USDA Natural Resources
Conservation Service

Ecological site R010XC054OR
SR Mountain Shallow South 12-16 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.

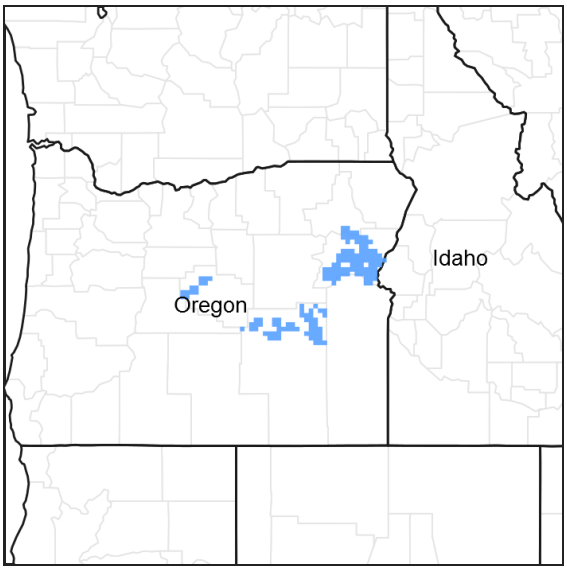

Figure 1. Mapped extent

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

R010XC032OR	**SR Mountain 12-16 PZ** SR Mountain 12-16 PZ (non-aspect site, deeper soil, higher elevation, Idaho fescue dominant, mountain big sagebrush strongly dominant sagebrush, higher production)
R010XC033OR	**SR Cool 12-16 PZ** SR Cool 12-16 PZ (non- aspect site, deeper soil, Idaho fescue dominant, higher production)
R010XC037OR	**SR Mountain Shallow 12-16 PZ** SR Mountain Shallow 12-16 PZ (non-aspect site, Idaho fescue dominant)
R010XC039OR	**SR Very Shallow 12-16 PZ** SR Very Shallow 12-16 PZ (non-aspect site, very shallow soil, Sandberg bluegrass dominant with stiff sagebrush, lower production)
R010XC047OR	**SR Mountain South 12-16 PZ** SR Mountain South 12-16 PZ (deeper soil, higher production)
R010XC059OR	**SR Mahogany Rockland 12+ PZ** SR Mahogany Rockland 12+ PZ (fractured bedrock, mountain mahogany dominant)
R010XC066OR	**SR Mountain North 12-16 PZ** SR Mountain North 12-16 PZ (north aspect, deeper soil, Idaho fescue dominant, colder temperature, higher production)

R010XC068OR	**SR Cool Mountain North 12-16 PZ** SR Cool Mountain North 12-16 PZ (north aspect, deeper soil, Idaho fescue dominant, higher production)

Similar sites

R010XC047OR	**SR Mountain South 12-16 PZ** SR Mountain South 12-16 PZ (deeper soil, higher production)

Table 1. Dominant plant species

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

Physiographic features

This site occurs on south aspects of terraces, tablelands and mountain plateaus. Slopes typically range from 12 to 60%. Elevations range from 3500 to 6000 feet.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Plateau (3) Mountain slope
Flooding frequency	None
Elevation	1,067–1,829 m
Slope	12–60%
Ponding depth	0 cm
Aspect	SE, S, SW

Climatic features

The annual precipitation ranges from 12 to 16 inches, most of which occurs in the form of snow during the months of November through March. Localized convection storms occasionally occur during the summer. The soil temperature regime is mesic to frigid near mesic with a mean air temperature of 47 degrees F. Temperature extremes range from 100 to -30 degrees F. The frost free period ranges from 50 to 90 days. The optimum growth period for plant growth is May through June.

Table 3. Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	0 days
Precipitation total (average)	406 mm

Influencing water features

Soil features

The soils of this site are typically shallow and well drained. The surface layer is a very stony loam about 6 inches thick. The subsoil is a stony clay to extremely cobbly clay loam about 10 inches thick. Depth to bedrock, an indurated pan or consolidated sediments ranges from 10 to 20 inches. Occasionally the soil is a fine gravelly coarse sandy loam over a granitic-like substratum. Permeability is moderate to slow. The available water holding capacity

(AWC) is about 2 to 4 inches for the profile. The erosion potential is moderate to severe.

Table 4. Representative soil features

Parent material	(1) Eolian deposits–rhyolite
Surface texture	(1) Stony loam (2) Very stony clay loam (3) Very gravelly
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderate to slow
Soil depth	25–51 cm
Available water capacity (0-101.6cm)	5.08–10.16 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0

Ecological dynamics

The reference native plant community is dominated by bluebunch wheatgrass and Sandberg bluegrass. Thurber's needlegrass, Idaho fescue and a variety of forbs are present. A big sagebrush complex of mountain, Wyoming and basin big sagebrush is common. Xeric big sagebrush is occasionally present. Wild crab apple and antelope bitterbrush occur sporadically. Vegetative composition of the community is approximately 75 percent grasses, 10 percent forbs and 15 percent shrubs. Approximate ground cover is 40 to 60 percent (basal and crown).

Range in Characteristics:
Bluebunch wheatgrass is strongly dominant on south facing aspects. Idaho fescue increases as the aspect changes to the southeast. Thurber needlegrass increases on a gravelly surface. Mountain big sagebrush increases in relationship to basin, Wyoming and xeric big sagebrush with elevation. Deciduous shrubs increase at the upper end of the precipitation zone and over gravelly and fractured substratums. Production increases with soil depth and precipitation.

Response to Disturbance:
If the condition of the site deteriorates as a result of inappropriate grazing, bluebunch wheatgrass and Idaho fescue decrease. Big sagebrush (mountain, basin & xeric) rapidly increases and juniper invades from rock outcrops. With continued inappropriate grazing big sagebrush and juniper dominate the overstory. Cheatgrass and other annuals invade. With further deterioration and lack of fire juniper invasion continues. Sagebrush and other shrubs decrease from juniper competition and bare ground increases. With fire and inappropriate grazing juniper and big sage are severely impacted. Rabbitbrush increases and annuals and biennial forbs invade. Bare ground increases and excessive erosion contributes to downstream sedimentation.

States: JUOC/ARTRV-X-T/Annuals-Bare Ground; CHVI8/Annuals-Bare Ground (with fire)

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

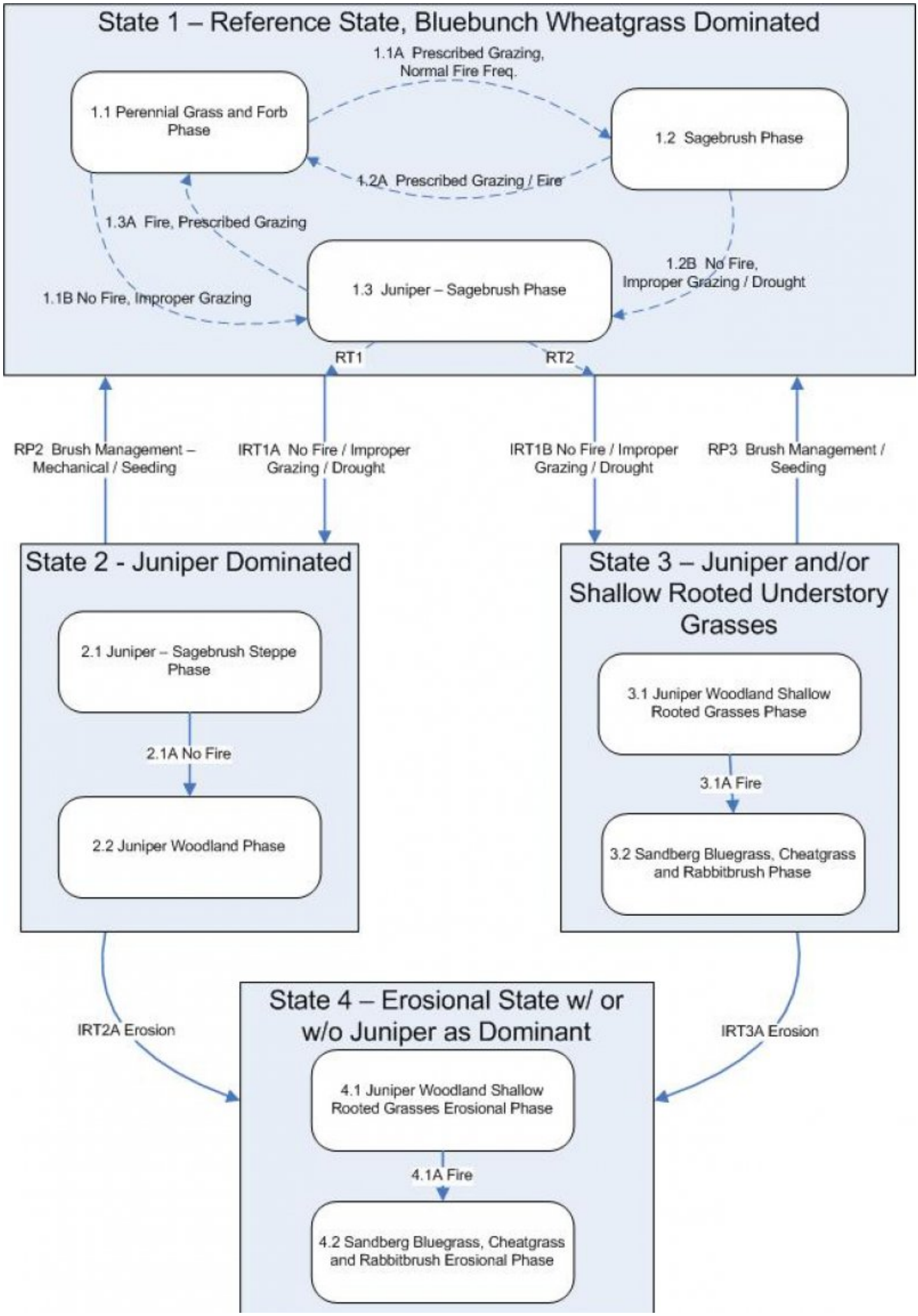
State 1 – Reference State, Bluebunch Wheatgrass Dominated
1.1A Prescribed Grazing, Normal Fire Freq.
1.1 Perennial Grass and Forb Phase
1.2 Sagebrush Phase
1.2A Prescribed Grazing / Fire
1.3A Fire, Prescribed Grazing
1.3 Juniper – Sagebrush Phase
1.2B No Fire, Improper Grazing / Drought
1.1B No Fire, Improper Grazing
RT1
RT2
RP2 Brush Management – Mechanical / Seeding
IRT1A No Fire / Improper Grazing / Drought
IRT1B No Fire / Improper Grazing / Drought
RP3 Brush Management / Seeding
State 2 - Juniper Dominated
2.1 Juniper – Sagebrush Steppe Phase
2.1A No Fire
2.2 Juniper Woodland Phase
State 3 – Juniper and/or Shallow Rooted Understory Grasses
3.1 Juniper Woodland Shallow Rooted Grasses Phase
3.1A Fire
3.2 Sandberg Bluegrass, Cheatgrass and Rabbitbrush Phase
IRT2A Erosion
IRT3A Erosion
State 4 – Erosional State w/ or w/o Juniper as Dominant
4.1 Juniper Woodland Shallow Rooted Grasses Erosional Phase
4.1A Fire
4.2 Sandberg Bluegrass, Cheatgrass and Rabbitbrush Erosional Phase

Figure 3. SR Mountain Shallow South12-16 PZ - R010XC054OR

State 1
Reference State

Community 1.1
Reference Plant Community

The reference plant community phase is dominated by bluebunch wheatgrass and Sandberg bluegrass. Mountain big sagebrush, Idaho fescue and needlegrasses are common in the stand. Wild crab apple and bitterbrush occur sporadically. Vegetative composition is approximately 80 percent grasses, 5 percent forbs and 15 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	359	538	807
Shrub/Vine	62	93	140
Forb	22	34	50
Tree	6	8	11
Total	**449**	**673**	**1008**

Figure 5. Plant community growth curve (percent production by month). OR4521, B10 SR Mtn Souths & Shallows 12-16. SR Mtn Souths & Shallows 12-16 RPC Growth Curves.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	35	25	20	5	5	5	0	0

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 bunchgrass**			336–471	
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	336–471	–
2	**Sub-dominant, deep-rooted, perennial bunchgrasses**			47–179	
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	34–135	–
	Idaho fescue	FEID	*Festuca idahoensis*	13–54	–
3	**Dominant, shallow rooted, perennial grass**			34–67	
	Sandberg bluegrass	POSE	*Poa secunda*	34–67	–
4	**Other perennial grasses**			7–34	
	needlegrass	ACHNA	*Achnatherum*	0–7	–
	onespike danthonia	DAUN	*Danthonia unispicata*	0–7	–
	squirreltail	ELEL5	*Elymus elymoides*	0–7	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–7	–
Forb					
7	**Dominant, perennial forbs**			27–54	
	milkvetch	ASTRA	*Astragalus*	7–13	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	7–13	

	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	7–13	–
	desertparsley	LOMAT	*Lomatium*	7–13	–
	lupine	LUPIN	*Lupinus*	7–13	–
9	**Other perennial forbs**			7–34	
	common yarrow	ACMI2	*Achillea millefolium*	0–7	–
	agoseris	AGOSE	*Agoseris*	0–7	–
	onion	ALLIU	*Allium*	0–7	–
	brodiaea	BRODI	*Brodiaea*	0–7	–
	Indian paintbrush	CASTI2	*Castilleja*	0–7	–
	hawksbeard	CREPI	*Crepis*	0–7	–
	larkspur	DELPH	*Delphinium*	0–7	–
	fleabane	ERIGE2	*Erigeron*	0–7	–
	buckwheat	ERIOG	*Eriogonum*	0–7	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	0–7	–
	woodland-star	LITHO2	*Lithophragma*	0–7	–
	beardtongue	PENST	*Penstemon*	0–7	–
	phacelia	PHACE	*Phacelia*	0–7	–
	phlox	PHLOX	*Phlox*	0–7	–
	ragwort	SENEC	*Senecio*	0–7	–
	deathcamas	ZIGAD	*Zigadenus*	0–7	–
Shrub/Vine					
11	**Dominant, evergreen shrubs**			27–101	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	20–34	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–34	–
	big sagebrush	ARTRX	*Artemisia tridentata ssp. xericensis*	0–34	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	7–20	–
15	**Other Shrubs**			13–34	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	13–54	–
	wild crab apple	PERA4	*Peraphyllum ramosissimum*	13–34	–
	wax currant	RICE	*Ribes cereum*	7–13	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–13	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–13	–
Tree					
16	**Evergreen**			0–17	
	western juniper	JUOC	*Juniperus occidentalis*	0–9	–
	ponderosa pine	PIPO	*Pinus ponderosa*	0–8	–

Animal community

Livestock Grazing:
This site is suitable for livestock grazing use in the late spring, summer, and fall under a planned grazing system. Use should be postponed until the soils are firm enough to prevent trampling damage and soil compaction. Grazing management should be keyed for Idaho fescue and bluebunch wheatgrass. Deferred grazing or rest is recommended at least once every three years.

Native Wildlife Associated with the Potential Climax Community:
This site is commonly used by mule deer, elk, antelope, rabbits, rodents, upland birds and various predators. It is a preferred site for upland bird rearing areas. Mule deer and elk make excellent use of the site for late spring and fall forage.

Hydrological functions

The soils of this site are typically in an upland topographic position. They have moderate high runoff potential and medium infiltration rates when the hydrologic cover is good. Under frozen ground conditions runoff potential is significantly increased. This occurs for extended periods when deep rooted perennial bunchgrass cover is negligible. Hydrologic cover is good when the bluebunch wheatgrass deep rooted bunchgrass component is >70 percent of potential.The soils are in hydrologic group D.

Wood products

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

Other information

Juniper invasion is a major risk on this site. Control measures include prescribed burning and/or cutting followed by rest to improve vigor, density and seed production of existing deep rooted perennial bunchgrasses. Consider seeding following control measures if an inadequate stand of bunchgrass is present. This soil is generally not suited to mechanical seeding because of its shallow depth and stony surface.

Other references

Stringham, Tamzen, 2007. Final Report for USDA Ecological Site Description. Oregon State University, Corvallis, Oregon.

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.

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Contact for lead author	State Rangeland Management Specialist for NRCS in Oregon
Date	09/09/2009
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 and rill erosion hazard.

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

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 40 to 60%.

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):** stability values should range from 3 to 5, but needs to be verified.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The soil surface structure varies from weak to moderate, very fine and fine granular and subangular blocky. The SOM ranges from 1 to 4 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Moderate to significant plant cover (40-60%) mediates the rainfall impact even on steeper slopes (40-60%). The root mass of perennial bunchgrasses provides significant soil stability.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None, depth to bedrock or an indurated pan is 10-20 inches.

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: Deep-rooted, perennial, cool season bunchgrasses>

Sub-dominant: Shallow-rooted, perennial, cool season bunchgrasses>

Other: Tall shrubs > Forbs

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mountain big sagebrush will become decadent in the absence of normal fire frequency and ungulate grazing. Grass and forb mortality will occur as tall shrubs increase. Normal decadence would be expected in the bluebunch wheatgrass. This would be evident by the dead centers in the plants.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Favorable: 900; Normal: 600; Unfavorable: 400 lbs/ac/yr.

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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:** Knapweed, leafy spurge, and dalmation toadflax.

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