USDA Natural Resources Conservation Service

Ecological site R010XY230OR
Aspen Upland 12-18 PZ

Last updated: 12/13/2023
Accessed: 04/12/2024

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.

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.

Classification relationships

Landfire Biophysical Setting:
Rocky Mountain Aspen Forest & Woodland

US National Vegetation Classification System
Group: G222. Rocky Mountain Subalpine-Montane Aspen Forest & Woodland
Alliance: A2036. *Populus tremuloides* Rocky Mountain Forest & Woodland Alliance
Association: (Undetermined)

Ecological site concept

In reference condition, this site supports a mature aspen forest with a diverse understory. In comparison to riparian aspen sites, this site is drier and exists on upland landforms such as swales, talus slopes, seeps, or snow pockets. Common plant species that characterize the reference community include mountain snowberry (*Symphoricarpos oreophilus*) and Idaho fescue (*Festuca idahoensis*). Unlike upland aspen stands in other portions of the Great Basin, this site is found on mid-elevations, typically between 4,300 and 7,000 feet. Historically wildfire was an important disturbance on this site that reduced invasion of encroaching western Juniper. Alteration of this disturbance regime may be promoting expansion of this competitive conifer on this site.

Associated sites

R010XC047OR	**SR Mountain South 12-16 PZ** SR Mountain South 12-16 PZ (drier site, no available sub-surface flows, different composition – aspen absent)
R010XC066OR	**SR Mountain North 12-16 PZ** SR Mountain North 12-16 PZ (drier site, less available sub-surface flows, different composition – aspen absent)
R010XC032OR	**SR Mountain 12-16 PZ** SR Mountain 12-16 PZ (drier site, no available sub-surface flows, different composition – aspen absent)
R010XY012OR	**Booth-Yellow Willow Riparian** Willow Riparian: Booth-Yellow Willow and other Willow Riparian Sites (wetter sites, deposition floodplain location, higher available sub- surface and surface flows, different composition – aspen minor or absent)
R010XY117OR	**Mountain Swale 12-16 PZ** Mountain Swale 12-16 PZ (drier site, less available sub-surface flows, different composition – aspen absent, LECI4 dominant)
R010XY220OR	**Alder Riparian 12-18 PZ** Alder Riparian 12-18 PZ (transportation reach, steeper grade, gravelly surface and subsurface, different composition – aspen minor)
R010XY225OR	**Aspen Riparian 12-18 PZ** Aspen Riparian 12-18 PZ (deposition location, flatter slope, wetter site, different composition-POTR5/SALIX-RIAU/LECI4 association)

Similar sites

R023XY418OR	**ASPEN 16-35 PZ** Aspen 16-35 PZ (higher elevation, coarser soil, different composition – POTR5/SYOR2/CAREX association with an increase in ACHNA)
R010XY225OR	**Aspen Riparian 12-18 PZ** Aspen Riparian 12-18 PZ (deposition location, flatter slope, wetter site, different composition-POTR5/SALIX-RIAU/LECI4 association)

Table 1. Dominant plant species

Tree	(1) *Populus tremuloides*
Shrub	(1) *Symphoricarpos oreophilus* (2) *Ribes*
Herbaceous	(1) *Festuca idahoensis* (2) *Leymus cinereus*

Physiographic features

This site typically occurs near forestland on the southern edge of the Ochoco and Blue Mountains where juniper invasion is a concern. It occurs on mountain side slopes and plateaus in areas receiving additional subsurface moisture. Locations include swales, foot slopes, talus sites, seeps and snow drift micro sites. Slopes typically range from 2 to 35 percent but may be as steep as 60 percent. Aspects are variable, but typically have a north to northeast exposure. Elevations range from 4,300 to 6,300 feet (1,300 to 1,900 meters) but may occur as high as 7,000 feet (2,150 meters). The site is not subject to ponding. No water table is present.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Mountains > Plateau (3) Mountains > Swale
Flooding duration	Extremely brief (0.1 to 4 hours)

Flooding frequency	None to very rare
Ponding frequency	None
Elevation	4,300–6,300 ft
Slope	2–35%
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding duration	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	4,300–7,000 ft
Slope	2–60%

Climatic features

The annual precipitation ranges from 12 to 18 inches (300 to 450 mm), but may receive as much as 25 inches (630 mm) most of which occurs in the form of snow and rain during the months of November through May. Localized convection storms occasionally occur during the summer. The soil temperature regime is mesic near frigid to frigid with a mean air temperature of 43° F (6° C) and a range of 39 to 46° F (4 to 8° C). Temperature extremes range from 90 to -20° F (-28 to 32° C). The frost free period is typically 20 to 90 days. The soil moisture regime is Xeric. The optimum growth period for plant growth is late May through July. Climate graphs are based on the nearest available climate stations to representative site locations and are provided to indicate general climate patterns.

Table 4. Representative climatic features

Frost-free period (characteristic range)	20-90 days
Freeze-free period (characteristic range)	70-120 days
Precipitation total (characteristic range)	12-18 in
Frost-free period (actual range)	
Freeze-free period (actual range)	
Precipitation total (actual range)	12-25 in
Frost-free period (average)	55 days
Freeze-free period (average)	95 days
Precipitation total (average)	16 in

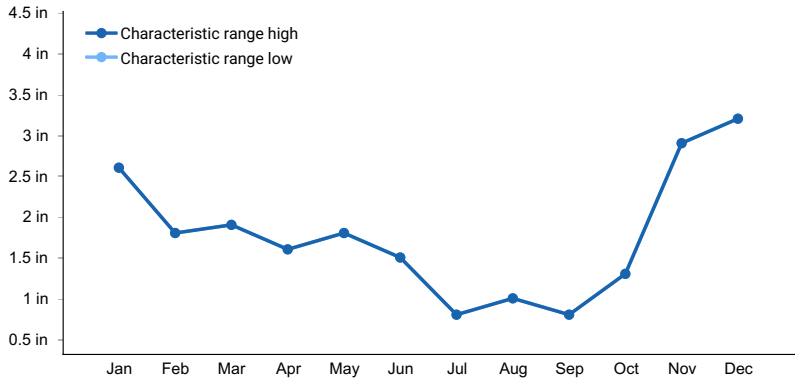


Figure 1. Monthly precipitation range

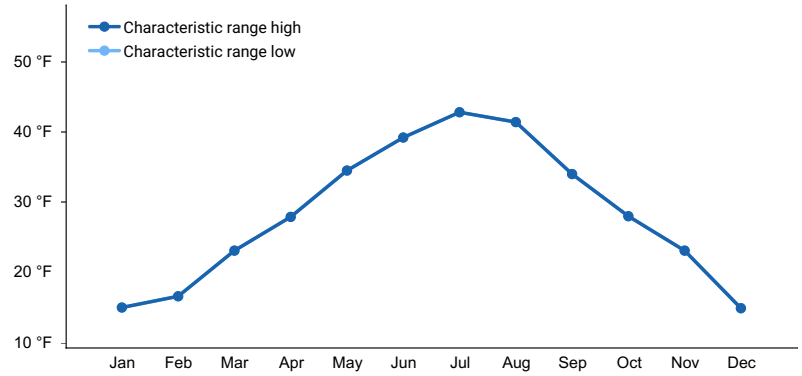


Figure 2. Monthly minimum temperature range

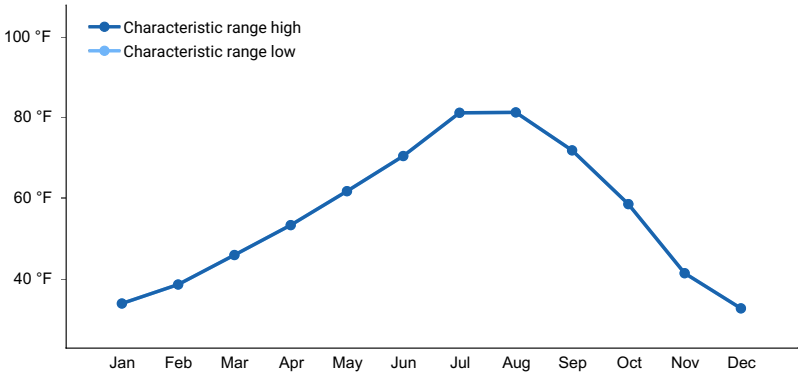


Figure 3. Monthly maximum temperature range

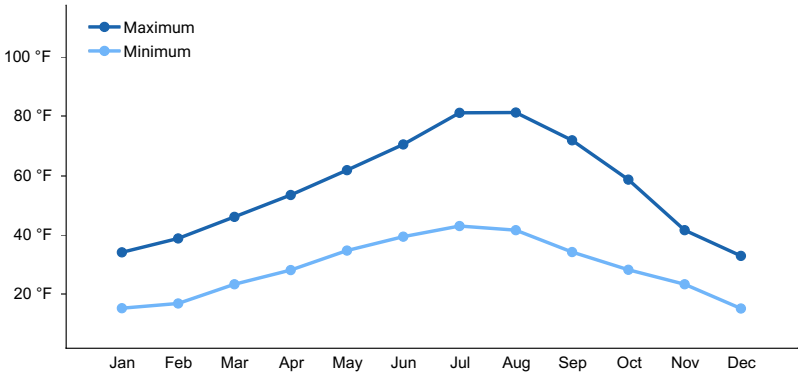


Figure 4. Monthly average minimum and maximum temperature

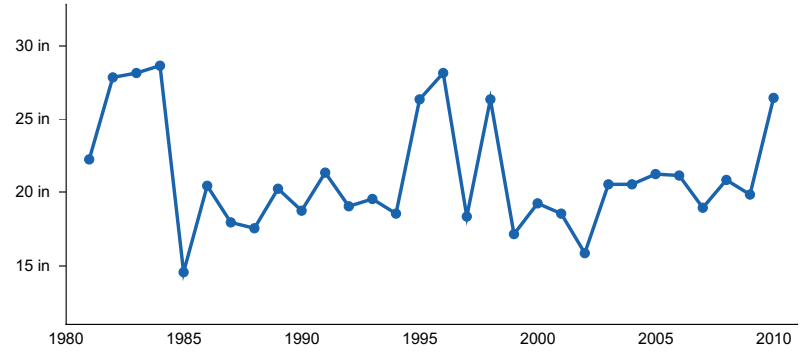


Figure 5. Annual precipitation pattern

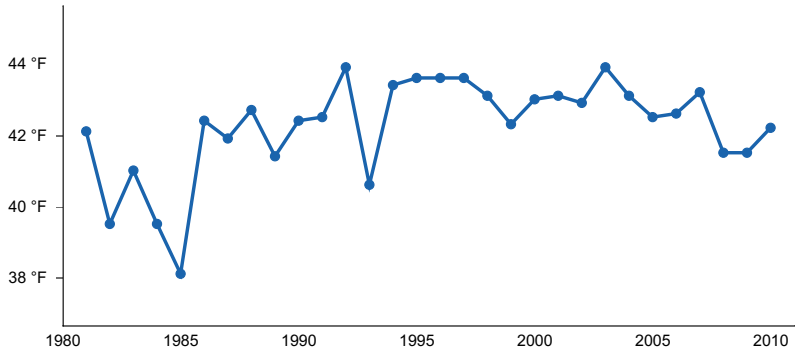


Figure 6. Annual average temperature pattern

Climate stations used

- (1) AUSTIN 3 S [USC00350356], Prairie City, OR
- (2) WESTFALL [USC00359176], Harper, OR

Influencing water features

This site receives additional subsurface moisture due to its topographical position relative to areas of snow accumulation or springs. These may include areas of snow drifting where late season melting infiltrates soils and augments growing season soil moisture. While this site is not associated with riparian areas and streams, it may also be found adjacent to low volume seeps.

Wetland description

Not defined.

Soil features

The soils of this site are typically deep to very deep and well drained. Soil organic matter is typically high. The family particle size is coarse loamy, with loam, fine sandy loam and ashy silt loam textures common in surface and subsurface horizons. Discontinuous small gravel lenses are common. Depth to bedrock is greater than 40 inches. Permeability is moderate to moderately slow. The available water holding capacity (AWC) is about 10 to 12 inches for the profile. Ephemeral sub-surface flows supplement the AWC. The erosion potential is moderate to severe. See Scratchpost for a typical soil series associated with this site concept.

Table 5. Representative soil features

Parent material	(1) Volcanic ash–rhyolite (2) Colluvium–tuff
Surface texture	(1) Loam (2) Fine sandy loam
Family particle size	(1) Coarse-loamy
Drainage class	Well drained
Permeability class	Moderate to moderately slow
Depth to restrictive layer	40–80 in
Soil depth	40–80 in
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–15%
Available water capacity (0-40in)	10–12 in

Soil reaction (1:1 water) (0-40in)	6.8–7.6
Subsurface fragment volume <=3" (4-60in)	10–20%
Subsurface fragment volume >3" (4-60in)	0–15%

Ecological dynamics

The potential native plant community is dominated by a multi age stand of quaking aspen (*Populus tremuloides*). Mountain snowberry (*Symphoricarpos oreophilus*) and wax currant (*Ribes cereum*) are prevalent in the understory. Idaho fescue (*Festuca idahoensis*), blue wildrye (*Elymus glaucus*), rose (Rosa spp.) and a variety of forbs are common. Mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana), basin wildrye (*Leymus cinereus*), mountain brome (*Bromus marginatus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), elk sedge (*Carex geyeri*) and pinegrass (*Calamagrostis rubescens*) are present. Vegetative composition of the community is approximately 25 percent grasses, 5 percent forbs, and 70 percent shrubs and trees. Approximate ground cover is 80 to 120 percent (basal and crown).

Range in Characteristics:
Healthy quaking aspen stands are uniform with varying age classes. The presence of tall and short shrubs, forbs and grasses varies with precipitation, available subsurface moisture and aspen canopy cover. Shrubs decrease under older closed aspen canopies and increase in stand initiation and open sapling-pole stages. Tall shrubs, chokecherry (Prunus spp.) and willows (Salix spp.) increase with an increase in perennial subsurface and surface moisture. Mountain snowberry and currants consistently occur in the understory. Idaho fescue is the dominant grass with blue wildrye increasing in shade. Basin wildrye and mountain big sagebrush increase in lightly shaded areas and near stand edges. On moist swales and other sites adjacent to forestland, elk sedge and pinegrass will increase. On lower elevation and droughtier aspects, mountain big sagebrush, wax currant and Idaho fescue increase. Needlegrasses (Achnatherum spp.) and blue wildrye increase on droughtier coarse textured soils. In areas with late winter snow drifts, understory shrubs such as snowberry, rose and serviceberry (Amelanchier spp.) increase. Associated riparian and seep areas are dominated by an aspen riparian site. Basin wildrye dominates associated swale sites.

Quaking Aspen Dynamics:
Quaking aspen occurs on this site as the dominant plant species in a stable plant community. The aspen community is multi aged with trees in various stages of development well represented. Reference phases are shrub/grass stand initiation, sapling-pole, mature aspen and decadent aspen.

Individual aspen are short-lived and rarely survive for more than 150 years. Aspen, however, are noted for their ability to regenerate vegetatively by suckers arising along their long lateral roots. Root sprouting results in many genetically identical trees (ramets), in aggregate called a “clone”. All the trees in a clone have identical characteristics and share a common root structure, however, a stand can be made up of several clones.

When aspen trees die or light becomes available in aspen openings, chemical signals from the tree to the root stimulate new sprouts to start growing. Through this cycle of regrowth, an aspen clone can lives much longer than an individual tree. Aspen clone survival can be hundreds of years old (5,000 to 10,000 year old clone ages have been estimated in some areas).

Aspen trees are dioecious, with male and female flowers normally borne on separate trees. Sexual reproduction may occur, yet in comparison to vegetative reproduction, reproduction by seed is less commonly observed in the Western US except following fire on adequately moist seedbeds. Few aspen seedlings survive in nature due to the short time seed is viable, lack of moisture during seed dispersal, poor seedbed conditions, fungi and adverse day and night temperatures.

Historically, periodic disturbance events have been important to the maintenance of healthy aspen stands. These include drought, windthrow, wildfire, insect outbreaks, and disease (e.g. stem cankers and root pathogens), that would remove portions of the stand, with advanced ramet age increasing the likelihood of damage from some disturbance agents.

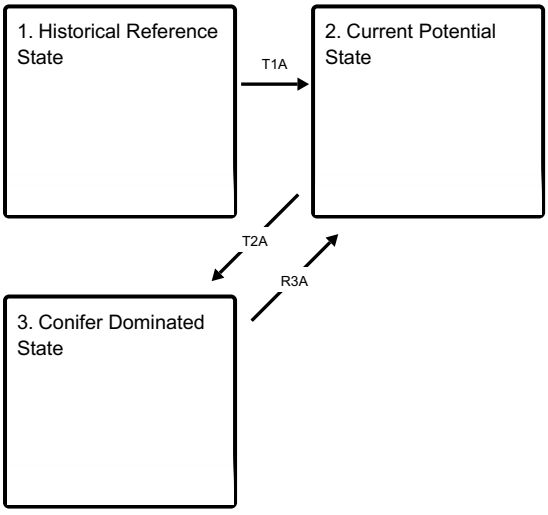
Wildfire has been an important disturbance in these aspen stands historically, stimulating vegetative reproduction, promoting stand heterogeneity and controlling the invasion of coniferous species. While the high fuel moisture content of aspen stands may render them somewhat resistant to fires for much of the year, fire frequency and intensity is influenced by the surrounding vegetation matrix within which the stand is found. For this site, surrounding vegetation types often include mountain big sagebrush, dry ponderosa pine woodlands and dry mixed conifer forests, all of which would have historically been subject to frequent low to replacement severity fires (Landfire fire regime groups 1 and 2, Landfire 2007). Without fire, coniferous species, particularly Western juniper (*Juniperus occidentalis*) on this site, readily invades and can dominate this site over time, outcompeting the less shade tolerant aspen for light and depleting soil moisture. Research has demonstrated that juniper expansion into similar sites in southeast Oregon has been widespread, coinciding with the suppression of fire in these areas beginning around the turn of the 20th century, in addition to associated grazing and climate factors (Wall et al. 2001).

Aspen provides quality browse for many ungulates including deer, elk and cattle. Excessive grazing can have profoundly detrimental effects on aspen regeneration and stand viability by suppressing regenerating saplings (among other impacts). Unlike other sites providing important forage for ungulates in the region, aspen stands may be as impacted by high wildlife densities (such as elk) as by high numbers of cattle. If the condition of the site deteriorates as a result of overgrazing by livestock, deer, and elk, a decline in aspen reproduction and composition of Idaho fescue, basin wildrye, elk sedge and palatable forbs occurs. Advanced decline in stand health is most commonly seen as a complete cessation of aspen recruitment resulting in an even-aged stand of damaged and disease affected decadent aspen. The understory is severely affected with the replacement of Idaho fescue, basin wildrye and elk sedge by Kentucky bluegrass (*Poa pratensis*), blue wildrye, mountain brome and low palatable forbs such as false hellebore (*Veratrum viride*), lupines (Lupinus spp.) and asters (Aster spp.). Snowberry, currants and other palatable shrubs decrease. With continued heavy use bare ground increases, erosion accelerates and site productivity decreases. Under prolonged heavy ungulate use aspen clone reproduction is eliminated and stands slowly become decadent, potentially transitioning the site to a shrub or juniper dominated community.

Severe drought events have been linked to episodes of widespread aspen mortality in North America and these types of events are expected to increase under a changing climate (Worrall et al. 2012). While the potential impacts of climate change and severe drought on this site are unknown, aspen stands in other marginal habitats in Oregon have demonstrated physiological sensitivity to drought related climate parameters (Neary et al. 2021) and it is possibly that interactions of changing climate with other stressors will render stands in the region more vulnerable to decline (Dwire et al. 2018).

State and transition model

Ecosystem states

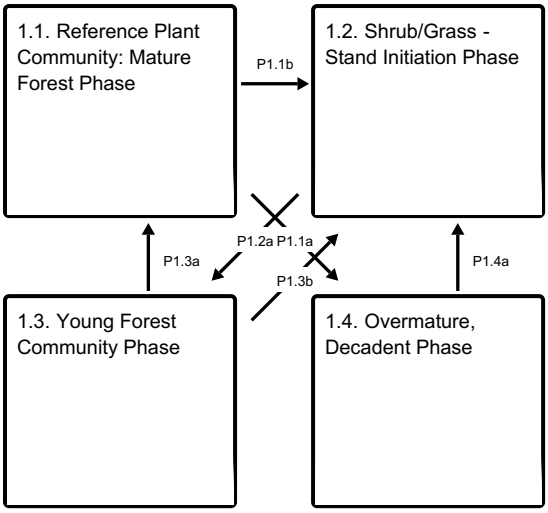


T1A - Invasion of the site by non-native plant species

T2A - Time and lack of wildfire

R3A - Mechanical removal of conifers, prescribed fire, ungulate exclosure fencing

State 1 submodel, plant communities



P1.1b - Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event

P1.1a - Extended time elapses in the absence of widespread disturbance

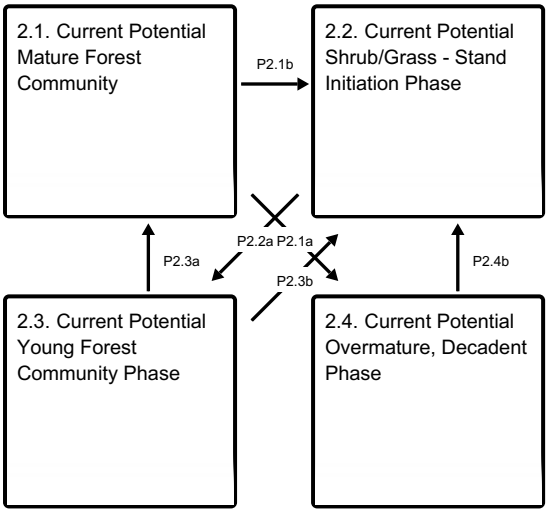
P1.2a - Extended time elapses in the absence of widespread disturbance

P1.3a - Extended time elapses in the absence of widespread disturbance

P1.3b - Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event

P1.4a - Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event

State 2 submodel, plant communities



P2.1b - Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event

P2.1a - Extended time without widespread disturbance

P2.2a - Extended time without widespread disturbance

P2.3a - Extended time without widespread disturbance

P2.3b - Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event

P2.4b - Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event

State 1
Historical Reference State

This state represents the pristine historical reference conditions with no exotic species present. Healthy aspen stands are on this site type are heterogeneous with vigorous trees in all natural life stages from young saplings to mature. Stands will cycle through several development phases from shrub/grass communities through mature stands, with many phases often occurring on a single site. These dynamics are driven by an intact historical disturbance regime with periodic events helping to reduce conifer invasion, remove diseased and decadent mature trees and stimulate reproduction. The resilience and resistance of the site is bolstered by positive feedbacks

between aspen production and the formation of deep, mollic epipedons with high organic matter, nutrient content and water holding capacity; and negative feedbacks between stand maturity and disturbance frequency/magnitude.

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- mountain snowberry (*Symphoricarpos oreophilus*), shrub
- currant (*Ribes*), shrub
- basin wildrye (*Leymus cinereus*), grass
- Idaho fescue (*Festuca idahoensis*), grass

Community 1.1
Reference Plant Community: Mature Forest Phase

The reference native plant community is dominated by a multi age stand of quaking aspen. Understory regeneration of aspen will slow as canopy closure progresses, yet periodic disturbance will remove mature aspen, create gaps and allow for localized pulses of regeneration to occur. Mountain snowberry and wax currant are prevalent in the understory. Idaho fescue, basin wildrye, blue wildrye, rose and a variety of forbs are common. Mountain big sagebrush, mountain brome, bluebunch wheatgrass, elk sedge and pinegrass are present. Vegetative composition of the community is approximately 25 percent grasses, 5 percent forbs and 70 percent shrubs and trees. Approximate ground cover is 80 to 120 percent (basal and crown).

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	800	1200	1600
Shrub/Vine	600	900	1200
Grass/Grasslike	500	750	1000
Forb	100	150	200
Total	**2000**	**3000**	**4000**

Community 1.2
Shrub/Grass - Stand Initiation Phase

In this phase, the stand is dominated by herbaceous species and sprouting shrubs. Young sapling aspen may be regenerating, conifers are absent. High populations of native ungulates such as deer and elk and subsequent heavy browsing of regenerating aspen, may maintain the site in this phase. Additionally, frequent fire intervals driven by abnormal climate conditions may maintain the site in this phase.

Community 1.3
Young Forest Community Phase

In this phase the stand is dominated by regenerating and recruiting aspen from sapling to pole size. Initial closed conditions and very high, uniform stem densities will give way to open stand conditions, lower stem densities and multi-layered stand structure as self-thinning, overstory recruitment and further regeneration takes place. Shrub and grass composition will decrease relative to community 1.2. Some conifers may be present at low levels.

Community 1.4
Overmature, Decadent Phase

In this phase the stand is dominated by large, mature aspen with a relatively even stand structure. Closed canopy conditions decrease understory diversity and favor shade tolerant grasses, forbs and shrubs. Understory aspen regeneration is uncommon due to lack of light at lower heights but may occur in localized patches as decadent overstory trees succumb to various disturbance agents. Conifers may be increasing in this state and the site risks a transition to a conifer dominated state with a prolonged lack of large scale disturbance.

Pathway P1.1b
Community 1.1 to 1.2

Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event leads to mortality of aspen trees.

Pathway P1.1a
Community 1.1 to 1.4

Extended time elapses in the absence of disturbance allowing the forest to become over mature and conifer expansion to occur.

Pathway P1.2a
Community 1.2 to 1.3

Extended time without widespread disturbance.

Pathway P1.3a
Community 1.3 to 1.1

Extended time without widespread disturbance.

Pathway P1.3b
Community 1.3 to 1.2

Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event leads to mortality of aspen trees.

Pathway P1.4a
Community 1.4 to 1.2

Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event leads to mortality of aspen trees.

State 2
Current Potential State

This state is similar to the historical reference state yet with the introduction of non-native plant species and an increased presence of western juniper. Kentucky bluegrass is one of the most common and persistent invading herbaceous plants with others including cheatgrass (*Bromus tectorum*), Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), houndstongue (*Cynoglossum officinale*), and St. Johnswort (*Hypericum perforatum*) also common. Ecological process and function have not been altered fundamentally by this low level of invasion, yet resistance and resilience to disturbance are decreased. Vegetated communities include all historical functional and structural groups, yet composition and richness may be reduced. This state is common due to widespread invasion of Kentucky bluegrass and expansion of western juniper in the Western US.

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- mountain snowberry (*Symphoricarpos oreophilus*), shrub
- currant (*Ribes*), shrub
- basin wildrye (*Leymus cinereus*), grass
- Idaho fescue (*Festuca idahoensis*), grass

Community 2.1
Current Potential Mature Forest Community

The reference native plant community is dominated by a multi age stand of quaking aspen. Understory regeneration

of aspen will slow as canopy closure progresses, yet periodic disturbance will remove mature aspen, create gaps and allow for localized pulses of regeneration to occur. Kentucky bluegrass (and potentially other exotic species) is a common associate with herbaceous plants listed in the reference plant community.

Community 2.2
Current Potential Shrub/Grass - Stand Initiation Phase

In this phase, the stand is dominated by herbaceous species and sprouting shrubs, Kentucky bluegrass (and potentially other exotic species) is common. Young sapling aspen may be regenerating from root suckers or seed given favorable conditions, seedling conifers may be present in low numbers. High populations of native ungulates such as deer and elk and subsequent heavy browsing of regenerating aspen, may maintain the site in this phase. Additionally, frequent fire intervals driven by abnormal climate conditions or adjacency with rangelands dominated by invasive annual grasses may maintain the site in this phase.

Community 2.3
Current Potential Young Forest Community Phase

In this phase the stand is dominated by regenerating and recruiting aspen from sapling to pole size. Initial closed conditions and very high, uniform stem densities will give way to open stand conditions, lower stem densities and multi-layered stand structure as self-thinning, overstory recruitment and further regeneration takes place. Shrub and grass composition will decrease relative to community 1.2, exotic species are likely present. Conifers may be present at moderate density.

Community 2.4
Current Potential Overmature, Decadent Phase

In this phase the stand is dominated by large, mature aspen with a relatively even stand structure. Closed canopy conditions decrease understory diversity and favor shade tolerant grasses, forbs and shrubs, with exotic species present. Understory aspen regeneration is uncommon due to lack of light at lower heights but may occur in localized patches as decadent overstory trees succumb to various disturbance agents. Conifers may be increasing in this state toward codominance with mature aspen and the site risks a transition to a conifer dominated state with a prolonged lack of large scale disturbance.

Pathway P2.1b
Community 2.1 to 2.2

Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event leads to mortality of aspen trees.

Pathway P2.1a
Community 2.1 to 2.4

Extended time elapses in the absence of disturbance allowing the forest to become over mature and conifer expansion to occur.

Pathway P2.2a
Community 2.2 to 2.3

Extended time without widespread disturbance.

Pathway P2.3a
Community 2.3 to 2.1

Extended time without widespread disturbance.

Pathway P2.3b

Community 2.3 to 2.2

Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event leads to mortality of aspen trees.

Pathway P2.4b
Community 2.4 to 2.2

Large scale disturbance such as fungal disease, insect outbreak, high severity wildfire or extreme drought event leads to mortality of aspen trees.

State 3
Conifer Dominated State

In this state, conifer succession has advanced to overtop aspen and outcompete the species for light and soil moisture. On this site, western juniper is the most likely conifer invader, yet ponderosa pine (*Pinus ponderosa*), or Douglas fir (*Pseudotsuga menziesii*) may also encroach on favorable sites. Over mature, decadent aspen may still be present and aspen reproduction may occur in patches with adequate light and moisture. However, feedbacks have been altered and aspen will likely not successfully compete with conifers to regenerate successfully, recruit into the overstory, and regain forest structure without management interventions or altered disturbance regimes. Impacts and emerging feedbacks may include alterations to soil chemistry, changes in hydrologic cycling (including increased sublimation and translocation of snowfall by conifers), and persistent increases in understory shading favoring more shade tolerant conifer reproduction (Wall et al. 2001, LaMalfa and Ryle 2008). Heavy herbivory of sapling aspen, and/or low intensity fire that leaves more fire resistant conifers intact may further accelerate the loss of aspen to conifers. Several community phases may occur within this state with the common thread of conifer dominance.

Dominant plant species

- western juniper (*Juniperus occidentalis*), tree
- ponderosa pine (*Pinus ponderosa*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree

Transition T1A
State 1 to 2

Invasion of the site by non-native plant species

Transition T2A
State 2 to 3

Time and lack of wildfire allows juniper to overtop and outcompete aspen for light and moisture. Shade intolerant aspen die off and regeneration is dramatically decreased due to closed canopy conditions. On some sites ponderosa pine and/or Douglas fir may encroach and facilitate a similar dynamic in the absence of fire.

Restoration pathway R3A
State 3 to 2

Mechanical removal of conifers may release understory aspen from canopy shading. Prescribed fire may also be used to remove conifers and stimulate aspen regeneration. However, under circumstances where advanced decline has led to an absence of aspen regeneration, the use of prescribed fire may actually lead to further damage to the clone and may accelerate complete clone mortality. Depending on the degree of encroachment and aspen loss, these interventions may transition the site to any one of the current potential community phases. Under conditions of high native ungulate or livestock use of the stand, management actions such as fencing or jackstrawing may need to follow conifer removal to allow aspen regeneration to occur unimpeded.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant, moderate rooted bunchgrass**			150–300	
	Idaho fescue	FEID	*Festuca idahoensis*	150–300	–
4	**Sub-dominant moderate to deep rooted bunchgrasses**			120–400	
	basin wildrye	LECI4	*Leymus cinereus*	60–250	–
	blue wildrye	ELGL	*Elymus glaucus*	60–150	–
5	**Common perennial grasses & grass-like**			60–700	
	mountain brome	BRMA4	*Bromus marginatus*	60–150	–
	Geyer's sedge	CAGE2	*Carex geyeri*	0–150	–
	pinegrass	CARU	*Calamagrostis rubescens*	0–150	–
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	0–150	–
	needlegrass	ACHNA	*Achnatherum*	0–120	–
6	**Other perennial grasses**			60–150	
	field horsetail	EQAR	*Equisetum arvense*	10–40	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	10–30	–
	squirreltail	ELEL5	*Elymus elymoides*	10–30	–
	Sandberg bluegrass	POSE	*Poa secunda*	10–30	–
Forb					
7	**Common perennial forbs**			50–100	
	tall ragwort	SESE2	*Senecio serra*	20–40	–
	buckwheat	ERIOG	*Eriogonum*	10–30	–
	milkvetch	ASTRA	*Astragalus*	10–20	–
	lupine	LUPIN	*Lupinus*	10–20	–
	cinquefoil	POTEN	*Potentilla*	5–10	–
	common yarrow	ACMI2	*Achillea millefolium*	5–10	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	5–10	–
9	**Other perennial forbs**			30–70	
	sweetroot	OSMOR	*Osmorhiza*	5–10	–
	desertparsley	LOMAT	*Lomatium*	5–10	–
	beardtongue	PENST	*Penstemon*	0–5	–
	aster	ASTER	*Aster*	2–5	–
	fleabane	ERIGE2	*Erigeron*	2–5	–
	stoneseed	LITHO3	*Lithospermum*	2–5	–
	Indian paintbrush	CASTI2	*Castilleja*	0–4	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	2–4	–
	buttercup	RANUN	*Ranunculus*	2–4	–
	tall bluebells	MEPA	*Mertensia paniculata*	2–4	–
	ballhead waterleaf	HYCA4	*Hydrophyllum capitatum*	2–4	–
	bedstraw	GALIU	*Galium*	0–3	–
	woodland-star	LITHO2	*Lithophragma*	1–2	–
Shrub/Vine					

Shrub/Vine					
10	**Sub-dominant, deciduous, sprouting shruba**			100–300	
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	150–300	–
	common snowberry	SYAL	*Symphoricarpos albus*	0–150	–
11	**Sub-dominant, evergreen, non-sprouting shrubs**			0–150	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	0–150	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–150	–
12	**Common, deciduous, sprouting shrubs**			200–700	
	chokecherry	PRVI	*Prunus virginiana*	50–400	–
	golden currant	RIAU	*Ribes aureum*	40–150	–
	wax currant	RICE	*Ribes cereum*	50–150	–
	Woods' rose	ROWO	*Rosa woodsii*	40–100	–
14	**Other shrubs**			60–300	
	Scouler's willow	SASC	*Salix scouleriana*	30–60	–
	bitter cherry	PREM	*Prunus emarginata*	0–50	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	0–50	–
	yellow willow	SALU2	*Salix lutea*	0–50	–
	elderberry	SAMBU	*Sambucus*	20–50	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–40	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–30	–
	creeping barberry	MARE11	*Mahonia repens*	5–10	–
Tree					
18	**Dominant, deciduous, sprouting tree**			1200–1500	
	quaking aspen	POTR5	*Populus tremuloides*	1200–1500	–
20	**Other evergreen trees**			0–150	
	ponderosa pine	PIPO	*Pinus ponderosa*	0–150	–
	Douglas-fir	PSME	*Pseudotsuga menziesii*	0–100	–

Animal community

Livestock Grazing:
This site is suitable for livestock grazing use in the summer, and early fall under a prescribed grazing system. Use should be postponed until the soils are firm enough to prevent trampling damage and soil compaction. Grazing management should be keyed to aspen regeneration, Idaho fescue, basin wildrye, elk sedge and blue wildrye. Utilization levels on aspen regeneration should be no more than one-third of the current year’s annual growth. Use levels on Idaho fescue, basin wildrye, elk sedge and blue wildrye should be no more than 50 percent of the current year’s growth. These species can be severely damaged if heavily grazed during periods of flowering and seed formation before root reserves have accumulated and soil moisture is low. Deferred grazing or rest is recommended at least once every three years.

Wildlife:
Wildlife habitat diversity in a healthy aspen stand is very high. The natural heterogeneity of the aspen stand with various stages of development provides excellent habitat. Aspen stands provide important habitat for cavity nesting birds. The extent of the stand, health and age class present will limit the population of deer, elk, birds and other wildlife that can exist on the site. Excess ungulate use can severely impact the quality of the habitat and life of the stand. Uses such as roads and intense recreation use directly impacts habitat quality.

Mule deer and elk respond most favorably to the early reproductive stages because of the quantity, quality, and

diversity of plants present. Excellent summer and fall forage as well as rearing areas is provided by these stages. Mature stages provide excellent hiding and thermal cover. Grouse, migratory birds, woodpeckers and other birds make good use of edges and the intermediate and older stages for food, nesting and rearing.

Aspen woodland is one of the strategy habitats in the “Oregon Conservation Strategy”. The limiting factors in aspen woodland are altered habitat and juniper encroachment, lack of reproduction, degraded understories, fragmentation and mapping limitations (small patches- connectivity). Oregon Conservation Strategy is an action plan for the long term conservation of Oregon’s native fish and wildlife and their habitats.

Hydrological functions

The soils of this site are in an upland topographic position. They have moderate runoff potential and medium infiltration rates when the hydrologic cover is good. With a reduction of ground cover and loss of deep rooted perennials accelerated erosion occurs. Incision of adjoining channels accelerates erosion and lowers the water table. The acceleration of erosion continues with decreasing ground cover. Hydrologic cover is good when deep rooted perennial herbaceous and shrub cover is greater than 70 percent of potential.

When adjoining incised channels are present, rehabilitation will markedly improve production, reduce downstream sedimentation, and restore good hydrologic characteristics. On altered sites, the reintroduction of deep rooted perennials may be needed to fully restore the site potential.

Recreational uses

This site has high aesthetic values. It provides opportunities for recreational hunting and limited camping activities. As a critical wildlife area, camping, roads and other uses should be limited.

Wood products

As a key wildlife area, the site should be carefully managed with little potential for wood fiber production.

Other information

Threatened And Endangered Plants And Animals:
This site contains unique rare plant communities and animal habitat. On site investigation is required for the determination of sensitive and T&E species.

Juniper Invasion and Control:
Juniper if present will readily invade aspen stands in the absence of fire. It can replace aspen to become the dominant overstory species. Increases in western juniper and the subsequent competition for moisture and shading will lead to reduced ground cover and available forage. Overgrazing can accelerate this trend, reducing available forage and accelerating soil loss.

Juniper control measures include cutting and/or prescribed burning followed by prescribed grazing. A prescribed grazing system including periodic rest will improve the vigor, density and reproduction of aspen along with understory sedges and palatable perennial bunchgrasses. Re-seeding preferred perennial grasses may be a necessary component of this program if original palatable bunchgrasses and sedges are absent.

Fire Response & Prescribed Burns:
Fire is an important natural component of the site. Benefits include the control of invading juniper, promotion of natural aspen succession, improved habitat diversity, maintenance of vigorous palatable grass and forb understories and the creation of openings for aspen sapling regeneration. In the absence of natural fire, mechanical treatments and/or prescribed burns may help promote healthy and diverse aspen stands.

Understanding aspen response to fire is essential in determining the effects of wildfire and in developing a prescribed burn plan. Unlike conifers, aspen stands do not readily burn due to moist green leaves and thick twigs. Conifers are subject to a longer open window seasonal burn period due to higher terpene contents and a longer dry needle and twig period. Although aspen do not burn readily, when burned they are extremely sensitive to fire. Following a burn, sucker development is stimulated. A fire intense enough to kill aspen overstories will stimulate

abundant suckering. However, evidence suggests that burning in severely weakened clones (where root systems have little available carbohydrate reserves) may accelerate decline or succession to conifers (Swanson et al. 2010). This may be especially true in stands experiencing advanced conifer encroachment where pre-fire aspen density and regeneration is very low and large conifers are resistant to all but high severity fire.

Fall burns are recommended if the management objective is to stimulate greater aspen suckering and eliminate western juniper with minimal cutting. A spring burn is recommended if the objective is to maintain shrub and herbaceous cover and moderately stimulate aspen suckering. With a spring burn follow-up management may be needed to remove juniper that are missed in initial treatments. Prescribed grazing to insure healthy stands is an important component with all treatment alternatives.

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Approval

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Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	04/12/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

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

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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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):**

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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:

    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):**

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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):**

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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:**

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17. **Perennial plant reproductive capability:**
