

The areas to be treated shall be shown on the plan maps and the methods used, target species, and timing of treatment are all listed on the practice documentation worksheet and supporting materials. The equipment and tools used must be consistent with soil and site factors, in order to avoid excessive soil erosion, compaction, rutting or damage to the soil surface layer. The treatment method, felling, and timing of tree cutting shall protect site resources, such as residual trees, soils, wetlands, cultural resources, improvements and utilities.

In areas of sage grouse leks, nesting, and brood- rearing habitat, mechanical treatments will only be conducted in the fall or early winter. Other wildlife species, including birds of conservation concern that occur in sagebrush ecosystems or pinyon and/or juniper woodlands slated for treatment and relevant seasonal restrictions must be considered as well.

### **III. GENERAL REQUIREMENTS**

All activities associated with applying this practice shall comply with applicable federal, state, tribal and local laws and regulations. It is the landowner's responsibility to obtain appropriate permits and/or applications prior to commencing an activity.

On native rangeland areas, tree management treatments will be used to control, contain, or eradicate undesirable woody vegetation.

Ecological Site Descriptions (ESD) and associated State and Transition models will be used to determine if proposed actions are ecologically sound and defensible. Treatments need to be congruent with dynamics of the ecological site(s) and are keyed to states and plant community phases that have the potential and capability to support the desired plant community. Consult the NRCS State Rangeland Management Specialist for the appropriate State and Transition Model.

Forestland ecological sites with old growth ( $\geq 150$  years) pinyon and/or juniper will be covered under conservation practice Forest Stand Improvement (Code 666). Old growth trees within a rangeland ecological site will be reviewed and identified on- site with the landowner and timber operator prior to treatment. All old growth will be excluded from treatment and will be flagged or painted. To determine a rangeland ecological site from a forest land ecological site, consult Appendix I in "Inventorying, Classifying, and Correlating Juniper and Pinyon Communities to Soils in Western United States" (USDA-NRCS 1997). Consult Table 2 within this specification for details regarding how to differentiate between old growth and younger pinyon and/or juniper.

Prior to contracting and treatment, all areas to be treated will have the following forms completed:

- NV-CPA-52 Environmental Evaluation
- NV-EVC-01 Cultural Resources Worksheet
- NV-ECS-01 Rangeland Inventory Worksheet and line-point data sheet
- NV-CPA-314 Brush Management Practice Documentation Worksheet
- NV-ECS-19 Wildlife Habitat Evaluation Guide for Grazed Range
- NV-ECS-34 Species Habitat Evaluation Guide for Sage Grouse when in Sage Grouse Range
- NV-ECS-44 Pinyon and Juniper Field Assessment

In order to achieve maximum treatment effects for the improvement of wildlife habitat, the following practices are required:

- Upland Wildlife Habitat Management (645) Depending on site conditions, monitoring results and conservation plan goals, the use of the following practices may also be appropriate:
- Forest Stand Improvement (666)
- Structures for Wildlife (649)
- Prescribed Burning (338)
- Prescribed Grazing (528)
- Range Planting (550)
- Woody Residue Treatment (384)

### **Soil Erosion Considerations**

Treatment activities shall be performed to maintain hydrologic function and minimize soil erosion, compaction, rutting, and damage to remaining vegetation. Treatment equipment shall not be used in or cross erodible features, riparian zones, springs, wetlands, or aspen stands except on established roads. Unless specifically noted in the treatment plan and supporting maps, manual methods shall replace mechanical treatment where treatment is to occur within 25 feet of the greenline of a perennial stream, seasonal stream, spring, or pond. Where tracked vehicles are used, turning in-place will be minimized to avoid unnecessary impacts to soils, non-target plants, and other resources. For safety purposes and to protect site resources including residual trees, treatment methods involving ground-based heavy equipment are generally not applied on slopes exceeding 35 percent.

The road/traffic plan establishes the primary access routes for repeated vehicular traffic, to, from, and across the treatment areas. The plan will include identification of primary skid trails, landings and burn pile locations in order to minimize disturbance throughout the treatment area. The road/traffic plan shall be adhered to as consistent with minimizing impacts to cultural and natural resources. Areas of soil disturbance such as skid trails and temporary roads will be protected from erosion through the placement of slash sufficient to reduce rate of overland water flow and raindrop impact. Where identified on the practice documentation worksheet, seeding for erosion control will be consistent with Critical Area Planting (Code 342) or Range Planting (Code 550).

Methods to reduce soil erosion on slopes greater than 10 percent include limbing cut trees and laying them perpendicular to the slope. The distance between cut trees will not exceed 20 feet to eliminate water concentrating and forming concentrated flow paths and accelerating the soil erosion process. Effective ground cover (large woody debris, embedded rocks, and basal area of vegetation) will also reduce sheet and concentrated flows.

**Table 1.** Estimated minimum effective percent ground cover required to prevent accelerated soil loss on hillslopes:

<b>Slope</b>	<b>Effective Ground Cover</b>
<10%	Approximately 20%
11 – 30%	Approximately 25-30%
>30%	Approximately 35%

### **Wildlife and Sensitive Plant Species Considerations**

Wildlife needs, including seasonal restrictions, will be considered when applying brush management practices and documented on the NRCS-CPA-52 Environmental Evaluation and supporting documentation. Species that need to be considered include, but are not limited to; pronghorn antelope, sage grouse, raptors, migratory birds, pygmy rabbit, mule deer, elk, as well as wetland or aquatic species that are found in riparian areas, springs, seeps, or meadows near/within the treatment area. In areas of sage grouse leks, nesting, and summer habitat, treatments will only be conducted in the fall or early

winter. Consult the NRCS State Biologist if an on- site evaluation identifies possible wildlife habitat conflicts.

Populations of sensitive plant species and/or habitat as identified on the NRCS-CPA-52 Environmental Evaluation and supporting documentation will be avoided such that associated treatment activities reduce potential impacts to identified resources.

### **Insect and Disease Considerations**

If feasible, timing of tree cutting will be conducted in late fall and winter to minimize insect attraction and should also include measures such as removal, chipping, and lopping in order to promote “drying” and minimize insect brood habitat.

Singleleaf pinyon pine mastication may only occur from July 1 to December 31 in areas where pinyon engraver bark beetle (*Ips confuses*) infestation is identified as a concern. In areas adjacent to pre-settlement (old growth) trees, pinyon pine tree boles and limbs greater than 4 inches in diameter at root collar would be bucked into rounds less than 2 feet in length.

### **Fuel Load Considerations**

Fuel loads of woody residue material will be considered and may require piling and burning, chipping, lop and scatter and/or removal in order to reduce the wildfire risk. Fine fuel loads of greater than 10 tons per acre on large contiguous blocks of treatment (>5 acres) will require a post- treatment operation. The planner will choose the method or methods that best meets management goals and objectives.

### **Grazing Considerations**

Where livestock grazing occurs within the treatment area, released vegetation shall be allowed to recover prior to grazing. A minimum period of deferment for at least one growing season is required. Targeted grazing from October through February to control invasive species will be allowed upon approval from the State Rangeland Management Specialist. Timing and sequence of brush management shall be planned in coordination with specifications developed for Prescribed Grazing (Code 528). A grazing plan will be developed consistent with the goals of the conservation plan.

## **IV. TREATMENT METHODS AND REQUIREMENTS**

Unless otherwise noted on the practice documentation worksheet, drainage crossings, burn pile locations, landings, skid roads/trails and sensitive resources will be flagged on site in advance of the treatment and in accordance with this specification and other supporting documentation.

Prior to arriving at and departing from the treatment site, all equipment will be cleaned and inspected in order to reduce the introduction of noxious weed seed such as cheatgrass, knapweeds, and medusahead.

Dry season operations will be done in a manner consistent with fire safety precautions and in compliance with local, state and federal fire regulations. Activities performed under this practice will be achieved in a manner in consideration of fire and fuel loading issues regardless of the timing of the treatment. In most cases, it will be necessary to consult with fire authorities prior to implementing the practice in order to assess relative risk to on-site and/or off- site as a result of fuel loading in the treatment area. Except where specifically consistent with an approved burn plan, the distribution of downed material will be in a manner which reduces the occurrence of ladder fuels and/or places on or off- site resources at undue risk of ignition.

### **1. MECHANICAL TREATMENT**

Timing of application is dependent upon the physiological life cycle stage of the species to be controlled, rainfall patterns, and seeding practices to follow treatment. Tree removal operations will be timed to prevent the exposure of bare soil for long periods of time and to reduce erosion and sediment transport into adjacent water bodies.

Following some mechanical treatments, fall seeding of herbaceous vegetation will be required.

***Treated areas (tree removal and/or seeded) will be deferred from grazing a minimum of one***

**full growing season following treatment** to allow for recovery and/or establishment of desirable perennial herbaceous vegetation. In cases where invasive annual species are abundant, a short period of targeted grazing from October to February to reduce the cover and biomass will be allowed. Approval from the State Rangeland Management Specialist and the State Biologist will be needed in this instance.

For additional guidance see Prescribed Grazing (Code 528) and Range Planting (Code 550) conservation practice standards and specifications.

a. Chaining:

Acceptable equipment: Chains – Smooth Chain, Ely Chain

This approach is most applicable to situations where pinyon and/or juniper canopy cover is greater than 20 percent. Chaining is accomplished by dragging an anchor chain in a *U*-shape, half-circle, or *J*-shape behind two crawler tractors traveling in a parallel direction. A chain length of 90 to 350-feet with individual links weighing 40 to 150-pounds each is recommended. Heavier links stay on the ground better and are more effective in removing young trees and shrubs. The chain is attached to each tractor using a swivel joint to allow for tumbling and turning of the chain. Chains are dragged in a loose pattern to maximize ground contact. A chain length to swath width ratio of 2:1 to 3:1 is most effective.

The Ely Chain is a modified conventional anchor chain where short lengths of railroad iron are welded across each link. An Ely Chain will uproot large shrubs and trees as the welded cross-rail catches the base of a plant. The heavy chain then rolls over the uprooted plants crushing and breaking the branches. An Ely Chain also loosens the surface soil and creates an excellent seedbed for broadcast planting. Refer to the publication [The Ely Chain](#) (Cain, 1971) for more information on uses, construction, and operation of an Ely chain.

A Chaining Suitability rating is available for soil map unit components listed for each map unit on the NRCS Web Soil Survey. The chaining suitability ratings represent the relative physical limitations of soil factors upon use of implements suitable for chaining rangeland sites. This rating should be used in conjunction with the Rangeland Seeding rating or the Restoration Potential rating depending upon whether seeding or natural regeneration will be utilized on the site.

Chaining operations can be used on land that is too rough, steep, or rocky for other equipment and commonly occurs on slopes of up to 50 percent. Chaining shall be accomplished on the contour wherever possible. Chaining on the contour reduces power requirements for equipment and soil-disturbance furrows and brush and/or tree windrows are left on the contour. Debris piles oriented across slope interrupt overland flow and act as sediment traps. *Double-chaining is necessary to remove trees.* The first chaining completely uproots some trees and the second chaining will occur in the opposite direction to completely uproot the trees and tips the downed trees over. *Seeding will occur between chainings, as the second chaining covers the seed.*

Revegetation will be considered if there is less than 25 percent composition (by foliar cover), in total, of desired understory species present in the plant community prior to treatment. Fall seeding using fixed-wing aircraft, helicopter and/or rangeland drills is recommended. For additional guidance follow the Range Planting (Code 550) conservation practice standard and specification.

**A post-treatment operation is required and the alternatives include:**

- **Lop and Scatter** – After the chaining, a follow-up hand treatment, using chainsaws or loppers will be conducted to remove all remaining small trees and large limbs. Large limbs and slash will be salvaged for fuelwood or left to dry for at least one year then piled and

burned. Small trees and limbs will be scattered to encourage rapid drying in order to prevent breeding areas for forest insect pests or disease. Whenever feasible, intact sensitive species identified on the practice documentation worksheet will not be inhibited by the placement of the dropped trees or associated slash. Whenever feasible, downed trees will be salvaged for fuelwood, sawlogs, poles, posts, or other uses. Erosion control methods will be employed where trees are left on-site.

- **Piling and Burning** – Piling and burning may be used in conjunction with lop and scatter or other methods in order to reduce ground cover of biomass. Brush piles will be less than 10 feet in diameter and will be placed at least two tree height lengths from residual trees. Piles will be left to dry for at least one year prior to burning. In order to reduce the damage to subsurface soil nutrient and microbial populations and potential of non-native species invasion, *burning will occur from late fall to early spring when soils are moist or frozen*. Slash burning will be done on nearby roads, trails or other openings located within the treatment area unless otherwise noted on the practice documentation worksheet, plan map, and other supporting documentation. Populations of sensitive plant species and/or habitat as identified on the practice documentation worksheet and/or supporting documentation will be avoided such that burning and associated activities reduce potential impacts to identified resources. Moving and piling of slash will be done manually or mechanically stacked unless specified in the practice requirement sheet. Pushing of slash using a bulldozer blade is prohibited. Burning of piled slash will be consistent with local and state requirements such as burn permits and air quality regulations. Burning of piles will require a Prescribed Burn Plan in accordance with conservation practice Prescribed Burning (Code 338) standard and specification.

b. Cutting

Acceptable equipment: Chainsaws, bow saws, axes, or other appropriate hand tools will be utilized.

This approach is most applicable to situations where pinyon and/or juniper canopy cover is less than 20 percent. The number, size, quality, and species to be saved will be determined before cutting begins. If appropriate, individual plants (trees) selected to be saved will be marked to prevent unnecessary delay in selection by cutters.

Downed trees may be salvaged for fuelwood, sawlogs, poles, posts, or other use. Tree tops and limbs that remain following salvage will be lopped and scattered, or piled and burned, depending on the amount of slash produced. Slash burning will be done in openings. Slash may be piled and left to provide wildlife habitat if specified in the conservation plan. Burning of brush/slash piles will require a Prescribed Burn Plan in accordance with conservation practice Prescribed Burning (Code 338) standard and specification.

Stumps will be cut as low to the ground surface as possible (height less than 6 inches on the uphill side of the stump) and lower most limbs must be cut to kill the tree.

**A post-treatment operation is required and the alternatives include:**

- **Lop and Scatter** – Where trees are to be felled by chainsaw or other manual methods and left in place to decompose, individual trees will be limbed to reduce the height of the felled trees to *three feet or less*. Slash will be scattered to encourage rapid drying in order to prevent breeding areas for forest insect pests for disease. Whenever feasible, intact sensitive species identified on the practice documentation worksheet will not be inhibited by the placement of the dropped trees or associated slash. Whenever feasible, downed trees may be salvaged for fuelwood, sawlogs, poles, posts, or other uses. Erosion control methods will be employed if cut trees are dragged from the site.
- **Piling and Burning** – Piling and burning may be used in conjunction with lop and scatter or other methods in order to reduce ground cover of biomass. Brush piles will be less than 10 feet in diameter and will be placed at least two tree height lengths from residual trees.



Piles will be left at least for one year before burning. In order to reduce the damage to subsurface soil nutrient and microbial populations and potential of non- native species invasion, *burning will occur from late fall to early spring when soils are moist or frozen*. Slash burning will be done on nearby roads and trails or other openings located within the treatment area unless otherwise noted on the practice documentation worksheet, plan map, and other supporting documentation.

Populations of sensitive plant species and/or habitat as identified on the practice documentation worksheet and/or supporting documentation will be avoided such that burning and associated activities reduce potential impacts to identified resources. Moving and piling of slash will be done manually or mechanically stacked unless specified in the practice documentation worksheet. Pushing of slash using a bulldozer blade is prohibited. Burning of piled slash will be consistent with local and state requirements such as burn permits and air quality regulations. Burning of piles will require a Prescribed Burn Plan in accordance with conservation practice Prescribed Burning (Code 338) standard and specification. Piling and burning is generally most applicable where standing pinyon and juniper canopy cover is over 10% but under 25%.

c. Mastication

This approach is most applicable to situations where pinyon and/or juniper canopy cover is greater than 25 percent. Wheeled equipment generally is effective on terrain with less than 35 percent slopes. Tracked equipment generally is most effective on terrain with slopes greater than 35 percent slope. Maximum slopes for operation of tracked equipment is approximately 55 percent. Broken terrain (areas with numerous drainages bisecting a project area), are best treated using tracking machinery equipped with a mastication head mounted on a boom or arm. All equipment will meet OSHA standards for operator protection.

Stumps will be cut as low to the ground surface as possible with the equipment being used (height less than 6 inches on the uphill side of the stump) and lower most limbs must be cut to kill the tree. All material greater than 4 inches in diameter will be masticated.

Unless specifically described in the treatment plan, when left on site to naturally decompose, *chip depth will not exceed three inches across the treatment area* in order to allow germination and recovery of native vegetation. Chipping of cut material is mainly applicable to treatments of pinyon and/or juniper stands having primarily over 25% canopy cover.

Revegetation will be considered if there is less than 25% composition (by foliar cover), in total, of desired understory species present in the plant community prior to treatment. Fall seeding using fixed-wing aircraft, helicopter and/or rangeland drills is recommended. For additional guidance follow the Range Planting (Code 550) conservation practice standard and specification.

**A post-treatment operation may be required if mastication has not reduced the fuel loads and tree cover. Post-treatment alternatives include:**

- **Piling and Burning** – Piling and burning of smaller trees and material left after mastication may be used to reduce fuel loads. Piles will be less than 10 feet in diameter and will be placed at least two tree height lengths from residual trees. In order to reduce the damage to subsurface soil nutrient and microbial populations and potential of non-native species invasion, *burning will occur from late fall to early spring when soils are moist or frozen*. Pile burning will be done on nearby roads and trails or other openings located within the treatment area unless otherwise noted on the practice documentation worksheet, plan map, and other supporting documentation. Populations of sensitive plant species and/or habitat as identified on the documentation worksheet and/or supporting documentation will be avoided such that burning and associated activities reduce potential impacts to identified resources. Moving and piling of slash will be done manually or mechanically stacked unless specified in the practice documentation worksheet. Pushing of slash using

a bulldozer blade is prohibited. Burning of piled slash will be consistent with local and state requirements such as burn permits and air quality regulations. Burning of piles will require a Prescribed Burn Plan in accordance with conservation practice Prescribed Burning (Code 338) standard and specification.

d. Whole Tree Yarding

Landings and skid roads and/or skid trails will be flagged and constructed in advance of felling. All skidding and yarding machinery will be required to stay on approved skid roads/trails. Trees shall be skidded prior to limbing unless excessive damage, as determined by the NRCS, occurs to the residual stand.

Equipment may include tractor and excavator (off- road jammer with tracked undercarriage), cable, and skyline units. Tractor yarding is restricted to slopes of 35% or less. When excavator yarding, logs on gradients greater than 35% must be yarded to the excavator. Forwarding to log landings is restricted to gradients less than 30% on designated skid trails. Mechanized felling equipment and pre-bunching is allowed on slopes up to 45%. When rigging is attached to residual trees, tree plates or similar protective devices shall be used and removed when rigging is removed. Except for lateral yarding, the large end of the logs shall be suspended off the ground during the entire yarding process. During lateral yarding, logs shall be yarded along a path which minimizes damage to residual trees.

## 2. CHEMICAL TREATMENT

Management of woody species by use of chemical treatment methods will be in accordance with conservation practice Integrated Pest Management (Code 595) standard and specification. NRCS will not provide chemical treatment recommendations but NRCS may provide clients with acceptable chemical references.

In accordance with NRCS policy, NRCS personnel are not authorized to provide recommendations for herbicide use. Landowners will contact their local Cooperative Extension Service educator, chemical company representative or an agricultural consultant for specific recommendations. NRCS personnel will use WIN-PST or other approved tools to evaluate environmental risk associated with herbicide recommendations relative to treatment site conditions and potential for herbicide to result in significant environmental impacts.

Land users and applicators using chemical herbicides are cautioned as follows:

*Read the entire container/product label -Follow all instructions and heed all precautions on the label. It is the responsibility of the user to use the herbicide according to the label.*

Landowners and applicators will be aware of and adhere to the provisions of local, county, state or federal laws and regulations concerning the use of agricultural chemicals.

Required conformance with permits of all local, state and federal regulations for use of chemicals will be the responsibility of the landowner. Permits for use of chemicals will specify legally required setbacks from water courses, ponds, residences, and other sensitive areas.

Specifications for the kind of chemical methods and time of application will be in accordance with the herbicide label and in accordance with the latest:

- University of Nevada Cooperative Extension Service - Weed Control Recommendations
- Pacific Northwest Weed Control Handbook Guidelines:
- Herbicides can be used in terrain or rocky areas unsuitable for mechanical equipment.
- When water is used as a carrier, commercial wetting agents (surfactant/adjuvant) shall be used according to manufacturers' recommendation and herbicide label.

Herbicides used for tree removal will never be applied over live water, including flowing springs. It is the responsibility of the landowner to ensure that herbicide applications are in full compliance with this requirement.

### 3. **PRESCRIBED BURNING**

Management of tree species by application of controlled burning will be in accordance with conservation practice Prescribed Burning (Code 338) standard and specification.

Only NRCS personnel, with required expertise and appropriate job approval authority and certification, are authorized to assist with the planning and implementation of prescribed burns (190-GM- NV413.10, Nevada Prescribed Burn Policy). A written Prescribed Burn plan will be prepared by a person with the appropriate job approval authority or qualifications (Nevada Revised Statute 527.128).

Each identifiable prescribed burn treatment area requires a separate burn plan. All permits necessary to conduct the prescribed burn will be obtained by the landowner/cooperator.

Burn plans must adhere to all federal, state and local laws regarding outdoor burning, fire control, smoke management, and air quality.

Prescribed burn plans will be coordinated with local fire departments, adjacent landowners, county commissioners, local law enforcement offices and Nevada Highway Patrol, Nevada Division of Forestry, Nevada Department of Wildlife, US Forest Service, Bureau of Indian Affairs, and/or the Bureau of Land Management, as applicable. The prescribed burn plan will be authorized by the entity that is responsible for fire protection in that area (local fire department, Nevada Division of Forestry, US Forest Service, Bureau of Indian Affairs, Bureau of Land Management).

NRCS personnel assisting with prescribed burning practice application are to document in the conservation plan file that the landowner has been informed that he/she is responsible for adherence to local, state, and federal laws and regulations pertaining to the use and management of fire and that he/she may be liable for damages and costs or fire suppression by others, should prescribed fire escape from a designated area.

## **V. MONITORING**

The collection of baseline and post-treatment data is required to determine the effectiveness of the brush management application. Minimum data collected will include cover using line-point intercept, photo points, and documentation recording the response of the herbaceous plant community as a result of treatment. Other methods may be desired depending on the treatment objectives.

## **VI. OPERATION AND MAINTENANCE**

Treatment areas will be inspected by the landowner periodically and a determination made of locations where additional treatment is necessary. Maintenance generally consists of treatment of small pinyon and/or juniper by manual or chemical methods for the 10-year life span of this practice.

Treatment areas require a *minimum* period of deferment for at least one growing season from use by domestic livestock. The period of deferment is dependent upon management objectives and the pretreatment density and vigor of desirable plants expected to benefit from application of the tree management practice.

Full benefit to established species released from competition with trees is usually realized after the second growing season following treatment (assuming "normal" growing conditions).

Drought following treatment, low vigor of desirable grasses, invasion of the treated area by undesirable plants, and/or other abnormal conditions may make it necessary to extend the deferment beyond the above requirements. If any of these conditions exist, the NRCS conservationist will inform the cooperator of additional deferment periods. Targeted or strategic grazing can often accomplish specific objectives with the timing and duration of livestock (type and class), and training of those animals depending on the species of plants targeted for grazing and those targeted for retention and expansion.

## **REFERENCE**



Busse, M.D., K.R. Hubbert, and E.Y. Moghaddas, E.Y. 2014. Fuel Reduction Practices and Their Effects on Soil Quality. Gen. Tech. Rep. PSW-GTR-241. U.S.D.A. – Forest Service, Pacific Southwest Research Station, Albany, CA 156pp.

Cain, Don. 1971. The Ely Chain. USDI-BLM, Ely, Nevada.

Colorado State Forest Service. 2010. Mastication Operational Guidelines. Colorado State Forest Service, October 2010. 3p.

Connolly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines for Management of Sage Grouse Populations and Habitats. Wildlife Society Bulletin 28:967-985.

Gillihan, S.W. 2006. Sharing the land with pinyon- juniper birds. Partners in Flight Western Working Group. Salt Lake City, Utah.

Jordan, G. L. 1981. Range Seeding and Brush Management on Arizona Rangelands. Cooperative Extension Service, Agricultural Experiment Station Publication T81121, University of Arizona, Tucson, AZ.

Hubbert, K.R, M.D. Busse, and S. Overby. 2013. Effects of Pile Burning in the LTB on Soil and Water Quality. SnPLMA 12576 Final Report. September 30, 2013.

Launchbaugh, K. (ed) 2006. Targeted Grazing: A natural approach to vegetation management and landscape enhancement. American Sheep Industry Association.

Montana, Utah, and Wyoming Cooperative Extension Service. 1995. Weed Management Handbook. Montana State University, Bozeman, MT; Utah State University, Logan, UT; and University of Wyoming, Laramie, WY.

Oregon, Idaho, and Washington Cooperative Extension Service. 1995. Pacific Northwest Weed Control Handbook. Oregon State University, Corvallis, OR. and Washington State University, Pullman, WA.

Skelly, J. and J. Christopherson. 2003. Pinyon Pine – Management Guidelines for Common Pests. University of Nevada Reno Cooperative Extension. EB 03-02.

Stevens, R. 1999. Mechanical Chaining and Seeding. In: Proceedings: Ecology and management of pinyon-juniper communities within the Interior West. 1996 September 15- 18: Provo, UT. RMRS-P-9. Ogden, UT: USDA, Forest Service, Rocky Mountain Research Station. Pp. 281-284.

Swanson, S. (editor in chief), B. Bruce, R. Cleary, B. Draugt, G. Brackley, G. Fults, J. Linebaugh, G. McCuin. V. Metschner, B. Perryman, P. Tueller, D. Weaver and D. Wilson 2006. Nevada Rangeland Monitoring Handbook. Second Edition. University of Nevada Reno, Cooperative Extension Educational Bulletin-06- 03, 81 pp.

Tausch, R.J., R.F. Miller, B.A. Roundy, J.C. Chambers. 2009. Piñon and juniper field guide: Asking the right questions to select appropriate management actions. U.S. Geological Survey Circular 1335, 96p.

USDA-Agricultural Research Service. 2010. Recommendations for pinyon-juniper post treatment site conditions following removal of trees to improve hydrologic function and control soil erosion. USDA-ARS Pacific West Area- Western Regional Research Center. Reno, NV. 15 p.

USDA-Natural Resources Conservation Service. 1997. Inventorying, Classifying, and Correlating Juniper and Pinyon Communities to Soils in Western United States. Grazing Lands Technology Institute, Fort Worth, TX. 39p.

Valentine, J.F. 1989. Range Development and Improvements. Third Edition. Academic Press San Diego, CA.

Young, J.A. and R.A. Evans. 1976. Control of pinyon samplings with Picloram or Karbutilate. Journal of Range Management 29 (2): 144-147.

<b>Table 2. Woodland Tree Growth Form</b>		
<b>Characteristic</b>	<b>Relatively Young Trees</b>	<b>Relatively Old Trees</b>
Juniper crown shape	Conical with pointed tip	Flattened, rounded, or uneven top
Pinyon crown shape	Conical with pointed to slightly rounded tip	Flattened, 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 the bole, few dead branches, little to 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 furrows	Thick, fibrous with well-developed vertical furrows
Pinyon bark	Relatively thin, flaky, with weak vertical furrows	Thick, more plate-like structure than furrowed
Juniper leader growth	Terminal leader growth in the upper ¼ of the tree, usually >2 in. In open stands, leader growth >2 in. from bottom to top	Leader growth in the upper ¼ 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 ¼ of the tree usually < 2 in.

## **Specific Site Requirements**