USDA Natural Resources Conservation Service

Ecological site R010XA020ID
Mixed Shrub 12-16 PZ

Last updated: 12/13/2023
Accessed: 05/10/2025

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.

MLRA notes

Major Land Resource Area (MLRA): 010X–Central Rocky and Blue Mountain Foothills

This MLRA is characterized by gently rolling to steep hills, plateaus, and low mountains at the foothills of the Blue Mountains in Oregon and the Central Rocky Mountains in Idaho. The geology of this area is highly varied and ranges from Holocene volcanics to Cretaceous sedimentary rocks. Mollisols are the dominant soil order and the soil climate is typified by mesic or frigid soil temperature regimes, and xeric or aridic soil moisture regimes. Elevation ranges from 1,300 to 6,600 feet (395 to 2,010 meters), increasing from west to east. The climate is characterized by dry summers and snow dominated winters with precipitation averaging 8 to 16 inches (205 to 405 millimeters) and increasing from west to east. These factors support plant communities with shrub-grass associations with considerable acreage of sagebrush grassland. Big sagebrush, bluebunch wheatgrass, and Idaho fescue are the dominant species. Stiff sagebrush, low sagebrush, and Sandberg bluegrass are often dominant on sites with shallow restrictive layers. Western juniper is one of the few common tree species and since European settlement has greatly expanded its extent in Oregon. Nearly half of the MLRA is federally owned and managed by the Bureau of Land Management. Most of the area is used for livestock grazing with areas accessible by irrigation often used for irrigated agriculture.

For further information, see "Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin (U.S. Department of Agriculture Handbook 296, 2006)" available online at: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_053624

Ecological site concept

• Site occurs on uplands
• Slopes generally less than 30%, occurring on all aspects
• Site associated with recent lava flows
• Soils 10-20” over fractured basalt

Associated sites

R010XA004ID	**Loamy 12-16 PZ ARTRV/FEID-PSSPS** On adjacent landforms with deep soils, not on recent lava flows

Similar sites

R010XA050ID	**Very Shallow Loam 12-16 PZ ARAR8/POSE** Deeper soils, 10-20 inches

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Artemisia tridentata var. vaseyana*
Herbaceous	(1) *Poa nevadensis*

Physiographic features

This site is associated with recent lava plains. Much of this site is mapped in complex with lava rock. Elevation ranges from 4600 to 5600 feet (1394 to 1700 meters). Slopes are less than 15 percent. The site is usually in a Kipuka or on lava rock outcrops.

Table 2. Representative physiographic features

Landforms	(1) Upland > Lava plain (2) Upland > Kipuka
Flooding frequency	None
Ponding frequency	None
Elevation	4,600–5,600 ft
Slope	0–15%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

The Big and Little Wood River Footslopes and Plains, proposed as MLRA 10A, has a mean elevation of 5310 feet above sea level, and varies from 3600 to 9235 feet. In general, average annual precipitation is greatest on the western side, with the southeast area being the driest. The average annual precipitation, based on 7 long term climate stations located throughout the MLRA, is 15.39 inches, with a range of 12.5 to 18 inches. Monthly precipitation is generally greatest at the end of the year, diminishes steadily until a low in July and August, then increases rapidly in the autumn.

Monthly temperatures can vary considerably. Highs of up to 102° and lows down to -52° Fahrenheit have been recorded. The average annual temperature is 42.9°. The frost-free period ranges from 75 to 98 days. The freeze-free period is a bit longer: 106 to 133 days.

Both morning and afternoon average relative humidity values peak in the winter, and reach their low in July and august. The average number of sunny, cloud-free days is above average for the summer months, but below average for the period from November through February.

Table 3. Representative climatic features

Frost-free period (characteristic range)	75-98 days
Freeze-free period (characteristic range)	106-133 days
Precipitation total (characteristic range)	12-16 in
Frost-free period (actual range)	
Freeze-free period (actual range)	
Precipitation total (actual range)	12-18 in
Frost-free period (average)	86 days
Freeze-free period (average)	120 days
Precipitation total (average)	15 in

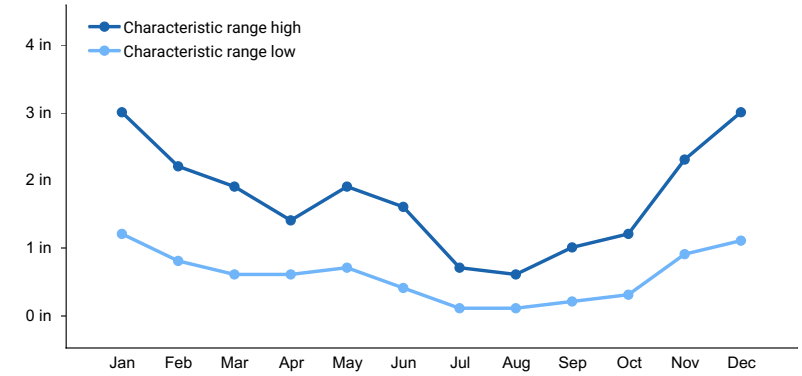

Figure 1. Monthly precipitation range

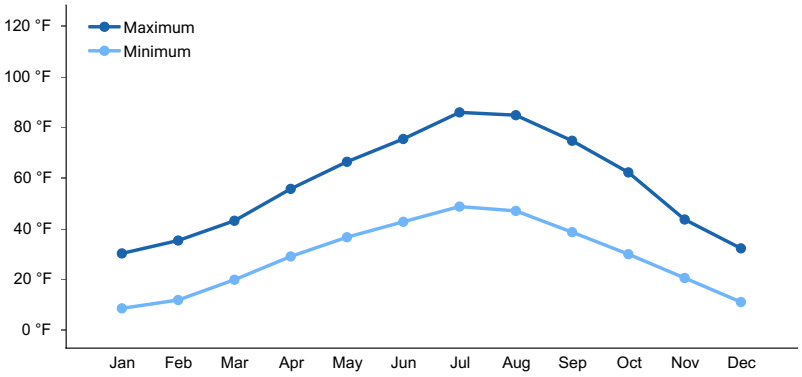

Figure 2. Monthly average minimum and maximum temperature

Influencing water features

This site is not influenced by adjacent streams or run on.

Wetland description

This site is not influenced by adjacent wetlands.

Soil features

The soils are high in volcanic ash. The soils vary in depth from 10 to 20 inches to basalt. The bedrock is fractured enough to allow deep rooted shrubs to grow. The soils commonly have extremely stony or extremely cobbly silt loam surfaces. The soils are well drained and have moderately rapid permeability. The available water holding capacity (AWC) is very low.

Table 4. Representative soil features

Parent material	(1) Tephra–basalt
Surface texture	(1) Extremely cobbly silt loam (2) Extremely stony silt loam
Family particle size	(1) Medial-skeletal
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	5–20 in
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–50%
Available water capacity (0-40in)	0–1 in

Soil reaction (1:1 water) (0-40in)	6.1–7.3
Subsurface fragment volume <=3" (4-60in)	0–25%
Subsurface fragment volume >3" (4-60in)	0–45%

Ecological dynamics

Ecological Dynamics of the Site:

The dominant visual aspect of this site is patches of shrubs and grass among lava rock. Composition by weight is approximately 10 to 25 percent grasses, 10 to 20 percent forbs, and 65 to 75 percent shrubs.

During the last few thousand years, this site has evolved in an arid climate characterized by dry summers and cold, wet winters. Herbivory has historically occurred on this site at low levels of utilization due to the inaccessibility of the site. Herbivores include mule deer, pronghorn antelope, and lagomorphs including the American pika.

Fire has historically occurred on the site at intervals 200 to 1000 years. The site is very stony on the surface and is intermingled or surrounded by rough, broken lava. This makes the site nearly fire-proof. An occasional lightning strike may burn a small portion of the site, but usually not all of it at a time.

FUNCTION:

This site is not suited for grazing because of the rough, broken lava surrounding and intermingled with the site making it nearly impossible for domestic livestock access and movement. Some mule deer and pronghorn antelope may use the site occasionally. The site is not well suited for recreational activities due to the surface stones and broken lava outcrops.

Due to the amount of surface stones and surrounding lava, this site is not easily degraded.

Due to the gentle topography and surface stones, infiltration is normally good and runoff low. Runoff, when it does occur is non-erosive except during high intensity convection storms. Snow accumulates on the site due to high elevation and presence of tall shrubs.

Impacts on the Plant Community.

Influence of fire:

Fire plays a minor role in this site because it is rarely burned.

In the absence of normal fire frequency, mountain big sagebrush and antelope bitterbrush increase and the grasses and forbs decrease as the shrubs increase.

In localized areas if fires occur much more frequently than the historic levels (200 to 1000 years), mountain big sagebrush and bitterbrush will be reduced significantly. With a continued short fire frequency, big sagebrush and antelope bitterbrush can be completely eliminated along with many of the desirable understory species such as bluebunch wheatgrass and Nevada bluegrass. These species may be replaced by cheatgrass, medusahead, or bulbous bluegrass along with a variety of annual and perennial forbs including noxious and invasive plants. These fine fuels will increase the fire frequency in these localized areas. Root sprouting shrubs such as rabbitbrush may increase.

It needs to be understood that fires on this site do not burn large acreages. When they do occur, they are very localized and small in size.

Influence of improper grazing management:

Grazing is not usual on this site. The surface stones and surrounding broken lava outcrops makes livestock movement into and through the site almost impossible. When it is accessible to livestock it can be degraded from improper grazing management.

Season-long grazing and/or excessive utilization can be very detrimental to this site. This type of management leads to reducing vigor of the bunchgrasses and possibly bitterbrush. With reduced vigor, recruitment of these species declines. As these species decline, the plant community becomes susceptible to an increase in mountain big sagebrush and noxious and invasive species

Continued improper grazing management in these small areas influences fire frequency by increasing fine fuels. As cheatgrass and/or medusahead increases, along with other annuals, fires potentially become more frequent in these small localized areas.

Proper grazing management that addresses frequency, duration, and intensity of grazing can also keep fine fuels from developing, thereby reducing the localized fire frequency. This can lead to gradual increases in mountain big sagebrush. Proper grazing management can also help maintain the integrity of the plant community in these small localized areas that make up this site.

Weather influences:

Above normal precipitation in April, May and June can increase total annual production of the plant community. These weather patterns can also increase viable seed production of desirable species to provide for recruitment. Likewise, below normal precipitation during these spring months can significantly reduce total annual production and be detrimental to good seed production. Overall plant composition is normally not effected when perennials have good vigor.

Below normal temperatures in the spring can have an adverse impact on total production regardless of precipitation. An early, hard freeze can occasionally kill some plants. .

Prolonged drought adversely affects this plant community in several ways. Vigor, recruitment, and production are usually reduced. Mortality can occur. Prolonged drought can lead to changes in fire frequency.

Influence of Insects and disease:

Outbreaks can affect vegetation health, particularly bitterbrush with western tent caterpillars (Malacosoma fragilis). Two consecutive years of defoliation by the tent caterpillar can cause mortality in bitterbrush. An outbreak of a particular insect is usually influenced by weather but no specific data for this site is available. Mormon cricket and grasshopper outbreaks occur periodically. Outbreaks seldom cause plant mortality since defoliation of the plant occurs only once during the year of the outbreak.

Influence of noxious and invasive plants:

Many of these species add to the fine-fuel component and lead to increased fire frequency.
Many of the annual and perennial invasive species with deep root systems compete with desirable plants for moisture and nutrients. The result is reduced production and change in composition of the understory.

Influence of wildlife:

Big game animals rarely use the site due to broken lava and stones on the surface. Big game may use the site occasionally in the late spring and fall. They may also use the site in mild winters. Their numbers are seldom high enough to adversely affect the plant community. In accessible portions of this site, herbivory can be detrimental to bitterbrush when livestock grazing and browsing by big game occurs at the same time and season. This will occur when both kinds of animal are using the plant in the late summer or fall. The adverse impact is excessive use of the current years' leader growth.

The deer mouse is beneficial to this site as it is the principal vector for planting bitterbrush seed. High populations of American pika may have an adverse affect on the herbaceous layer of the plant community in small areas.

Watershed:

Decreased infiltration and increased runoff occur with the increase in mountain big sagebrush in interspaces of open soil between rocky areas. Desired understory species can be reduced. The increased runoff also causes sheet and rill erosion. This composition change can affect nutrient and water cycles. Abnormally short fire frequency also gives the same results, but to a lesser degree.

Due to the “fireproof” site conditions and inaccessibility to livestock and big game animals, and gentle slopes, this site is highly resistant to degradation from most influences that would alter the plant community. Therefore crossing the threshold to a different state or to an unknown site would be rare.

Practice Limitations:

This site has severe limitations for facilitating or accelerating practices. Implementation of practices is usually impractical.

State and transition model

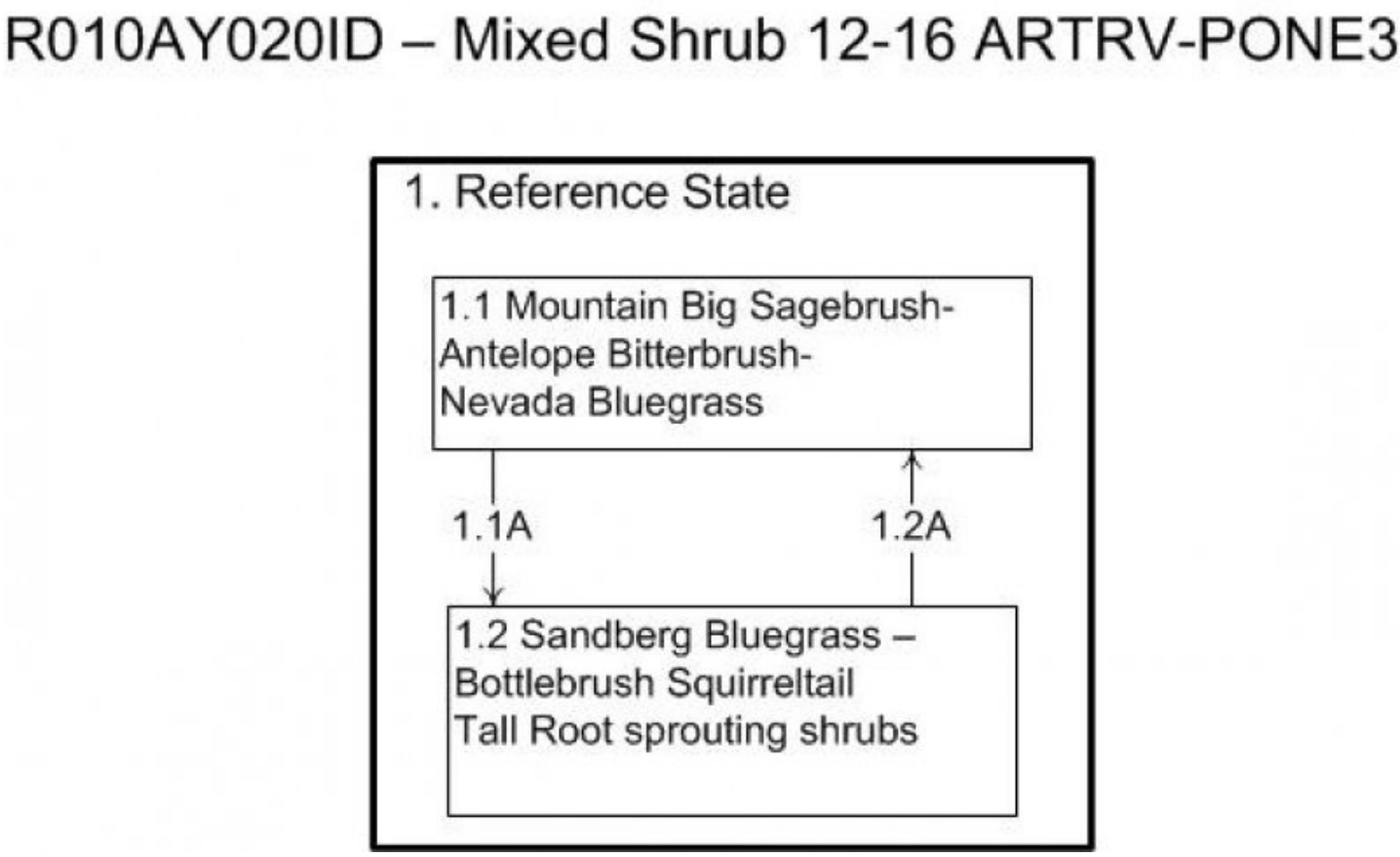

Figure 3. 10A-20

State 1
Reference State

Dominant plant species

- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- Sandberg bluegrass (*Poa secunda*), grass

Community 1.1
Reference Plant Community

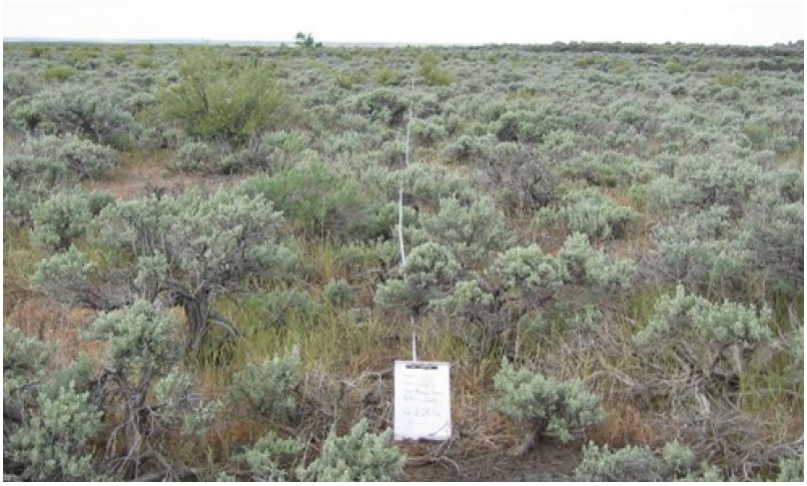

Figure 4. Reference State

Mountain Big Sagebrush - Antelope Bitterbrush - Nevada Bluegrass The Reference Community Phase has mountain big sagebrush and antelope bitterbrush dominant in the overstory. Nevada bluegrass is the dominant understory species. There is a wide variety of tall shrubs in small amounts such as chokecherry, serviceberry, silver sagebrush, tall green rabbitbrush, and currant. Other grasses and forbs that occur in small amounts include bluebunch wheatgrass, Sandberg bluegrass, bottlebrush squirreltail, phlox, Biscuitroot, buckwheat, balsamroot, and fleabane. An occasional lightning strike may cause a fire in small patches, therefore the natural fire frequency is very long, estimated at 200 to 1000 years.

Resilience management. The historic Reference State, previously referred to as the Historic Climax Plant Community (HCPC), moves through many phases depending on the natural and man-made forces that impact the community over time. State 1, described later, indicates some of these phases. The Reference Plant Community is Phase 1.1. This plant community is dominated by Nevada bluegrass and mountain big sagebrush. Antelope bitterbrush is subdominant in the overstory. Subdominant species include phlox, biscuitroot, and buckwheat. A variety of other tall shrubs occur in the plant community in small amounts. Most of these species occur in rock crevasses. The plant species composition of Phase 1.1 is listed later under “Reference Plant Species Composition”. Total annual production is 600 pounds per acre (672 kilograms per hectare) in a normal year. Production in a favorable year is 800 pounds per acre (896 kilograms per hectare). Production in an unfavorable year is 500 pounds per acre (560 kilograms per hectare). Structurally, tall shrubs are very dominant, followed by cool season deep rooted perennial bunchgrasses being more dominant than perennial forbs while shallow rooted bunchgrasses are subdominant. NOTE: This may be a Phase of a Shallow Stony Loam 12 to 16 inches ARTRV/PSSPS ecological site. This site has not been described. The Phase would be developed from “no fire”, where mountain big sagebrush and antelope bitterbrush have increased to the point of shading out principal understory species.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	350	420	560
Grass/Grasslike	80	100	130
Forb	70	80	110
Total	**500**	**600**	**800**

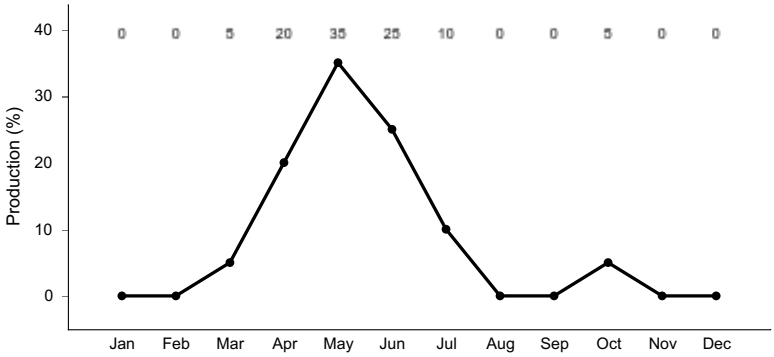

Figure 6. Plant community growth curve (percent production by month). ID0901, D25 ARTRV .

Community 1.2
Grass and Forb Dominated

Sandberg Bluegrass - Bottlebrush Squirreltail Tall Root sprouting shrubs This community develops in the small patches that occasionally burn from lightning strikes. This plant community is dominated by Sandberg bluegrass and bottlebrush squirreltail. There is a wide variety of forbs. Some tall, root-sprouting shrubs have increased. Mountain big sagebrush and antelope bitterbrush have been significantly reduced by the fire. All other bunchgrasses have died or are in much reduced vigor. Cheatgrass and other annuals may have invaded the site in small amounts.

Pathway 1.1A
Community 1.1 to 1.2

Phase 1.1 to 1.2. Develops with fire. Fires occur as patches, not entire site.

Pathway 1.2A
Community 1.2 to 1.1

Phase 1.2 to 1.1. Develops with no fire.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				80–130	
	Sandberg bluegrass	POSE	*Poa secunda*	1–20	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	1–10	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	1–10	–
	squirreltail	ELEL5	*Elymus elymoides*	1–10	–
	oniongrass	MEBU	*Melica bulbosa*	1–10	–
Forb					
2				70–110	
	phlox	PHLOX	*Phlox*	15–30	–
	desertparsley	LOMAT	*Lomatium*	15–30	–
	fleabane	ERIGE2	*Erigeron*	15–25	–
	buckwheat	ERIOG	*Eriogonum*	10–20	–
	balsamroot	BALSA	*Balsamorhiza*	10–15	–
	scabland penstemon	PEDE4	*Penstemon deustus*	0–10	–
	Salmon River beardtongue	PEPU12	*Penstemon pumilus*	0–5	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	0–5	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	0–5	–
	herb sophia	DESO2	*Descurainia sophia*	0–5	–
	silky phacelia	PHSE	*Phacelia sericea*	0–5	–
	sticky cinquefoil	POGLP	*Potentilla glandulosa ssp. pseudorupestris*	0–5	–
Shrub/Vine					
3				350–560	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	190–300	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	60–90	–
	desert sweet	CHMI2	*Chamaebatiaria millefolium*	1–25	–
	chokecherry	PRVI	*Prunus virginiana*	10–15	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	10–15	–
	silver sagebrush	ARCA13	*Artemisia cana*	1–10	–
	wax currant	RICE	*Ribes cereum*	1–10	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	1–10	–
	buckwheat	ERIOG	*Eriogonum*	1–10	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	1–5	–

Animal community

Wildlife Interpretations.

Animal Community – Wildlife Interpretations

This rangeland ecological site is typically surrounded by recent lava flows providing an island of diverse habitat for many native wildlife species. The number of small mammal species is typically related to the size of the Kipuka and isolation from other habitat types. The smaller the Kipuka typically the smaller the mammal populations. The more

isolated the Kipuka, there is a possibility that it may be visited fewer times by predators and may support higher populations of small mammals. The site is visited on a limited basis by mule deer and pronghorn antelope. Seasonal habitat is provided for resident and migratory animals including western toad, sagebrush lizard, western rattlesnake, shrews, bats, jackrabbits, ground squirrels, mice, coyote, red fox, badger, sage-grouse, Ferruginous hawk, prairie falcon, horned lark and western meadowlark. Changes in the plant community composition can reduce the numbers and diversity of wildlife species in the area. Encroachment of noxious and invasive plant species (cheatgrass, Rush skeleton weed, medusahead and knapweed) on some sites can replace native plant species which provide critical feed, brood-rearing and nesting cover for a variety of native wildlife. Water is limited only being provided by seasonal runoff and artificial water catchments. This rangeland ecological site is commonly associated with pre-historic lava flows which provide unique cave habitats for several sensitive animal species, including the blind cave leiodid beetle, cave obligate mite, bats, and cave obligate harvestman. Lava flows surrounding the Kipukas has provided habitat for townsend's big-eared bat, long-eared myotis, hoary bat and others. Kipukas provide foraging areas for these small mammals.

State 1 Phase 1.1 – Mountain Big Sagebrush/Antelope Bitterbrush/ Nevada Bluegrass/ Sandberg Bluegrass/ Bluebunch Wheatgrass/ Chokecherry/ Serviceberry Reference Plant Community (RPC): This plant community provides a diversity of grasses, forbs and shrubs, used by native insect communities that assist in pollination. The reptile and amphibian community is represented by leopard lizard, short horned lizard, sagebrush lizard, western skink, western rattlesnake and western toad. Amphibians are associated with springs and isolated water bodies adjacent to this plant community. Spring developments that capture all available water would preclude the use of these sites by amphibians. The plant community supports a variety of migratory and resident avian species that utilize both the grasses and shrubs for food, brood-rearing and nesting cover. Native shrub-steppe obligate avian species include the Brewer's sparrow, sage sparrow, sage-grouse and sage thrasher. The plant community supports seasonal needs of large mammals (mule deer and antelope) providing food and cover on a seasonal basis. Antelope bitterbrush, chokecherry and serviceberry are preferred forage for mule deer. Depending on size and isolation of Kipukas a limited small mammal population including golden-mantled ground squirrels, chipmunks, yellow-bellied marmots and pygmy rabbit may utilize this community.

State 1 Phase 1.2 - Sandberg Bluegrass/ Bottlebrush Squirreltail Plant Community: This plant community is the result of fire. The plant community, dominated by herbaceous vegetation with little or no sagebrush provides less vertical structure for animals. Insect diversity would be reduced but a diverse native forb plant community would still support select pollinators. Reptiles including desert horned lizard, short horned lizard, sagebrush lizard and western rattlesnakes, would be limited or excluded. The dominance of herbaceous vegetation with little sagebrush canopy would prevent use of these areas for nesting by Brewer's sparrow, sage sparrow and sage thrasher. Winter habitat for sage grouse is eliminated. The dominant herbaceous vegetation improves habitat for grassland avian species (horned lark and western meadowlark). Large mammal (mule deer and antelope) use would be seasonal and offer little thermal or young of year cover. Small mammal diversity would be reduced and the plant community would not provide suitable habitat for pygmy rabbit.

Grazing Interpretations.

This site is not suited for grazing because of the rough broken lava surrounding and intermingled with the site which makes it nearly impossible for domestic livestock movement. In the small localized areas where it is grazed, use the following information for determining initial stocking rate:
Estimated initial stocking rate will be determined with the landowner or decision-maker. They will be based on the inventory which includes species, composition, similarity index, production, past use history, season of use, and seasonal preference.

Hydrological functions

The soils in this site are in hydrologic group D. When ground cover is at or near potential the erosion hazard is moderate.

Wood products

None

Other products

None

Inventory data references

Information presented here has been derived from NRCS clipping and other inventory data. Also, field knowledge of range-trained personnel was used. Those involved in developing this site description include:
Dave Franzen, co-owner, Intermountain Rangeland Consultants, LLC
Jacy Gibbs, co-owner, Intermountain Rangeland Consultants, LLC
Jim Cornwell, Range Management Specialist, IASCD
Joe May, State Rangeland Management Specialist, NRCS, Idaho
Lee Brooks, Range Management Specialist, IASCD

References

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USDI Bureau of Land Management, US Geological Survey; USDA Natural Resources Conservation Service, Agricultural Research Service: Interpreting Indicators of Rangeland Health. Technical Reference 1734-6; version 4-2005.

Contributors

Dave Franzen And Jacy Gibbs

Approval

Kirt Walstad, 12/13/2023

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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Date	03/28/2007

Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills: rarely occur on this site. If rills are present they are likely to occur on slopes greater than 10 percent and immediately following wildfire and on areas within the site that have few surface stones. Rills are most likely to occur on soils with surface textures of silt loam and clay loam. Stones on the surface reduce the possibility of rills.

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2. **Presence of water flow patterns:** Water-Flow Patterns: rarely occur on this site. When they occur they are short and disrupted by cool season grasses and tall shrubs and surface stones. They are not extensive.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals and/or Terracettes: are rare on this site. In areas where slopes approach 10 percent and where flow patterns and/or rills are present, a few pedestals may be expected.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** On sites in mid-seral status bare ground may range from 25-35 percent.

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5. **Number of gullies and erosion associated with gullies:** Gullies: none

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind-Scoured, Blowouts, and/or Deposition Areas: usually not present. Immediately following wildfire some soil movement may occur on lighter textured soils.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter Movement: fine litter in the interspaces may move up to 2 feet following a significant run-off event. Coarse litter generally does not move. Surface stones reduce litter movement.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Surface Resistance to Erosion: values should range from 3 to 5 but needs to be tested.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil Surface Loss or Degradation: the A or A1 horizon is typically 1 to 3 inches thick. Structure ranges from weak very fine to fine granular. Soil organic matter (SOM) ranges from 2 to 4 percent.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial**

distribution on infiltration and runoff: Plant Community Composition and Distribution Relative to Infiltration: bunchgrasses, especially deep-rooted perennials, slow run-off and increase infiltration. Tall shrubs accumulate snow in the interspaces. Surface stones slow runoff and increase infiltration.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compaction Layer: not present.

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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: Functional/ Structural Groups: tall shrubs >>Cool season deep-rooted perennial bunchgrasses > perennial forbs > shallow rooted bunchgrasses.

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Plant Mortality/ Decadence: mountain big sagebrush will become decadent in the absence of fire and ungulate grazing. Grass and forb mortality will occur as tall shrubs increase.

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14. **Average percent litter cover (%) and depth (in):** Litter Amount: additional litter cover data is needed but is expected to be 20-25 percent to a depth of 0.2 inches. Under mature shrubs litter is >0.5 inches deep and is 90-100 percent ground cover.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual Production: is 600 pounds per acre (672 kilograms per hectare) in a year with normal temperatures and precipitation. Perennial grasses produce 10-25 percent of the total production, forbs 10-20 percent and shrubs 65-75 percent.

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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:** Invasive Plants: include bulbous bluegrass, whitetop, rush skeletonweed, musk and scotch thistle, and diffuse and spotted knapweed. Cheatgrass and medusahead may invade at lower elevations of site.

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17. **Perennial plant reproductive capability:** Reproductive Capability of Perennial Plants: all functional groups have the potential to reproduce in most years.
