USDA Natural Resources
Conservation Service

Ecological site R010XC055OR
SR Mountain Shallow South 16-20 PZ

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Associated sites

R010XC034OR	**SR Shrubby Mountain Loam 16-20 PZ** Shrubby Mountain Loam 16-20" PZ
R010XC049OR	**SR Shrubby Mountain South 16-20 PZ** Shrubby Mountain South 16-20" PZ
R010XC067OR	**SR Shrubby Mountain North 16-20 PZ** Shrubby Mountain North 16-20" PZ

Similar sites

R010XC049OR	**SR Shrubby Mountain South 16-20 PZ** Shrubby Mountain South 16-20" PZ (deeper soil, higher production)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Pseudoroegneria spicata ssp. spicata* (2) *Poa secunda*

Physiographic features

This site occurs adjacent to forestland on south exposure backslopes of canyons, tablelands and mountain plateaus. Slopes typically range from 12-60%. Elevations range from 3200 to 5700 feet.

Table 2. Representative physiographic features

Landforms	(1) Canyon (2) Plateau
Elevation	975–1,737 m
Slope	12–60%
Aspect	S

Climatic features

The annual precipitation ranges from 16 to 20 inches, most of which occurs in the form of snow during the months of November through March. Localized, occasionally severe, convectional storms occur during the summer. The soil temperature regime is frigid to near frigid with a mean annual air temperature of about 44 degrees F. Temperature extremes range from 90 to -30 degrees F. The frost free period ranges from 50 to 90 days. The optimum period for plant growth is from April through July.

Table 3. Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	0 days
Precipitation total (average)	508 mm

Influencing water features

Soil features

The soils of this site are typically shallow and well drained. Typically the surface layer is a stony loam or clay loam about 3 to 10 inches thick. The subsoil is a very stony or cobbly clay loam about 3 to 6 inches thick. Depth to bedrock or an indurated pan is 10 to 20 inches. Permeability is slow to moderate. The available water holding capacity is about 2 to 4 inches for the profile. The potential for erosion is moderate to severe.

Table 4. Representative soil features

Surface texture	(1) Stony loam (2) Clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	25–51 cm
Available water capacity (0-101.6cm)	5.08–10.16 cm

Ecological dynamics

Plant composition and production is dependent on soil depth and bedrock fracture. Bluebunch wheatgrass and shrubs increase on deeper soils and over fractured bedrock. Sandberg bluegrass increases in percent composition on more shallow soils over unfractured bedrock. Needlegrasses increase with coarse textured surfaces.

If the condiditon of the site deteriorates as a result of overgrazing, bluebunch wheatgrass decreases while Sandberg bluegrass and shrubs increase. With further deterioration, Sandberg bluegrass decreases, annuals invade, and bare ground markedly increases. Excessive erosion in the bare soil interspaces reduces the site productivity and contributes to downstream sedimentation.

Treatment Response:

South facing aspects lack resiliency and typically respond poorly to Juniper removal due to shallow soils and heat. One repair pathway (RP2) located between State 1 and 2 indicates that potential for rehabilitation of the juniper controlled plant community exists. The potential for success is less than that of the juniper-sagebrush steppe phase in State 1 due primarily to aspect and soils. Treatment of juniper should incorporate lopping of limbs to provide microsites for seedling establishment along with seeding of desired grasses, forbs and shrubs. Fire is not a recommended tool of rehabilitation due to the increased risk of cheatgrass invasion. A second repair pathway (RP3) exists between States 1 and 3. Treatment of the Sandberg bluegrass, cheatgrass and rabbitbrush phase would require chemical control of the rabbitbrush and cheatgrass along with seeding. Treatment of the juniper woodland and shallow rooted grasses phase would also require control on the cheatgrass while removing juniper and seeding desirable species. The potential for failure of rehabilitation projects within State 3 is high. Because of this, every effort should be taken to prevent threshold forcing events from occurring.

Reference Plant Community

State 1 – Reference State

Three plant community phases occur in the Reference State. They are phase 1.1, the Reference Plant Community Phase (RPCP) which is the perennial grass phase, phase 1.2, the sagebrush phase and phase 1.3, the juniper-sagebrush phase.

Phase 1.1. The Reference Plant Community Phase (RPCP) is the perennial grass phase. This plant community is strongly dominated by bluebunch wheatgrass with Sandberg bluegrass and Thurber needlegrass being common and lesser amounts of other perennial grasses and a small amount of forbs. Mountain big sagebrush and antelope bitterbrush are common. Grasses compose 80 % of the community, forbs 5% and shrubs 15%. Ecological processes are controlled by the perennial grasses.

Phase 1.2. The sagebrush phase results with prescribed grazing with normal fire frequency of 40-60 years (CP1.1A). The composition of sagebrush within the plant community will increase as the length of time between fires becomes greater. A period of improper grazing can accelerate the increase in sagebrush even if the bunchgrass plant community is maintained. Under prescribed grazing and fire the plant community pathway (CP1.2A) moves back toward Phase 1.1, the perennial grass community. With the continued absence of fire and improper grazing management or drought (CP1.2B) the plant community will move towards phase 1.3, juniper-sagebrush.

Phase 1.3. The juniper-sagebrush phase is dominated by Juniper, mountain big sagebrush, bluebunch wheatgrass, and Sandberg bluegrass. This plant community is a result of the absence of fire with improper grazing or drought and can occur through community pathways CP1.1B or CP1.2B. This phase is the “at risk” plant community within State 1. If the site deteriorates the potential for cheatgrass invasion and juniper increases. With proper grazing and fire this phase can be returned (RT1 & RT2) to Phase 1.1 by community pathway CP 1.3A. This “at risk” phase can transition to State 2 (IRT1A) “characterized by juniper dominance with a perennial grass understory” with suppressed fire or State 3 (IRT1B) “characterized by the loss of deep rooted perennial grass functional groups” with improper grazing management, and/or drought and continued lack of fire

State 2. This State is dominated by juniper. Initially, Phase 2.1, the juniper-sagebrush phase is occupied by juniper, mountain big sagebrush, Sandberg bluegrass, and Idaho fescue with a trace of bluebunch wheatgrass and cheatgrass. If fire continues to be suppressed and improper grazing continues, juniper will continue to increase and out compete both the sagebrush and bunchgrass understory. When fine fuels are reduced and fire will no longer carry (fire proof), the site transitions to a juniper woodland community (Phase 2.2). The potential for soil erosion increases as the juniper woodland matures and the understory plant community declines. The risk of an irreversible transition (IRT2A) over an abiotic threshold to the juniper woodland erosional phase of State 4 increases with increasing slope and increasing bare ground. The repair pathway (RP1) from state 2 back to State 1 is generally not

economically feasible and would require mechanical treatment of the junipers prior to initiating prescribed burns. The potential for needing to reseed to adapted grasses, forbs and shrubs is extremely high. In this state all of the ecological processes are controlled by juniper.

State 3. This state is dominated in the understory by cheatgrass and in the overstory by either juniper (Phase 3.1) or rabbitbrush (Phase 3.2). Sagebrush and the deep-rooted perennial bunch grasses have almost been entirely replaced in the understory of the plant community by cheatgrass and Sandberg bluegrass. This state has developed as a result of continued improper grazing in the absence of fire (IRT1B) and this transition moves the plant community to the juniper woodland shallow-rooted grasses phase (3.1). If fire occurs, the plant community transitions to the cheatgrass, Sandberg bluegrass, and rabbitbrush phase (3.2). The risk of an irreversible transition (IR3A) to the erosional State 4 is paramount with continued improper grazing in combination with the lack of fire (4.1) or with frequent fire (4.2). The repair pathway (RP2) from State 3 back to State 1 is generally not economically feasible and requires mechanical treatment of the juniper, chemical treatment of the cheatgrass and rabbitbrush, and reseeding of desirable grasses, forbs, and shrubs. Ecological processes in this state are controlled by the juniper and/or the shallow rooted grasses and cheatgrass.

State 4. This state is dominated by cheatgrass and shallow-rooted grasses in the understory with junipers (4.1) or rabbitbrush (4.2) in the overstory. This state is recognized by the soil erosion that is occurring or has occurred on site. Since this state has occurred through widespread erosion from State 2 (IRT2A) or State 3 (IRT3A), the increase in bare ground makes the site more susceptible to increased wind and/or water erosion. Abiotic factors control site resources and ecological functions. Rehabilitation of this state may not be practical or possible due to extreme soil loss.

State and transition model

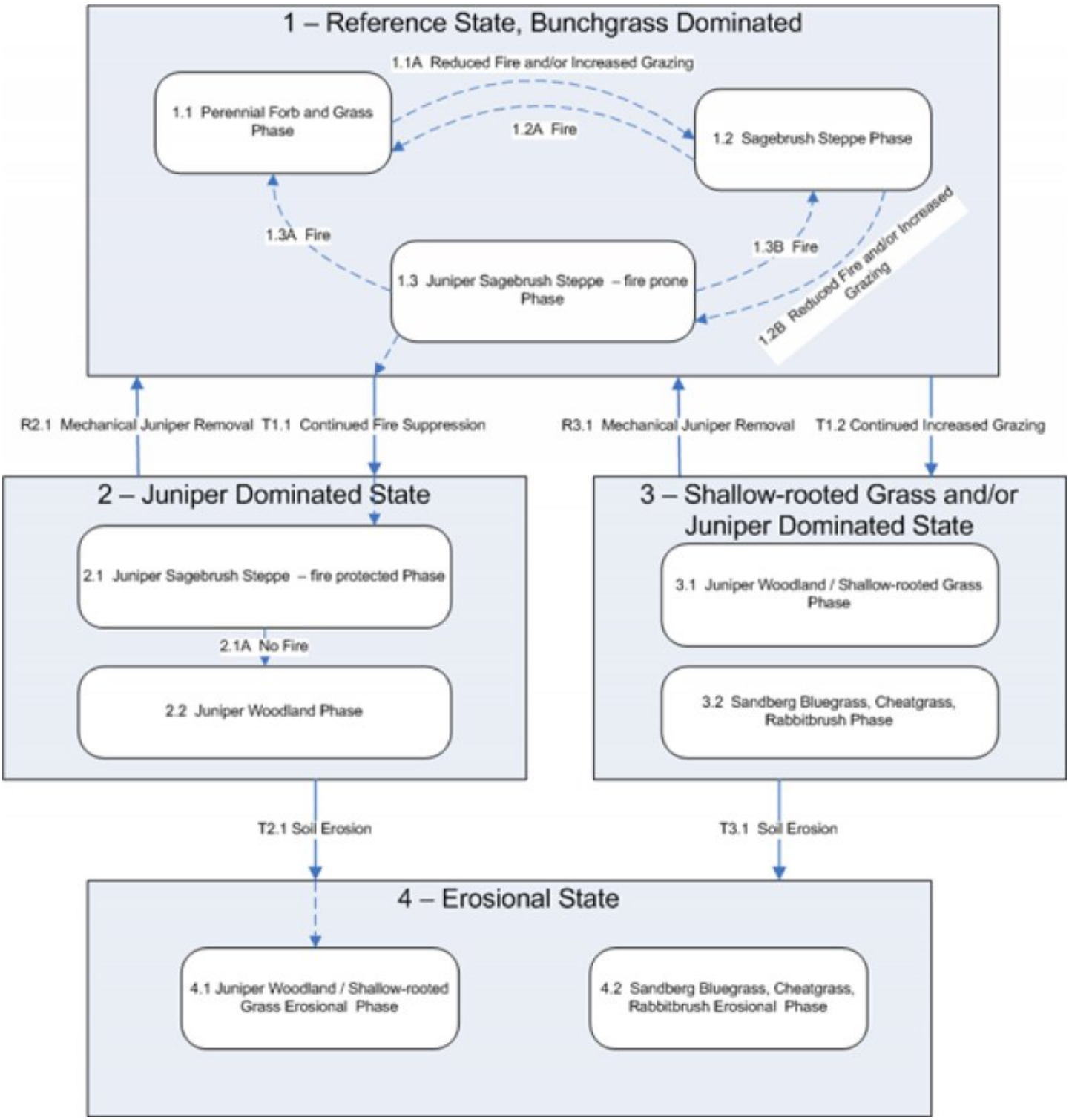

Figure 3. Group 3, STM

State 1
Reference State

Community 1.1
Reference Plant Community

The potential native plant community is dominated by bluebunch wheatgrass. Mountain big sagebrush, squaw apple, antelope bitterbrush, Sandberg bluegrass, and Idaho fescue are common in the stand. Vegetative composition is approximately 75% grasses, 5% forbs, and 20% shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	420	673	925
Shrub/Vine	101	163	224
Forb	28	45	62
Tree	11	17	22
Total	**560**	**898**	**1233**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant, deep-rooted, perennial grasses**			484–771	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	448–628	–
	needlegrass	ACHNA	*Achnatherum*	18–72	–
	Idaho fescue	FEID	*Festuca idahoensis*	18–72	–
4	**Sub-dominant, shallow-rooted, perennial grasses**			54–108	
	Sandberg bluegrass	POSE	*Poa secunda*	45–90	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	9–18	–
5	**All other perennial grasses**			18–45	
	mountain brome	BRMA4	*Bromus marginatus*	0–18	–
	squirreltail	ELEL5	*Elymus elymoides*	0–18	–
	blue wildrye	ELGL	*Elymus glaucus*	0–18	–
Forb					
7	**All dominant, perennial forbs**			36–72	
	common yarrow	ACMI2	*Achillea millefolium*	9–18	–
	balsamroot	BALSA	*Balsamorhiza*	9–18	–
	buckwheat	ERIOG	*Eriogonum*	9–18	–
	beardtongue	PENST	*Penstemon*	9–18	–
9	**All other perennial forbs**			9–36	
	onion	ALLIU	*Allium*	0–9	–
	milkvetch	ASTRA	*Astragalus*	0–9	–
	brodiaea	BRODI	*Brodiaea*	0–9	–
	fleabane	ERIGE2	*Erigeron*	0–9	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	0–9	–
	desertparsley	LOMAT	*Lomatium*	0–9	–
	lupine	LUPIN	*Lupinus*	0–9	–
	phacelia	PHACE	*Phacelia*	0–9	–
	phlox	PHLOX	*Phlox*	0–9	–
	stonecrop	SEDUM	*Sedum*	0–9	–
	deathcamas	ZIGAD	*Zigadenus*	0–9	–
Shrub/Vine					
11	**Dominant, evergreen, perennial forbs**			45–117	

	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	18–72	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	27–45	–
14	**Sub-dominant, deciduous, perennial shrubs**			36–99	
	wild crab apple	PERA4	*Peraphyllum ramosissimum*	18–45	–
	wax currant	RICE	*Ribes cereum*	9–27	–
	common snowberry	SYAL	*Symphoricarpos albus*	9–27	–
15	**All other perennial shrubs**			0–36	
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	0–18	–
	rabbitbrush	CHRYS9	*Chrysothamnus*	0–18	–
Tree					
16	**Dominant, evergreen, perennial trees**			0–22	
	western juniper	JUOC	*Juniperus occidentalis*	0–18	–
	ponderosa pine	PIPO	*Pinus ponderosa*	0–18	–

Animal community

This site offers food and cover for mule deer and elk.

Mule deer
Elk
Hawks
Songbirds
Rodents

Hydrological functions

The soils are in hydrologic group D. The soils of this site have high runoff potential.

Wood products

This site is susceptible to an increase in western juniper. Where this has occurred, the site will yeild fence posts, firewood and specialty products.

Other products

This site is suited to use by cattle, sheep, and horses in late spring, summer and fall under a planned grazing system. Limitations are steepness of slope and coarse fragments. Use should be postponed until soils are firm enough to prevent trampling damage and soil compaction.

Other information

The soils in this site have good water holding capacities providing late season water for plant growth and slow water releases to streams. Increase in western juniper and the subsequent competition for moisture will lead to a reduction of available forage. Overgrazing can easily reduce ground cover and accelerate soil loss. Improving infiltration and permeability, and reducing runoff should be the immediate goal of juniper control. When incised channels are present, rehabilitation will markedly improve production, reduce downstream sedimentation and restore good hydrologic characteristics. On altered sites the reintroduction of basin wildrye may be needed to fully restore the site potential.

Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Jeff Repp and Bruce Frannsen
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Date	08/07/2012
Approved by	Bob Gillaspy
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to some, moderate to severe sheet & rill erosion hazard

2. **Presence of water flow patterns:** None to some

3. **Number and height of erosional pedestals or terracettes:** None to some, (some frost heaving)

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-20%

5. **Number of gullies and erosion associated with gullies:** None

6. **Extent of wind scoured, blowouts and/or depositional areas:** None, moderate wind erosion hazard

7. **Amount of litter movement (describe size and distance expected to travel):** Fine - limited movement

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Moderately to significantly resistant to erosion: aggregate stability = 3-6

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Shallow well drained stony loam or clay loam (3-10 inches thick): Low OM (1-2%)

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Moderate ground cover (50-60%) and gentle to steep slopes (12-60%) moderately limit rainfall impact and overland flow

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Bluebunch wheatgrass > other grasses > shrubs > forbs

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Normal decadence and mortality expected

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Favorable: 1100, Normal: 800, unfavorable: 500 lbs/acre/year at high RSI (HCPC)

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Western Juniper readily invades the site. Cheatgrass and Medusahead invade sites that have lost deep rooted perennial grass functional groups.

17. **Perennial plant reproductive capability:** All species should be capable of reproducing annually