Ecological site F026XY086NV
Wet Loamy Stream Terrace POTR5/SYOR

Last updated: 4/10/2024
Accessed: 05/13/2025

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): 026X–Carson Basin and Mountains

The area lies within western Nevada and eastern California, with about 69 percent being within Nevada, and 31 percent being within California. Almost all this area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. Isolated north-south trending mountain ranges are separated by aggraded desert plains. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are drained by three major rivers flowing east across this MLRA. A narrow strip along the western border of the area is in the Sierra Nevada Section of the Cascade-Sierra Mountains Province of the Pacific Mountain System. The Sierra Nevada Mountains are primarily a large fault block that has been uplifted with a dominant tilt to the west. This structure leaves an impressive wall of mountains directly west of this area. This helps create a rain shadow affect to MLRA 26. Parts of this eastern face, but mostly just the foothills, mark the western boundary of this area. Elevations range from about 3,806 feet (1,160 meters) on the west shore of Pyramid Lake to 11,653 feet (3,552 meters) on the summit of Mount Patterson in the Sweetwater Mountains.

Valley areas are dominantly composed of Quaternary alluvial deposits with Quaternary playa or alluvial flat deposits often occupying the lowest valley bottoms in the internally drained valleys, and river deposited alluvium being dominant in externally drained valleys. Hills and mountains are dominantly Tertiary andesitic flows, breccias, ash flow tuffs, rhyolite tuffs or granodioritic rocks. Quaternary basalt flows are present in lesser amounts, and Jurassic and Triassic limestone and shale, and Precambrian limestone and dolomite are also present in very limited amounts. Also of limited extent are glacial till deposits along the east flank of the Sierra Nevada Mountains, the result of alpine glaciation.

The average annual precipitation in this area is 5 to 36 inches (125 to 915 millimeters), increasing with elevation. Most of the rainfall occurs as high-intensity, convective storms in spring and autumn. Precipitation is mostly snow in winter. Summers are dry. The average annual temperature is 37 to 54 degrees F (3 to 12 degrees C). The freeze-free period averages 115 days and ranges from 40 to 195 days, decreasing in length with elevation.

The dominant soil orders in this MLRA are Aridisols and Mollisols. The soils in the area dominantly have a mesic soil temperature regime, an aridic or xeric soil moisture regime, and mixed or smectitic mineralogy. They generally are well drained, are clayey or loamy and commonly skeletal, and are very shallow to moderately deep.

This area supports shrub-grass vegetation characterized by big sagebrush. Low sagebrush and Lahontan sagebrush occur on some soils. Antelope bitterbrush, squirreltail, desert needlegrass, Thurber needlegrass, and Indian ricegrass are important associated plants. Green ephedra, Sandberg bluegrass, Anderson peachbrush, and several forb species also are common. Juniper-pinyon woodland is typical on mountain slopes. Jeffrey pine, lodgepole pine, white fir, and manzanita grow on the highest mountain slopes. Shadscale is the typical plant in the drier parts of the area. Sedges, rushes, and moisture-loving grasses grow on the wettest parts of the wet flood plains and terraces. Basin wildrye, alkali sacaton, saltgrass, buffaloberry, black greasewood, and rubber rabbitbrush grow on the drier sites that have a high concentration of salts.

Some of the major wildlife species in this area are mule deer, coyote, beaver, muskrat, jackrabbit, cottontail, raptors, pheasant, chukar, blue grouse, mountain quail, and mourning dove. The species of fish in the area include trout and catfish. The Lahontan cutthroat trout in the Truckee River is a threatened and endangered species.

LRU notes

The Bodie Hills LRU straddles the California-Nevada state boundary, just north of Mono Lake. The area is underlain by late Miocene age volcanic fields with upper Miocene and Pliocene sedimentary deposits over top. The youngest faults in the area are north and north-east striking. Extensive zones of hydrothermally altered rocks and large mineral deposits, including gold and silver rich veins, formed during hydrothermally active periods of the Miocene (John et al. 2015). A primary distinguishing factor between the Bodie Hills and other hills in MLRA 26 is the dominance of volcanic parent material.

Ecological site concept

This forest site dominated by quaking aspen (Populus tremuloides) occurs on cool, stream terraces on the margin of perennial stream floodplains. The soils are deep and moderately-well drained. These soils are wet within the rooting zone of quaking aspen for short periods during the early part of the growing season.

Table 1. Dominant plant species

Tree	(1) *Populus tremula ssp. tremuloides*
Shrub	(1) *Symphoricarpos orbiculatus*
Herbaceous	Not specified

Physiographic features

This forest site occurs on cool, stream terraces on the margin of perennial stream floodplains. Slope gradients are typically less than 30 percent. Elevations are 7200 to about 9500 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Stream terrace (2) Mountain slope
Runoff class	Low
Flooding frequency	None to rare
Elevation	2,195–2,896 m
Slope	0–30%
Water table depth	102–127 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is subhumid with cool, dry summers and cold, wet winters. Average annual precipitation is 16 to over 20 inches. Mean annual air temperature is 40 to 43 degrees F. The average growing season is 70 to 90 days. Climate data used to support this section were derived from PRISM and is not specifically tied to any dominant climate station.

Nevada’s climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms, heavy snowfall in the higher mountains, and great location variations with elevation. Three basic geographical factors largely influence Nevada’s climate: continentality, latitude, and elevation. Continentality is the most important factor. The strong continental effect is expressed in the form of both dryness and large temperature variations. Nevada lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate of the State. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation occurs and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the West but throughout the state, with the result that the lowlands of Nevada are largely desert or steppes. The temperature regime is also affected by the blocking of the inland-moving maritime air. Nevada sheltered from maritime winds, has a continental climate with well-developed seasons and the terrain responds quickly to changes in solar heating.

Nevada lies within the mid-latitude belt of prevailing westerly winds which occur most of the year. These winds bring frequent changes in weather during the late fall, winter and spring months, when most of the precipitation occurs. To the south of the mid-latitude westerlies, lies a zone of high pressure in subtropical latitudes, with a center over the Pacific Ocean. In the summer, this high-pressure belt shifts northward over the latitudes of Nevada, blocking storms from the ocean. The resulting weather is mostly clear and dry during the summer and early fall, with scattered thundershowers. The eastern portion of the state receives significant summer thunderstorms generated from monsoonal moisture pushed up from the Gulf of California, known as the North American monsoon. The monsoon system peaks in August and by October the monsoon high over the Western U.S. begins to weaken and the precipitation retreats southward towards the tropics (NOAA 2004).

Table 3. Representative climatic features

Frost-free period (average)	80 days
Freeze-free period (average)	
Precipitation total (average)	457 mm

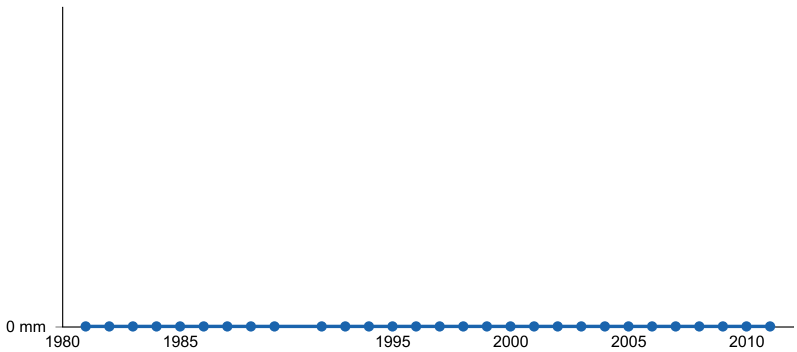


Figure 1. Annual precipitation pattern

Influencing water features

The site has a seasonal water table between 40 and 50 inches. This site can occur on stream terraces and infrequently experiences flooding.

Soil features

The soils are deep and moderately-well drained. These soils are wet within the rooting zone of quaking aspen for short periods during the early part of the growing season. They have a very thick, dark, and, typically, medium-textured surface layer. Some soils may have cobbles or boulders on the surface. The underlying material is medium to coarse textured. The available water capacity is moderate to high. Surface runoff is slow to medium. The potential for sheet and rill erosion is slight to moderate depending on slope

Table 4. Representative soil features

Parent material	(1) Eolian deposits–volcanic rock (2) Colluvium–andesite (3) Residuum–andesite (4) Colluvium–tuff breccia (5) Residuum–tuff breccia
Surface texture	(1) Ashy, gravelly loamy fine sand

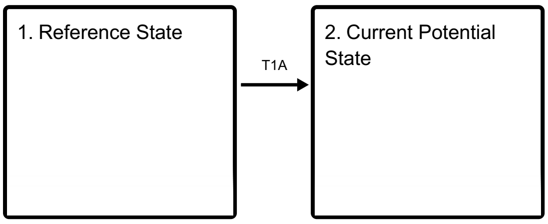
Family particle size	(1) Ashy
Drainage class	Moderately well drained
Permeability class	Moderately rapid
Surface fragment cover <=3"	25–30%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	13.21–16.76 cm
Calcium carbonate equivalent (Depth not specified)	0–1%
Clay content (Depth not specified)	8–15%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	28–30%
Subsurface fragment volume >3" (Depth not specified)	22%

Ecological dynamics

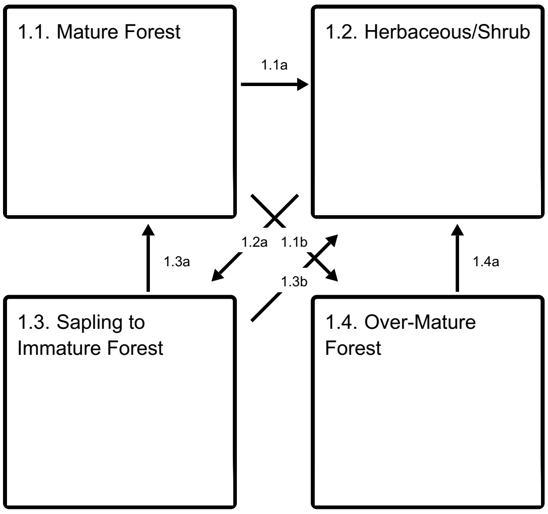
The Forestland site has two states, the difference between the two is presence of non-native plants.

State and transition model

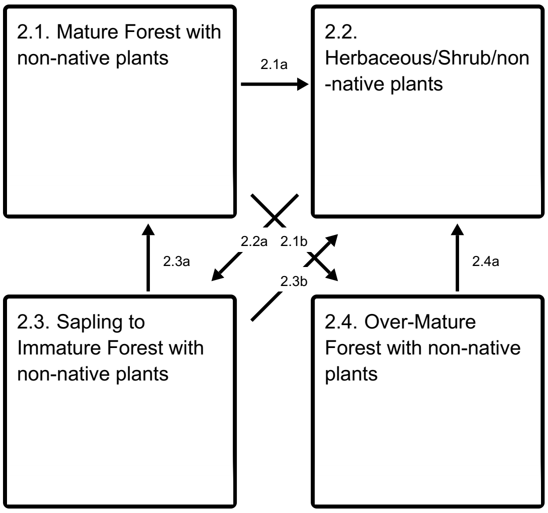
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference State

The Reference State is a representative of the natural range of variability under pristine conditions. This site has four general community phases; a mature woodland phase, a sucker/sapling phase, an immature woodland phase and an over mature woodland/conifer phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, fuel loads, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire, periodic drought and/or insect or disease attack.

Community 1.1
Mature Forest

This site is dominated by quaking aspen and overstory tree canopy composition is typically 100 percent quaking aspen. This site is composed of one to several quaking aspen clones, each with a common genetic makeup and individual phenological and physiological characteristics. Wildfire is recognized as a natural disturbance that strongly influenced the structure of the historic climax vegetation of this site. Periodic wildfires prevent over-mature aspen stands and maintain a naturally stratified mosaic of even-aged aspen communities in various stages of successional development. A total overstory canopy cover of 35 percent is assumed to be representative of tree dominance on this site in the natural environment. Sufficient light is able to penetrate the canopies to support abundant understory vegetation. Overstory tree canopy is 100 percent quaking aspen. Mountain brome, slender wheatgrass, streambank wheatgrass, meadowrue, columbine, mountain big sagebrush and currant are common understory species associated with this site. MATURE FOREST: Diameter growth of aspen shows strong recovery with reduced competition during this stage. The visual aspect and vegetal structure are dominated by single-storied aspen that have reached or are near maximal heights for the site. Tree heights range from 60 to 80 feet, depending upon site. Tree canopy cover ranges from 25 to about 40 percent. Despite considerable understory forage production, the overstory trees do compete with the undergrowth plants for moisture, light, nutrients, and space. Vegetative shoots and/or saplings of aspen occur in the understory, but they are inconspicuous and have a high mortality rate.

Forest overstory. Diameter growth of aspen shows strong recovery with reduced competition during this stage. The visual aspect and vegetal structure are dominated by single-storied aspen that have reached or are near maximal heights for the site. Tree heights range from 60 to 80 feet, depending upon site. Tree canopy cover ranges from 25 to about 40 percent. Despite considerable understory forage production, the overstory trees do compete with the undergrowth plants for moisture, light, nutrients, and space. Vegetative shoots and/or saplings of aspen occur in the understory, but they are inconspicuous and have a high mortality rate.

Forest understory. Understory vegetative composition is about 40 percent grasses, 30 percent forbs and 30 percent shrubs and young trees when the average overstory canopy is medium (25 to 40 percent). Average understory production ranges from 800 to 1400 pounds per acre with a medium canopy cover. Understory production includes the total annual production of all species within 4½ feet of the ground surface.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	359	493	628
Forb	269	370	471
Shrub/Vine	224	308	392
Tree	45	62	78
Total	**897**	**1233**	**1569**

Community 1.2
Herbaceous/Shrub

HERBACEOUS: Vegetation is dominated by grasses and forbs under full sunlight. This stage is experienced after a major disturbance such as fire, root-rot, insect damage, or tree harvest. Following a major disturbance, the root system gives rise to many root suckers, assuming the root system is intact and healthy. Residual trees left following harvest have little or no affect on the composition and production of the herbaceous vegetation. SHRUB-HERBACEOUS: Herbaceous vegetation dominates the site. Quaking aspen suckers are evident. If the aspen stand is healthy, these first two stages will only last one to two years. However, if competing brush and herbaceous plants grow for a full season before aspen suckers emerge, a reduction in growth and survival of aspen suckers may occur.

Community 1.3
Sapling to Immature Forest

SAPLING: Early growth of quaking aspen suckers ranges from less than 1 foot to more than 3 feet per year for shoots having good competitive position. In the absence of disturbance, suckers develop into saplings (to 4½ feet in height) with a range in canopy cover of about 5 to 15 percent. Vegetation consists of grasses, forbs and a few shrubs in association with tree saplings. POLE STAGE: This stage is characterized by rapid growth of the aspen trees, both in height and canopy cover. Aspen stands are self-thinning, especially at young ages. After the canopy closes, trees stratify into crown classes quickly, despite genetic uniformity within clones. The visual aspect and vegetal structure are dominated by aspen ranging from about 5 to 15 feet in height, and having a diameter at breast height of about 2 to 4 inches. Understory vegetation is moderately influenced by a tree overstory canopy of about 15 to over 35 percent. IMMATURE FOREST: Growth of the aspen slows during this stage and there is a fairly continual adjustment of trees to growing space. As competition becomes intense enough to affect the diameter growth of dominants, mortality quickly reduces the number of trees in the lower crown classes. There are periodic surges in mortality, with a large number of trees dying within a short time. The visual aspect and vegetal structure are dominated by aspen mostly greater than 25 feet in height. Understory vegetation is moderately influenced by a tree overstory canopy of about 30 to 50 percent.

Community 1.4
Over-Mature Forest

OVER-MATURE FOREST: In the absence of wildfire or other naturally occurring disturbances, the tree canopy on this site can become very dense. This stage is normally dominated by aspen that have reached maximal heights for the site. Engelmann's spruce, white fir, and other conifers may comprise as much as 50 percent of the total tree canopy in stable, over-mature, aspen stands. Aspen trees have straight, clear stems with short, high-rounded crowns. Uneven-aged stands form under stable conditions where the overstory gradually disintegrates with disease or age, and is replaced by aspen suckers. In the absence of disturbance, over-mature, even-aged aspen stands slowly die. The aspen canopy opens up, and otherwise inconspicuous aspen suckers survive and grow in the openings not shaded by the remaining conifers. These suckers typically arise over a period of several years; the resulting stand is broadly even-aged. If broadly even-aged stands reach old age without disturbance, their deterioration is likely to extend over a longer period than before because of the range of tree ages. That, in turn, will result in a longer regeneration period and a new stand with an even greater range of ages. If this continues over several generations, all-aged stands will result. Tree canopy cover is commonly more than 50 percent. Understory production is strongly influenced by the overstory, as is species composition. Shade tolerant forbs and a few grasses will dominate the understory.

Pathway 1.1a
Community 1.1 to 1.2

Fire would reduce the mature aspen and allow for the suckers, saplings and the herbaceous understory to increase.

Pathway 1.1b
Community 1.1 to 1.4

Time and lack of disturbance will allow for the conifer trees in the understory to mature and dominate the site.

Pathway 1.2a
Community 1.2 to 1.3

Time and lack of disturbance, release from herbivory will allow for the aspen suckers to mature.

Pathway 1.3a
Community 1.3 to 1.1

Time and lack of disturbance, release from herbivory will allow for the aspen trees to mature.

Pathway 1.3b
Community 1.3 to 1.2

Fire, insects, disease or wind damage can reduce the aspen canopy and the subsequent competition with the understory allowing the understory herbaceous community to increase. Excessive herbivory while trees are still within reach to browse may also reduce aspen growth.

Pathway 1.4a
Community 1.4 to 1.2

Fire would decrease the conifer canopy and allow for the aspen suckers to increase.

State 2
Current Potential State

This state is similar to the Reference State with four similar community phases. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Non-natives may increase in abundance but will not become dominant within this State. These non-natives can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These feedbacks include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

Community 2.1
Mature Forest with non-native plants

This community phase is similar to the Reference State Community Phase 1.1, with the presence of non-native species in trace amounts such as common dandelion and cheatgrass. Diameter growth of aspen shows strong recovery with reduced competition during this stage. The visual aspect and vegetal structure are dominated by single-storied aspen that have reached or are near maximal heights for the site. Tree heights range from 60 to 80 feet, depending upon site. Tree canopy cover ranges from 25 to about 40 percent. Despite considerable understory forage production, the overstory trees do compete with the undergrowth plants for moisture, light, nutrients, and space. Vegetative shoots and/or saplings of aspen occur in the understory, but they are inconspicuous and have a high mortality rate.

Community 2.2
Herbaceous/Shrub/non-native plants

HERBACEOUS: Vegetation is dominated by grasses and forbs under full sunlight. This stage is experienced after a major disturbance such as fire, root-rot, insect damage, or tree harvest. Following a major disturbance, the root system gives rise to many root suckers, assuming the root system is intact and healthy. Residual trees left following harvest have little or no affect on the composition and production of the herbaceous vegetation. SHRUB-HERBACEOUS: Herbaceous vegetation dominates the site. Quaking aspen suckers are evident. If the aspen stand is healthy, these first two stages will only last one to two years. However, if competing brush and herbaceous plants grow for a full season before aspen suckers emerge, a reduction in growth and survival of aspen suckers may occur. Annual non-native species are stable to increasing within the community.

Community 2.3
Sapling to Immature Forest with non-native plants

SAPLING: Early growth of quaking aspen suckers ranges from less than 1 foot to more than 3 feet per year for shoots having good competitive position. In the absence of disturbance, suckers develop into saplings (to 4½ feet in height) with a range in canopy cover of about 5 to 15 percent. Vegetation consists of grasses, forbs and a few shrubs in association with tree saplings. POLE STAGE: This stage is characterized by rapid growth of the aspen trees, both in height and canopy cover. Aspen stands are self-thinning, especially at young ages. After the canopy closes, trees stratify into crown classes quickly, despite genetic uniformity within clones. The visual aspect and vegetal structure are dominated by aspen ranging from about 5 to 15 feet in height, and having a diameter at breast height of about 2 to 4 inches. Understory vegetation is moderately influenced by a tree overstory canopy of about 15 to over 35 percent. IMMATURE FOREST: Growth of the aspen slows during this stage and there is a fairly continual adjustment of trees to growing space. As competition becomes intense enough to affect the diameter growth of dominants, mortality quickly reduces the number of trees in the lower crown classes. There are periodic surges in mortality, with a large number of trees dying within a short time. The visual aspect and vegetal structure are dominated by aspen mostly greater than 25 feet in height. Understory vegetation is moderately influenced by a tree overstory canopy of about 30 to 50 percent.

Community 2.4
Over-Mature Forest with non-native plants

OVER-MATURE FOREST: In the absence of wildfire or other naturally occurring disturbances, the tree canopy on this site can become very dense. This stage is normally dominated by aspen that have reached maximal heights for the site. Engelmann's spruce, white fir, and other conifers may comprise as much as 50 percent of the total tree canopy in stable, over-mature, aspen stands. Aspen trees have straight, clear stems with short, high-rounded crowns. Uneven-aged stands form under stable conditions where the overstory gradually disintegrates with disease or age, and is replaced by aspen suckers. In the absence of disturbance, over-mature, even-aged aspen stands slowly die. The aspen canopy opens up, and otherwise inconspicuous aspen suckers survive and grow in the openings not shaded by the remaining conifers. These suckers typically arise over a period of several years; the resulting stand is broadly even-aged. If broadly even-aged stands reach old age without disturbance, their deterioration is likely to extend over a longer period than before because of the range of tree ages. That, in turn, will result in a longer regeneration period and a new stand with an even greater range of ages. If this continues over several generations, all-aged stands will result. Tree canopy cover is commonly more than 50 percent. Understory production is strongly influenced by the overstory, as is species composition. Shade tolerant forbs and a few grasses will dominate the understory.

Pathway 2.1a
Community 2.1 to 2.2

Fire would reduce the mature aspen and allow for the suckers, saplings and the herbaceous understory to increase. Annual non-natives are likely to increase after fire.

Pathway 2.1b

Community 2.1 to 2.4

Time and lack of disturbance will allow for the conifers in the understory to mature and dominate the site.

Pathway 2.2a
Community 2.2 to 2.3

Time and lack of disturbance, changing of grazing season or grazing reduction/exclusion will allow for the aspen suckers to mature.

Pathway 2.3a
Community 2.3 to 2.1

Time and lack of disturbance and/or release from browsing, will allow for the aspen trees to mature.

Pathway 2.3b
Community 2.3 to 2.2

Fire, insects, disease or wind damage can reduce the aspen canopy and the subsequent competition with the understory allowing the understory herbaceous community to increase. Inappropriate grazing especially by sheep, and/or herbivory by large ungulates while trees are still within reach to browse may also reduce aspen growth.

Pathway 2.4a
Community 2.4 to 2.2

Fire, or equivalent such as clearcutting/harvesting of the conifers would allow for the aspen suckers to increase and the understory plant community to increase of shrubs and grasses to increase.

Transition T1A
State 1 to 2

Trigger: This transition is caused by the introduction of non-native annual plants, such as Kentucky bluegrass, thistles and common dandelion. Slow variables: Over time the annual non-native species will increase within the community. Threshold: Any amount of introduced non-native species causes an immediate decrease in the resilience of the site. Annual non-native species cannot be easily removed from the system and have the potential to significantly alter disturbance regimes from their historic range of variation.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses/Grasslikes**			185–333	
	mountain brome	BRMA4	*Bromus marginatus*	62–111	–
	thickspike wheatgrass	ELLA3	*Elymus lanceolatus*	62–111	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	62–111	–
2	**Secondary Perennial Grasses/Grasslikes**			37–222	
	muttongrass	POFE	*Poa fendleriana*	12–62	–
	Sandberg bluegrass	POSE	*Poa secunda*	12–62	–
	Columbia needlegrass	ACNEN2	*Achnatherum nelsonii ssp. nelsonii*	0–12	–
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	0–12	–
	sedge	CAREX	*Carex*	0–12	–
Forb					
3	**Perennial Forbs**			37–185	
	ragwort	SENEC	*Senecio*	12–62	–
	Fendler's meadow-rue	THFE	*Thalictrum fendleri*	12–62	–
	clover	TRIFO	*Trifolium*	12–62	–
Shrub/Vine					
4	**Secondary Shrubs**			25–160	
	currant	RIBES	*Ribes*	12–62	–
	Woods' rose	ROWO	*Rosa woodsii*	12–62	–
	snowberry	SYMPH	*Symphoricarpos*	0–12	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–12	–
Tree					
5	**Trees**			12–62	
	quaking aspen	POTR5	*Populus tremuloides*	12–62	–

Animal community

LIVESTOCK INTERPRETATIONS
This site is suited to cattle and sheep grazing during the summer and early fall. Livestock use aspen types for forage and shade. Cattle select for mountain brome, slender wheatgrass, and other forage grasses while sheep select for bluegrasses, meadowrue, and forbs. Browsing has a direct impact on aspen. Through the early sapling stage, browsing reduces aspen growth, vigor and numbers. Heavy browsing by sheep or deer can eliminate aspen sucker regeneration. Suckers can be drastically reduced or eliminated by big game browsing on winter ranges. Sheep browse the aspen with increasing pressure through late summer and early fall. Browsing is incidental to grazing by cattle. If grazing is light to moderate, the effect on aspen will be also. This, however, is less true for sheep and wild ungulates.
Grazing management should allow aspen saplings to attain a minimum height of 55 to 60 inches before use to prevent destructive browsing by livestock.
Harvesting trees under a sound management program can open up the tree canopy to allow increased production of understory species desirable for grazing and browsing.

Initial stocking rates:
Stocking rates vary with such factors as kind and class of grazing animal, season of use and fluctuations in climate.

Actual use records for individual sites, a determination of the degree to which the sites have been grazed, and an evaluation of trend in site condition offer the most reliable basis for developing initial stocking rates.

Forage Value Rating:
The forage value rating is not an ecological evaluation of the understory as is the range condition rating for rangeland. The forage value rating is a utilitarian rating of the existing understory plants for use by specific kinds of grazing animals.
The amount and nature of the understory vegetation in a forestland is highly responsive to the amount and duration of shade provided by the overstory canopy. Significant changes in kinds and abundance of plants occur as the canopy changes, often regardless of grazing use. Some changes occur slowly and gradually as a result of normal changes in tree size and spacing. Other changes occur dramatically and quickly, following intensive Forest harvest, thinning, or fire.
WILDLIFE INTERPRETATIONS
The aspen community is important habitat for many species of birds and mammals, especially where it is associated with free flowing streams. Mule deer and elk use aspen Forests mostly in summer and fall for browse, thermal and hiding cover. Commonly associated birds using aspen during breeding season include the Western tanager, common nighthawk, mourning dove, Swainson's hawk and various species of bluebird, thrush and flycatcher. Birds using aspen during the wintering season include the Ruby-crowned kinglet, Townsend's solitaire, rough-legged hawk, Cooper's hawk, sharp-shinned hawk, and various species of finch and waxwing. Birds that use aspen either yearlong or as migrants, include the American robin, American kestrel, mountain chickadee, scrub jay, yellow-bellied sapsucker, long-eared owl, screech owl, great-horned owl, California quail, red-tailed hawk, golden eagle, and various species of sparrow, nuthatch and woodpecker. Commonly associated mammals using the aspen community type include various species of shrew, myotis, bat, mouse and vole. Some very common species include deer mouse, Nuttall's cottontail, least chipmunk, Western gray squirrel, bushy-tailed woodrat, raccoon, long-tailed weasel and the North American porcupine.
THREATENED OR ENDANGERED SPECIES
The bald eagle is listed as an endangered species in Nevada. The bald eagle occasionally winters in eastern Nevada, between the months of October and March, and probably perches in aspen trees where they occur near bodies of water.

Hydrological functions

A well stocked aspen stand provides excellent watershed protection. A mixture of herbaceous and woody root systems penetrate and anchor the soil. Erosion producing overland flow is almost non-existent. The hydrologic cover condition of this site is good in a representative stand. The average runoff curve is about 80 for group D soils. See Section 4, SCS National Engineering Handbook for runoff quantities and hydrologic curves.

Recreational uses

Aesthetic value is derived from the rich hues and textures of the aspen trees, particularly in the fall. The diverse flora and fauna, and the colorful wildflowers in the summer enhance the beauty of this site. The site offers rewarding opportunities to photographers and for nature study. It has high value for hunting, camping, picnicking, cross country skiing and family wood gathering. Management of the aspen Forest should include small, irregularly shaped clearcuts that blend into the natural landscape. Harvesting plans should include a mix of even-aged aspen patches in all size classes. Aspen fits well into management for dispersed recreation activities, but does not tolerate concentrated use such as found in established campgrounds. Encouraging concentrated recreation or developing campgrounds within aspen stands can lead to serious damage, including carving on trees, vandalism, destruction or removal of young suckers and trampling and disturbance of the soil.

Wood products

PRODUCTIVE CAPACITY
This site is of low site quality for tree production. Site indexes for quaking aspen range from 46 to about 55 (Baker, 1925).
Productivity class:
CMAI*: 21 to 28 ft3/ac/yr
1.5 to 2.0 m3/ha/yr
*CMAI: is the culmination of mean annual increment or highest average growth rate of the stand in the units

specified.
Basal Area: About 116 square feet/acre for stands averaging 60 feet in height at 100 years of age (Table 17, Baker, 1925).
Fuelwood Production: About 17 cords per acre for stands averaging 6 inches in diameter at breast height (Table 17, Baker, 1925). There are about 203,000 gross British Thermal Units (BTUs) heat content per cubic foot of quaking aspen wood. Firewood is commonly measured by the cord, or a stacked unit equivalent to 128 cubic feet. Solid wood volume in a cord varies, but assuming an average of 75 cubic feet of solid wood per cord, there are about 15 million BTUs of heat value in a cord of quaking aspen.
Tree Volume per Acre: About 2400 cu ft/ac for stands averaging 50 feet in height and 7 inches diameter at breast height (Table 17, Baker, 1925).
LIMITATIONS AND CONSIDERATIONS
Potential for sheet and rill erosion is moderate to severe depending on slope.
Severe equipment limitations on slopes over 30 percent.
Proper spacing is the key to a well managed, multiple use and multi-product aspen Forest.
To begin short-rotation management, older stands with larger trees will have to be utilized.
Cut residual, unmerchantable, trees to stimulate maximum sucker regeneration and rapid development of a replacement stand – thin resulting sucker stands.

2. ESSENTIAL REQUIREMENTS
a. Adequately protect from high intensity wildfire.
b. Protect soils from accelerated erosion.
c. Apply proper grazing management.
SILVICULTURAL PRACTICES
a. Harvest Cutting: Selectively harvest surplus trees to achieve desired spacing. Harvest stands in small blocks of 1/5 to 1/2 acre with slash left in place to shelter emerging aspen suckers from browsing.
1) Clear-Cutting - Clear-cutting is appropriate when the primary management objective is sustained production of forest products, either saw timber or fiber. Cutting sub-merchantable stems along with the merchantable ones will maximize sucker production, minimize the presence of diseased or defective growing stock in the new stand, and avoid suppression of the new crop by residual overstory stems.
2) Partial Cutting - Partial cutting may be feasible in some uneven-aged stands where management objectives require vertical canopy diversity or retention of some overstory; partial cutting may result in enough sprouting to adequately regenerate stands. Individual tree or group selection cutting methods can be applied. Extreme care is necessary to avoid injury to residual stems during logging. Partial cutting is not worthwhile in deteriorated aspen clones where root system die back has reduced suckering.
3) Selective Tree Removal - Remove selected trees on suitable sites to enhance forage production and manage site reproduction.

SILVICULTURAL PRACTICES (continued)
b. Thinning - Ordinarily, only stands on saw timber sites should be thinned. Pre-commercial thinning may be uneconomical as the low productivity of this site would not justify thinning costs.
c. Protection from Disease - There are no proven forest stand treatments that successfully prevent or control disease in aspen. Maintenance of well-stocked stands, minimizing wounding of stems and control of damaging agents, and harvesting at the proper rotation age are the best management recommendations that can be made today.
d. Protection from Insects - Direct control of insects in aspen forests has not been practical. The environmental side-effects from chemical pesticide spraying usually has not been acceptable in the aspen ecosystem. Maintenance of a well-stocked stand and protection from wounding is the most practical method of coping with insects in the aspen forest.
e. Protection from Mammals - Domestic livestock, wild ungulates, porcupines, rodents and hares utilize aspen as food and can have measurable impacts on some stands. Most animal damage can be prevented by careful husbandry of domestic livestock and by population control of wild game. Because most aspen stands are grazed by cattle and/or sheep and have a significant population of wild ungulates, grazing management and game management are important to aspen communities.
f. Fire Management - Fire is a natural feature of the aspen ecosystem. Fire is considered responsible for the abundance of aspen in the west as well as the even-aged structure of many stands. Without human intervention, fire appears to be necessary for the continued well-being of aspen on sites where natural degeneration of the clone occurs, or where insects or pests are especially harmful to the stand. Fires in aspen generally are infrequent, spread slowly, are of low intensity, and are easy to control. Although aspen forests do not burn readily, aspen trees

are extremely sensitive to fire. Even very light fires will kill aspen because the bark is thin and green, and lacks protective corky layers.

Other information

Historically, quaking aspen has been used for mine props, posts, bridge planking, flooring, furniture and fuelwood. This tree has a considerable potential for increased utilization. It makes excellent pulp, excelsior, door corestock, paper, particleboard, matchsticks, structural flakeboard, lumber products and boxwood.
Aspen propagates almost entirely by vegetative means throughout the Great Basin. Regeneration by seed is very rare, although aspen in this area produce large quantities of viable seed. Aspen seeds require a continually moist seedbed and the dry spring and summers of the Great Basin are not conducive to seedling survival.
An undesirable characteristic of quaking aspen is their heavy drain on available water in the soil.

Inventory data references

NASIS data for soil survey areas CA686 and NV774.

Type locality

Location 1: Lander County, NV	
Township/Range/Section	T17N R38E S4
General legal description	Along upper Smith Creek, Desatoya Mountains, Lander County, Nevada. Distribution and extent. Carson City, Churchill, Douglas, southwest Lander, Lyon, Mineral, Storey, and Washoe Counties, Nevada

Other references

Airola, D. A. 1980. Northeast Interior Zone: Vol. III - Birds & Vol. IV - Mammals. U.S. Gov. Printing Off.: 1980-690-082/26.

Alexander R.R. 1987. Ecology, Silviculture, and Management of the Engelmann Spruce-Subalpine Fir Type in the Central and Southern Rocky Mtns. Ag Hndbk No. 659. Rky Mtn For & Rng Exp Sta, USDA-FS.

Baker, F. S. 1925. Aspen in the Central Rocky Mountain Region. USDA Technical Bulletin 1291.

Cryer, D.H. and Murray, J.E. 1988. Aspen Regeneration and Soils. USDA, Bulletin 1291, 47 p. Washington D.C.

DeByle, N. V., and R.P. Winokur, editors. 1985. Aspen: Ecology and Management in the Western United States. General Technical Report RM-119, Rocky Mtn For & Rng Exp Sta, FS, USDA.

DeByle, N.V., P.J. Urness, and D.L. Blank. 1989. Forage Quality in Burned and Un-burned Aspen Communities. Research Paper INT-404. Inter. Res. Sta., FS, USDA.

Edminster, C., et al. 1982. Volume Tables and Point-Sampling Factors for Aspen in Colorado. Res Paper RM-232, Rocky Mtn For & Rng Exp Sta. USDA-FS.

Eyre, F.H. (editor). 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington, D.C.

Contributors

Tamzen Stringham
GKB
Patti Novak-Echenique

Approval

Kendra Moseley, 4/10/2024

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	05/13/2025
Approved by	Kendra Moseley
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:**

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

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:

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

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

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

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:**

17. **Perennial plant reproductive capability:**