USDA Natural Resources
Conservation Service

Ecological site R034BY334UT
Upland Stony Loam (Wyoming big sagebrush)

Last updated: 3/05/2022
Accessed: 05/18/2024

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.

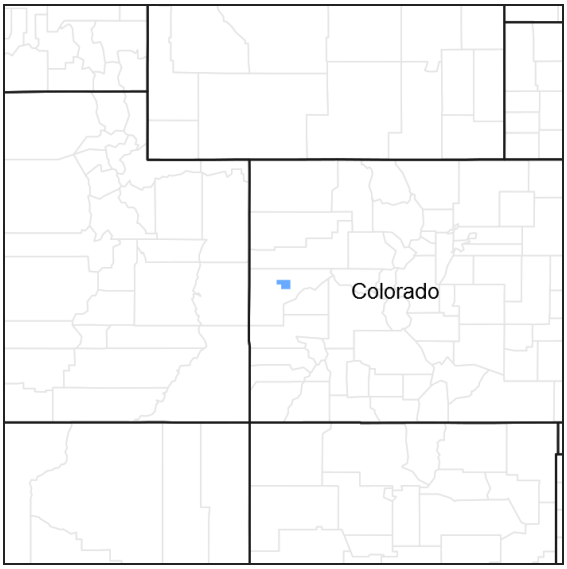

Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 034B–Warm Central Desertic Basins and Plateaus

MLRA 34B occurs in is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau.
Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA.
The average annual precipitation in most of this area ranges from 6 to 10 inches (150 to 255 millimeters). A small

part of this area receives as much as 24 inches of annual precipitation.
Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. Precipitation is more evenly distributed throughout the year in the northern part of the MLRA than in the southern part, where there is a significant peak in late summer. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The freeze-free period averages 170 days and ranges from 110 to 235 days.
The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 12 inches (205 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have an ustic soil moisture regime that borders on aridic. The dominant soil mineralogy is mixed and soils are formed in slope alluvium or residuum derived from shale or sandstone. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

Ecological site concept

Characteristic soils in this site are moderately deep to deep and well drained. They formed in eolian deposits over residuum derived from sandstone and shale parent materials. Soils are typically loamy-skeletal with more than 50 percent rock fragments throughout the soil profile. However, some non-skeletal soils with very cobbly surfaces are included in this site. The water supplying capacity is 2 to 7 inches. pH is slightly to moderately alkaline. The soil moisture regime is mostly aridic ustic and the soil temperature regime is mesic. Precipitation ranges from 12-16 inches annually. Average annual soil loss in potential is approximately 0.5 to 1 ton/acre. The soil surface factor (ssf) in potential is moderate (49).

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. wyomingensis* (2) *Purshia tridentata*
Herbaceous	Not specified

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Mountainside (2) Plateau
Runoff class	Low
Flooding frequency	None
Ponding frequency	None
Elevation	1,981–2,438 m
Slope	2–50%
Ponding depth	Not specified
Water table depth	Not specified
Aspect	N, SW

Climatic features

Average annual precipitation is 12 to 16 inches. Approximately 60% occurs as rain from March through October. Much of this summer precipitation occurs as convection thunderstorms. On the average, November through February are the driest months and July through October are the wettest months. The soil temperatures are in the

frigid regime. In average years, plants begin growth around March and April and end growth in October. Plants usually remain green until frost in October except in drier than average years. There is usually an active greenup period in the fall. The most rapid growth occurs during April, May and June.

Table 3. Representative climatic features

Frost-free period (average)	
Freeze-free period (average)	125 days
Precipitation total (average)	356 mm

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands.

Soil features

Characteristic soils in this site are moderately deep to deep and well drained. They formed in eolian deposits over residuum derived from sandstone and shale parent materials. Soils are typically loamy-skeletal with more than 50 percent rock fragments throughout the soil profile. However, some non-skeletal soils with very cobbly surfaces are included in this site. The water supplying capacity is 2 to 7 inches. pH is slightly to moderately alkaline. The soil moisture regime is mostly aridic ustic and the soil temperature regime is mesic. Precipitation ranges from 12-16 inches annually. Average annual soil loss in potential is approximately 0.5 to 1 ton/acre. The soil surface factor (ssf) in potential is moderate (49).

Table 4. Representative soil features

Parent material	(1) Eolian deposits–sandstone and shale (2) Residuum–sandstone and shale
Surface texture	(1) Loam (2) Gravelly loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Depth to restrictive layer	51–152 cm
Soil depth	51–152 cm
Surface fragment cover <=3"	0–23%
Surface fragment cover >3"	0–8%
Available water capacity (Depth not specified)	5.08–17.78 cm
Calcium carbonate equivalent (Depth not specified)	0–15%
Electrical conductivity (Depth not specified)	0–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–5
Soil reaction (1:1 water) (Depth not specified)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	9–37%
Subsurface fragment volume >3" (Depth not specified)	2–12%

Ecological dynamics

Ecological Dynamics of the Site
It is impossible to determine in any quantitative detail the historic plant community for this ecological site because of the lack of historical documentation. In some areas, the earliest reports of dominant plants include the cadastral survey conducted by the General Land Office, which began in the late 19th century for this area (Galatowitsch 1990). Although there is evidence of Native Americans passing through southern extent of this ecological site, there has been no evidence of permanent inhabitance. The northern extent of this ecological site did have signs of permanent inhabitants for a short time (Spangler 1995), then became similar to the southern extent of this site. The first Europeans came to eastern Utah in 1765 as a Spanish expedition, however it wasn't until approximately 1870 that Europeans brought livestock to the area (Watt 1997). Itinerant and local sheep flocks followed, largely replacing cattle as the browse component increased.

Below is a State and Transition Model diagram to illustrate the "phases" (common plant communities), and "states" (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.
The major successional pathways within states, ("community pathways") are indicated by arrows between phases. "Transitions" are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram. The transition between Reference State 1 and State 2 is considered irreversible because of the naturalization of exotic species of both flora and fauna, possible extinction of native species, and climate change. There may have also been accelerated soil erosion.
When available, monitoring data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more details.

The plant communities shown in this State and Transition Model may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and/or new ones may be added. According to the USDA NRCS National Range & Pasture Handbook (USDA-NRCS 2003), Desired Plant Communities (DPC's) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision, not to imply what the desired plant community should be.
State 1: Reference State
The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and familiarity with rangeland relict areas where they exist. The Reference State for this site would have been a shrub semi-desert characterized by Wyoming big sagebrush and associated native perennial forbs and grasses. A more complete list of species by lifeform for the Reference State is available in the accompanying tables in the "Plant Community Composition by Weight and Percentage" section of this document.

Community Phase 1.1: Wyoming big sagebrush with native perennial grasses and forbs
This community is dominated by Wyoming big sagebrush, Indian ricegrass and galleta. Shadscale and winterfat are also commonly present in the shrub layer. Indian ricegrass and galleta are the principle perennial grasses. Bottlebrush squirreltail is also commonly present. Abundant forbs including longleaf phlox and scarlet globemallow. Natural fire frequency is estimated to be 10 to 70 years (USDA-FS, 2006).

Community Phase Pathway 1.1-1.2
Extended period of time without a major disturbance such as fire or insect. This allows Wyoming big sagebrush to dominate the plant community and suppress the understory species. Fire frequency extends well beyond the 10 to 70 year average for the site.

Community Phase Pathway 1.1-1.3
Recent fire occurrence, lightning or human caused, eliminating sagebrush and other non-sprouting species from the community. Site is properly grazed.

Community Phase 1.2: Wyoming big sagebrush and juniper
Wyoming big sagebrush increases significantly in percent composition. Winterfat, shadscale and yellow rabbitbrush may increase also. Shrubs become decadent due to age. Perennial grasses and forbs lose vigor, due to competition for available resources, and juniper may have begun to encroach on the site. With the plant interspaces becoming larger from the reduction of the understory, soil erosion may accelerate. Water flow patterns and pedestals become more abundant. Although the overall functionality of the site is still intact, it is at risk of further degradation.

Community Phase 1.3: Perennial grasses with sprouting shrubs and scattered annual species.
Native perennial bunchgrasses dominate this community phase. Wyoming big sagebrush and shadscale decrease in the community. Winterfat has the ability to re-sprout and re-establish following a fire. Yellow rabbitbrush and horsebrush species may increase significantly following fire and much of the excess fine fuel accumulation is removed. Fire tolerant shrubs typically persist as dominant shrubs in the community for 30 years or longer. Indian ricegrass and other perennial grasses flourish.

Community Phase Pathway 1.2-1.3
This pathway occurs with natural or human induced fire. Site is properly grazed.

Community Phase Pathway 1.3-1.1
This represents the time following a fire with a normal fire return interval of 10-70 years. Site is properly grazed.

Transition 1-2
A threshold is crossed when there is an introduction of non-native species, primarily cheatgrass and various annual forbs, that become established in the community.

State 2: Current Potential
This state includes plant communities dominated by a diverse mixture of perennial grasses, a mixture of Wyoming big sagebrush and perennial grasses, and a community dominated by Wyoming big sagebrush. These community phases occur depending on the time since a disturbance that kills Wyoming big sagebrush has occurred, such as fire, insects, or drought, and grazing that provides adequate duration, timing, and intensity that maintain plant vigor and health of the plant community.
Plant communities in this state can include native, acclimatized, naturalized and invasive non-native species. This state is irreversibly changed from the reference state because these non-native species will now remain a permanent part of the community.
This plant community has the composition, structure and cover present that facilitates the capture, storage, and safe release of precipitation. Nutrients are being cycled through deep rooted perennial grasses, forbs, and evergreen shrubs, and energy capture throughout the entire growing season (March to October) such that this plant community and site resiliency is maintained. With a lengthened fire return interval (greater than 70 years), an increase in sagebrush canopy occurs until sagebrush dominates available resources. This results in a decrease in vigor, cover and reproduction of perennial grasses, and an increase in invasive annuals such as cheatgrass. Once junipers become a dominant feature, they are a permanent part of the plant community until a fire or management action removes them. The understory is depleted (lack of both living plants and seed bank) so that a return to state 2 is not possible.

Community Phase 2.1: Wyoming big sagebrush/perennial native herbs with minor component of exotic species
This community is dominated by Wyoming big sagebrush, Indian ricegrass and galleta. Shadscale and winterfat are also commonly present in the shrub layer. Indian ricegrass and galleta are the principle perennial grasses. Bottlebrush squirreltail is also commonly present. Abundant forbs include longleaf phlox and scarlet globemallow. Naturalized and invasive non-native species are also present. Natural fire frequency is estimated to be 10 to 70 years.

Community Phase Pathway 2.1-2.2
Fire or brush management or excessive browsing removes non-sprouting shrubs from the community.

Community Phase Pathway 2.1-2.3
Improper grazing (including season long, overstocking, wrong season, etc.) and/or drought remove annual and perennial fine fuels from the site decreasing the potential for fire to occur. Fire frequency extends beyond the 10 – 70 year average for the site. Utah juniper may begin to invade the site if a seed source is available.

Community Phase 2.2: Perennial grasses and sprouting shrubs and scattered annual species.
Wyoming big sagebrush and shadscale decrease in the community. Winterfat resprouts following the fire. Yellow rabbitbrush and horsebrush may increase significantly in the community following fire. Several native grasses dominate the understory. Fire tolerant shrubs typically persist as dominants shrubs in the community for 30 years or longer. The abundance of invasive annuals prior to the disturbance will dictate their abundance post disturbance.

Community Phase Pathway 2.2-2.1
Site is properly grazed for an extended period of time without disturbance. Plant community succession results in an increase of non-sprouting shrubs such as sagebrush.

Community Phase 2.3: Wyoming big sagebrush with scattered juniper and depleted herbaceous understory and annuals.

Wyoming big sagebrush and/or shadscale increase significantly in percent composition. Winterfat and yellow rabbitbrush may increase also. Shrubs become decadent due to age. Indian ricegrass, needleandthread and other grasses begin to lose vigor because of improper grazing (including, season long overstocking, wrong season, etc.) and/or increased shrub competition. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species. Utah Juniper may begin to encroach in this community phase but is small and low in cover.

Community Phase Pathway 2.3-2.2
Fire, brush management or excessive browsing removes non-sprouting shrubs from the community. Yellow rabbitbrush and/or horsebrush species may become dominant.

Transition 2-3
Sustained, long-term improper grazing (including season long, overstocking, wrong season, etc.); and/or prolonged drought. Lengthening of the fire return interval.

Transition 2-4
Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency.

Transition 2-5.1
Disturbance such as a fire or brush management followed by a rangeland seeding.

Transition 2-6
Sustained, long-term improper grazing and/or the lack of fire.

State 3: Juniper Invasion
Native shrubs such as Wyoming big sagebrush or rabbitbrush dominate the site. The occurrence of fire extends well beyond the normal period for the site. Wyoming big sagebrush is non-sprouting and will be killed by fire. Rabbitbrush can sprout after a fire and can become the dominant shrub. This state typically has invasive grasses and/or forbs as the dominant understory species. There may be a few native species remaining, but they do not dominate. Utah junipers may increase to occupy a significant portion of the over story, if a seed source is present. Wyoming big sagebrush dominates the shrub layer and may be decadent due to age. Indian ricegrass and other native bunchgrasses are significantly reduced due to increased shrub and tree competition and/or heavy grazing pressure. Galleta may increase.

Community Phase 3.1: Wyoming big sagebrush and/or Utah juniper, invasive annuals

Wyoming sagebrush is typically the dominant shrub in this community phase. Where Utah juniper has invaded, Wyoming big sagebrush and other shrubs decline, otherwise they dominate the community. Winterfat is dead or dying. Remaining perennial herbaceous vegetation is mostly found only in protected locations under shrubs. Invasive, non-native grasses and weeds including cheatgrass, annual mustards, redstem storksbill, etc. typically dominate the understory.

Community Phase Pathway 3.1-3.2
Lengthening of the fire return interval.

Community Phase 3.2: Juniper near monoculture
The number and size of trees
has increased with the absence of fire. The understory shrub and herbaceous vegetation has become very decadent or absent. A few scattered shrubs may still exist with the herbaceous component nearly nonexistent. Exposed soil results in increased runoff and erosion.

Transition 3-4
Fire, with long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought.

Restoration Pathway 3-5
Fire or brush management with the seeding of introduced species with prescribed grazing.

State 4: Invasive Annuals
Invasive grasses and forbs dominate this state. This may occur under a shortened fire return cycle which excludes native non sprouting shrubs by frequent burning or this may occur with repeated improper grazing, or a combination of the two. Indian ricegrass and other native bunchgrasses are significantly reduced due to competition from invasive annuals and/or improper grazing and shortened fire return interval. Only remnant perennial species remain. Highly combustible fine fuels from invasive annuals dominate the community. Reoccurring fire is common. Fire frequency is 5 – 30 years. Cheatgrass dominance prevents reestablishment of sagebrush due to competition.

Community Phase 4.1: Invasive annuals dominated community with sprouting shrubs.

Invasive annuals dominate this community phase. If shrubs are present, yellow rabbitbrush dominates the shrub layer. Remaining Winterfat is mostly dead. Horsebrush species can also be plentiful if conditions are right. Fire tolerant shrubs may persist as dominants with fire periods reoccurring at intervals of 5 - 30 years. Broom snakeweed may be a dominant episodic species when conditions are favorable. Only remnant perennial bunchgrasses remain, if any; invasive annuals including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory

Restoration Pathway 4-5
Seeding of introduced species with prescribed grazing.

State 5: Seeded State
This state is seeded to rangeland species that are composed of mostly introduced species. Trees and/or shrubs are initially reduced but they will eventually re-occupy the site through natural succession. Invasive annual grasses and weedy forb species primarily, cheatgrass and various annual mustards, may be present in the seeding, but do not dominate. The introduced perennial grasses prevent the reestablishment of native herbaceous species due to competition, and can persist indefinitely.

Community Phase 5.1: Introduced Perennial Grasses

This plant community is the result of a seeding of introduced grasses. Although there may be some native species present, however the introduced species will dominate the site. Shrubs are sparse to absent. Range seedings, when healthy, are usually resistant to fire.

Community Phase Pathway 5.1-5.2
Over time Wyoming big sagebrush and other shrubs gradually move back into the site. The rate of this re-colonization may depend on factors such as climate, management and grazing (both domestic and wildlife). Re-colonization of non-sprouting shrubs requires 10-70 years without fire.

Community Phase 5.2: Wyoming big sagebrush, introduced perennial grasses
This community shows where sagebrush and other shrubs have slowly reestablished in the area and have become dominate or codominant with the herbaceous component.

Community Phase Pathway 5.2-5.1
Site receives good grazing management. Mechanical, chemical, biological or fire disturbances reduce the woody

vegetation components of the community. Perennial herbaceous vegetation becomes dominant.

Transition 5.2-3
Invasion of the site by junipers, long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; lengthened fire frequency allows the site to be invaded by juniper.

Transition 5-4
Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency allows the understory vegetation on the site to be dominated by invasive annuals.

State 6: Sagebrush with cheatgrass understory
This state is characterized by a decadent sagebrush overstory with scattered other shrubs and the understory that is dominated by cheatgrass with scattered native grasses and forbs, caused by long-term improper grazing (including season long, overstocking, wrong season, etc.). Sagebrush and native herbaceous species cannot reestablish due to competition from cheatgrass.

Community Phase 6.1: Sagebrush with invasive annual understory
Cheatgrass and other invasive annuals dominate the understory of a decadent stand of Wyoming big sagebrush. A component of other shrubs is typically present and remnant populations of native grasses and forbs may still be present. This community phase is very susceptible to wildfire due to the high amounts of fine fuels produced from the invasive annuals.

Transition 6-4
Fire, with long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought.

Restoration Pathway 6-5.1
Disturbance such as a fire or brush management followed by a rangeland seeding.

State and transition model

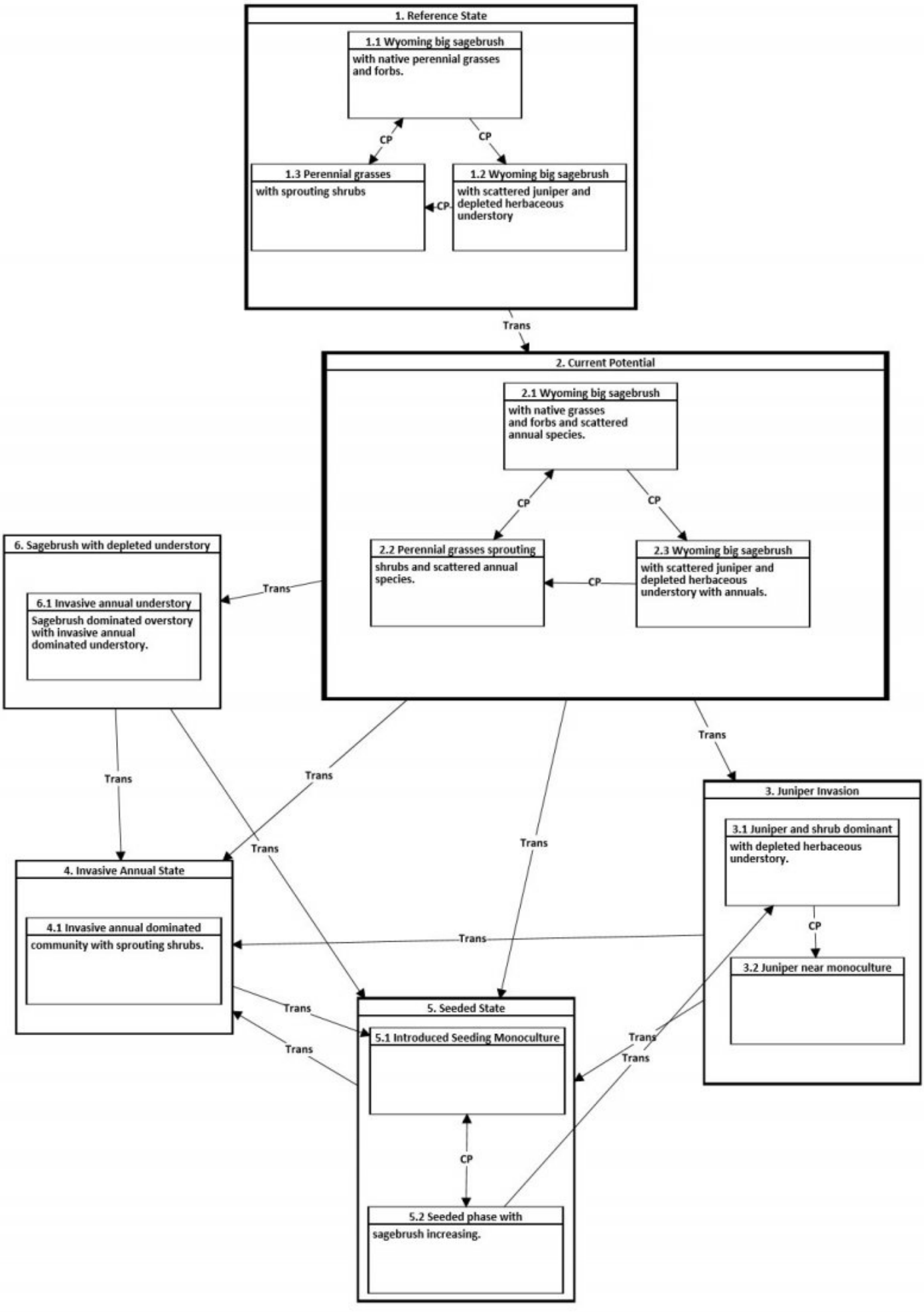
1. Reference State
1.1 Wyoming big sagebrush
with native perennial grasses and forbs.
CP
CP
1.3 Perennial grasses
with sprouting shrubs
CP
1.2 Wyoming big sagebrush
with scattered juniper and depleted herbaceous understory
Trans
2. Current Potential
2.1 Wyoming big sagebrush
with native grasses and forbs and scattered annual species.
CP
CP
2.2 Perennial grasses sprouting
shrubs and scattered annual species.
CP
2.3 Wyoming big sagebrush
with scattered juniper and depleted herbaceous understory with annuals.
6. Sagebrush with depleted understory
Trans
6.1 Invasive annual understory
Sagebrush dominated overstory with invasive annual dominated understory.
Trans
Trans
Trans
Trans
Trans
Trans
3. Juniper Invasion
3.1 Juniper and shrub dominant
with depleted herbaceous understory.
CP
3.2 Juniper near monoculture
4. Invasive Annual State
4.1 Invasive annual dominated
community with sprouting shrubs.
Trans
Trans
Trans
5. Seeded State
5.1 Introduced Seeding Monoculture
CP
5.2 Seeded phase with
sagebrush increasing.
Trans
Trans

Diagram Legend

T 1-2	Introduction of exotic species.
T 2-3	Poor grazing management and/or lengthened fire return interval.
T 2-4	Poor grazing management and/or drought with increased fire return interval.
T 2-5	Disturbance such as fire or brush management followed by a rangeland seeding.
T 2-6	Improper grazing and/or lack of fire.
T 3-4	Poor grazing management and/or drought and a shortened fire return interval.
T 3-5	Disturbance such as brush management or fire and range seeding.
T 4-5.1	Seeding of introduced species with prescribed grazing.
T 5.2-3.1	Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or lengthened fire frequency.
T 5-4	Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency allows the understory vegetation on the site to become dominated by invasive annuals.
T 6-4	Fire without a rangeland seeding.
T 6-5	Brush management and/or fire followed by rangeland seeding with primarily introduced species.
CP 1.1-1.2	Increased time since disturbance/fire.
CP 1.1-1.3	Fire.
CP 1.2-1.3	Fire.
CP 1.3-1.1	Time after fire with prescribed grazing.
CP 2.1-2.2	Fire, brush management or heavy browse use.
CP 2.1-2.3	Poor grazing management and/or drought.
CP 2.2-2.1	Time after fire with prescribed grazing.
CP 2.3-2.2	Fire, brush management or heavy browse use.
CP 3.1-3.2	Continued poor grazing management and/or drought and lengthened fire return interval.
CP 5.1-5.2	Overgrazing and/or drought.
CP 5.2-5.1	Prescribed grazing with brush management or fire.

State 1
Reference State

Community 1.1

Reference State

The dominant aspect of the plant community is Wyoming big sagebrush and bitterbrush. The composition by air-dry weight is approximately 45 percent perennial grasses, 10 percent forbs and 45 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	429	581	681
Grass/Grasslike	429	581	681
Forb	95	129	151
Total	**953**	**1291**	**1513**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	29-31%
Grass/grasslike foliar cover	29-31%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	29-31%	29-31%	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			377–538	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata* ssp.	202–269	

	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	202–269	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	135–202	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	40–67	–
3	**Sub-Dominant Shrubs**			282–794	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	135–202	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	13–54	–
	longflower rabbitbrush	CHDE2	*Chrysothamnus depressus*	13–54	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	13–54	–
	mormon tea	EPVI	*Ephedra viridis*	13–54	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	13–54	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	13–54	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	13–54	–
	creeping barberry	MARE11	*Mahonia repens*	13–54	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	13–54	–
	rock goldenrod	PEPU7	*Petradoria pumila*	13–54	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	13–54	–
Grass/Grasslike					
0	**Dominant Grasses**			256–605	
	needle and thread	HECO26	*Hesperostipa comata*	135–202	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	67–135	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	13–67	–
	western wheatgrass	PASM	*Pascopyrum smithii*	13–67	–
	muttongrass	POFE	*Poa fendleriana*	13–67	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	13–67	–
1	**Sub-Dominant Grasses**			81–242	
	Grass, annual	2GA	*Grass, annual*	13–67	–
	Grass, perennial	2GP	*Grass, perennial*	13–67	–
	blue grama	BOGR2	*Bouteloua gracilis*	13–27	–
	Geyer's sedge	CAGE2	*Carex geyeri*	13–27	–
	squirreltail	ELEL5	*Elymus elymoides*	13–27	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	13–27	–
Forb					
0	**Dominant Forbs**			13–67	
	rayless tansyaster	MAGR2	*Machaeranthera grindelioides*	13–67	–
2	**Sub-Dominant Forbs**			81–242	
	Forb, annual	2FA	*Forb, annual*	13–67	–
	Forb, perennial	2FP	*Forb, perennial*	13–67	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	13–27	–
	thickleaf beardtongue	PEPA6	*Penstemon pachyphyllus*	13–27	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	13–27	–
	stemless mock goldenweed	STAC	*Stenotus acaulis*	13–27	–

Animal community

This site provides proper grazing for cattle and sheep during spring, summer, and fall.
This site produces food and cover for wildlife.
Wildlife using this site include jackrabbit, coyote, mule deer, and elk.

Hydrological functions

The soil is in hydrologic group c. The runoff curve numbers are 74 through 86 depending on the condition of the watershed.

Recreational uses

This site has low recreational potential and often has scenic vistas.

Wood products

None

Other references

Modal Soil: Lanver L Moist 2-4% — loamy-skeletal, mixed, mesic Ustollic Calciorthids

Contributors

J. Lee Broadbent

Approval

Kirt Walstad, 3/05/2022

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)	V. Keith Wadman (NRCS Retired).
Contact for lead author	shane.green@ut.usda.gov
Date	03/10/2012
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to few rills present. Some increase in rill development may occur on steeper slopes or on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Where rills are present, they should be fairly short (3-6 feet), <1 inch deep and somewhat widely spaced (4-8 feet). Rills may increase in lenght (4-8 feet) and decrease in spacing (3-6 feet)on slopes greater than 40 percent. A minor increase in rill development may be observed on all slopes following major thunderstorm or spring runoff events but should heal during

the next growing season.

---

2. **Presence of water flow patterns:** Some very minor evidence of water flow patterns may be found around perennial plant bases. They show little evidence of current erosion. They are expected to be short (3-6 feet), stable, sinuous, and not connected. There may be very minor evidence of deposition. Evidence of water flow may increase somewhat with slope.

---

3. **Number and height of erosional pedestals or terracettes:** Perennial vegetation shows little evidence of erosional pedestalling (1 to 2% of individual plants). Plant roots are covered and litter remains in place around plant crowns. Terracettes should be absent or, if present, stable. A slight increase in both pedestal and terracette development may occur with increasing slope.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-20% bare ground. Bare ground spaces should not be greater than 1 foot in diameter.

---

5. **Number of gullies and erosion associated with gullies:** No gullies present on site. A very few gullies may be present in landscape settings where they transport runoff from areas of greater water flow such as exposed bedrock. These gullies will be limited to slopes exceeding 20% and adjacent to sites where this runoff accumulation occurs. Any gullies present should show little sign of accelerated erosion and should be stabilized with perennial vegetation.

---

6. **Extent of wind scoured, blowouts and/or depositional areas:** None. No evidence of wind generated soil movement is present. Wind caused blowouts and deposition are not present.

---

7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution downslope caused by water movement. Minor litter removal may occur in flow channels with deposition occurring within 1 to 2 feet at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move. However, some litter movement is expected (up to 6 feet) with increases in slopes >15% and/or increased runoff resulting from heavy thunderstorms.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 5 or 6 under the plant canopies, and a rating of 3 to 5 in the interspaces. The average rating should be a 5. Soil surface textures are typically gravelly loams and fine sandy loams.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (St. Marys) Soil surface 0-9 inches. Texture is a gravelly loam; color is dark brown (7.5YR4/3); and structure is very weak, fine granular. Mollic epipedon ranges from 9 to 20 inches. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

---

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

distribution on infiltration and runoff: Perennial vegetation produces sufficient cover and spatial arrangement to intercept most raindrops and reduce raindrop splash erosion. Litter on soil surface and cryptogamic crusting, where present, also protect soil from splash erosion and encourages a higher rate of infiltration. Plant spatial distribution should slow runoff, allowing additional time for infiltration. Bare spaces are expected to be small and irregular in shape and are usually not connected. Vegetative structure is usually adequate to capture snow and ensure that snowmelt occurs in a controlled manner, allowing maximum time for infiltration, and reducing runoff and erosion in all but the most extreme storm events. When perennial grasses and shrubs decrease due to natural events (i.e., drought, insect damage, etc.) which reduce ground cover and increase bare ground, runoff is expected to increase and associated infiltration reduced.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. A "C" horizon which contains a very cobbly heavy fine sandy loam occurs at 26 to 50 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: Perennial bunchgrasses (needle-and-thread, Indian ricegrass), > = Non-sprouting shrub (Wyoming big sagebrush), > Sprouting shrub (antelope bitterbrush).

    Sub-dominant: Rhizomatous grasses (western wheatgrass) > = Sprouting shrubs (alderleaf mountain mahogany, green rabbitbrush) > Perennial forbs (scarlet globemallow).

    Other: A wide variety of other perennial grasses and both perennial and annual forbs can be expected to occur in the plant community.

    Additional: Natural disturbance regimes include fire, drought, and insects. Assumed fire cycle of 30 to 40+ years. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Crested wheatgrass, Smooth brome, intermediate wheatgrass, Siberian Wheatgrass etc.)
    Following a disturbance such as fire, drought, rodents or insects that remove woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community for a period of time. If a disturbance has not occurred for an extended period of time, woody species may continue to increase. These conditions would reflect a functional community phase within the reference state.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All age classes of perennial grasses should be present under average to above average growing conditions. There may be partial mortality on individual bunchgrasses and shrubs during drought periods, and complete mortality of individual plants during severe drought periods. Slight decadence in the principle shrubs could occur near the end of the fire cycle or during periods of extended drought, or insect infestations. In general, a mix of age classes should be expected with some dead and decadent plants present.

---

14. **Average percent litter cover (%) and depth (in):** Litter cover will be heavier under plants. Most litter will be herbaceous and depths of 1/2 to 1 inch would be considered normal. Perennial vegetation should be well distributed on the site.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-**

production): Annual production in air-dry herbage should be approximately 1100 - 1200 #/acre on an average year but could range from 800 - 1400 #/acre during periods of prolonged drought or above average precipitation.

---

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:** Cheatgrass, Russian thistle, Utah juniper, and non-native, invasive annual forbs.

---

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce in all years, except in extreme drought years. Green rabbitbrush sprouts vigorously following fire. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species is present during average and above average growing years.
