Ecological site F022AX101CA
Moist Colluvial Headwater System

Accessed: 05/04/2024

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

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): 022A–Sierra Nevada and Tehachapi Mountains

Major Land Resource Area 22A, Sierra Nevada Mountains, is located predominantly in California and a small section of western Nevada. The area lies completely within the Sierra Nevada Section of the Cascade-Sierra Mountains Province. The Sierra Nevada range has s gentle western slope, and a very abrupt eastern slope. The Sierra Nevada consists of hilly to steep mountains and occasional flatter mountain valleys. Elevation ranges between 1,500 and 9,000 ft throughout most of the range, but peaks often exceed 12,000 ft. The highest point in the continental US occurs in this MLRA (Mount Whitney, 14,494 ft). Most of the Sierra Nevada is dominated by granitic rock of the Mesozoic age, known as the Sierra Nevada Batholith. The northern half is flanked on the west by a metamorphic belt, which consists of highly metamorphosed sedimentary and volcanic rocks. Additionally, glacial activity of the Pleistocene has played a major role in shaping Sierra Nevada features, including cirques, arêtes, and glacial deposits and moraines. Average annual precipitation ranges from 20 to 80 inches in most of the area, with increases along elevational and south-north gradients. Soil temperature regime ranges from mesic, frigid, and cryic. Due to the extreme elevational range found within this MLRA, Land Resource Units (LRUs) were designated to group the MLRA into similar land units.

LRU “X” represents ecological sites driven by abiotic features that override the typical soils or climatic features that drive most of the other LRU zones. In the Sierra Nevada these sites are typically driven by water features associated with lotic or lentic riparian systems. Other features maybe shallow bedrock, or unique chemical development which affects the growth of typical vegetation.

Classification relationships

Forest Alliance = Populus tremuloides – Aspen groves; Association = tentatively Populus tremuloides/upland. murrayana/Carex rossii and *Pinus contorta* ssp. murrayana/Carex spp. (Sawyer, John O., Keeler-Wolf, Todd, and Evens, Julie M. 2009. A Manual of California Vegetation. 2nd ed. California Native Plant Society Press. Sacramento, California.)

Ecological site concept

This site occurs on headwater swales and first order streams, often at geologic junctions that create seeps, at elevations typically between 6,000 and 7,800 feet. Slopes are typically between 3 and 15 percent. Soils are very deep, moist, and sandy, and formed in alluvium and colluvium from mixed sources. The vegetation is a quaking aspen (Populus tremuloides) forest with a high cover and diversity of forbs and grasses in the understory.

Associated sites

F022AX100CA	**Frigid, Sandy, Moist, Outwash Fan** Occurs on adjacent gently sloping meadows and forest edges on alluvial flats with very deep soils with a weak fragipan at 12 to 65 inches and redox features at 10 to 20 inches. The fragipan creates a perched water table, so soils are saturated at shallow depths during the wet season, and droughty during the dry season. Vegetation is a Sierra lodgepole pine (Pinus contorta var. murrayana) forest with willow and forbs.
R022AX102CA	**Frigid E-C Meadow System** Occurs on adjacent low gradient C to E type channels with broad gentle sloped floodplain. A wet to dry meadow complex is associated with aloamy poorly drained soil complex. Vegetation includes Lemmmon's and Geyer's willow, sedges, grasses and forbs.
R022AX105CA	**Steep Mountain Drainageways** Occurs on adjacent steep mountain drainageways with subsurface or Rosgen A or B type channels. A complex of community types are present, with willow (Salix) - alder (Alnus) dominant.

Similar sites

R022AX105CA	**Steep Mountain Drainageways** This site is associated with steep mountain drainageways. Quaking aspen (Populus tremuloides) communities are sometimes present, but willow (Salix) and alder (Alnus(thickets are more typical.

Table 1. Dominant plant species

Tree	(1) *Populus tremuloides*
Shrub	Not specified
Herbaceous	(1) *Veratrum californicum var. californicum* (2) *Elymus glaucus*

Physiographic features

This ecological site is found in mountain drainages with slopes ranging from 0 to 15 percent, but typically above 3 percent. It is found on all aspects, at elevations ranging from 6,230 to 8,790 feet, but typically below 7,800 feet. This site experiences none to frequent flooding of brief duration that may occur from March through May.

Table 2. Representative physiographic features

Landforms	(1) Drainageway
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding frequency	None

Elevation	1,899–2,679 m
Slope	0–15%
Water table depth	51 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 23 to 51 inches, mostly in the form of snow in the winter (November to April). The average annual air temperature ranges from 39 to 43 degrees Fahrenheit. The frost-free (>32F) season is 20 to 60 days and the freeze-free (>28F) season is 40 to 100 days.

Climate stations: (1) 048762, Tahoe Valley FFA AP, California. Period of record 1968-2008

Table 3. Representative climatic features

Frost-free period (average)	40 days
Freeze-free period (average)	70 days
Precipitation total (average)	940 mm

Influencing water features

The area floods during the spring snow melt and the water table remains at 20 to 30 inches from March to May. The water table drops below 60 inches in the summer and fall.

Soil features

The soils associated with this site are very deep and developed from alluvium and colluvium derived from mixed parent materials. They are somewhat poorly drained with moderate permeability. The surface textures are gravelly loamy coarse sand. A layer of moderately decomposed plant material overlies the mineral horizons. Subsurface textures are very gravelly and gravelly loamy coarse sand. The soils associated with this site are taxon above family Oxyaquic cryorthents.

This ecological site has been correlated as a major component in the following mapunits and soil components in the Tahoe Basin soil survey area (CA693), and occurs as a minor component in 27 additional mapunits:

Musym ; MUname ; Compname ; Local_phase ; Comp_pct
9011 ; Oxyaquic Cryorthents-Aquic Xerorthents-Tahoe complex, 0 to 15 percent slopes ; Oxyaquic Cryorthents ; ; 30

Table 4. Representative soil features

Surface texture	(1) Gravelly loamy coarse sand
Family particle size	(1) Sandy
Drainage class	Somewhat poorly drained
Permeability class	Moderate
Soil depth	152 cm
Available water capacity (0-101.6cm)	4.06–5.59 cm
Soil reaction (1:1 water) (0-101.6cm)	5.1–6.5

Ecological dynamics

Abiotic factors
This site occurs on headwater swales and first order streams, often at geologic junctions that create seeps, at elevations of approximately 6000 to 9000 feet. Soils are very deep, moist, and sandy, and formed in alluvium and colluvium from mixed sources. Moist soils support a quaking aspen forest with a high cover and diversity of forbs and grasses in the understory. California false hellebore, a large forb indicative of moist habitats, dominates understory production and blue wildrye is the dominant grass.

Ecological/Disturbance factors
The historic reference community phase is dominated by mature aspen clones, which are adapted to the perennially moist soils of this ecological site (Shepperd et al. 2006). Moist soils and the relatively high light levels characteristic of aspen forests support a high cover and diversity of forbs and grasses.

Fire, conifer invasion and disease are the primary disturbances affecting this ecological site. Aspen regenerates primarily by root suckering after matures stems die; thus aspen requires disturbance from fire, flooding, landslides, or avalanches to maintain dominance and vigor (Shepperd et al. 2001, Shepperd et al. 2006). When the tree canopy is killed or stressed, the movement of the hormone that suppresses root resprouting is reduced, which then causes another hormone to stimulate resprouting from roots (Bartos and Amacher 1998). Without fire or other disturbances such as disease or insect infestation, these hormones are inhibited root sprout production is inhibited. Although less flammable than surrounding forests due to higher moisture (Howard 1996), the aspen forests of this ecological site depend on fire to maintain dominance. With a lack of fire, white fir (*Abies concolor*) and/or Sierra lodgepole pine (*Pinus contorta* var. murrayana) infill into this ecological site. White fir regenerates in the shade of the aspen canopy, and can eventually overshadow the aspen. When thus shaded, new sprouts are inhibited and the mature aspens will die from either diseases or natural senescence. Natural disturbance such as fire or disease can cause die-off of the conifers, creating canopy openings initiating regeneration of the aspen, and prescribed burning or clearcut can also stimulate regeneration (Shepperd et al. 2001). However, if conifers are dominant for too long and all above ground aspen ramets die off, the rootstock will also die and aspen may be lost from the site altogether (Shepperd et al. 2006). Fire suppression has led to infilling, and threatens the viability of many aspen stands in the Tahoe Basin (Shepperd et al. 2006). Grazing by ungulates can also severely impact regeneration of aspen, but at this time this is not an issue in the Lake Tahoe Basin.

Several plant pathogens and pests can kill or severely impact the health of aspen. Aspen are susceptible to several fungal stem canker diseases; the more common and serious cankers are the sooty-bark canker (Encoelia pruinosa), black canker (Ceratocystis fimbriata), Cryptosphaeria canker (Cryptosphaeria populina), and Cytospora canker (Cytospora chrysosperma). These stem cankers enter the aspen through wounds in the bark and create abnormal growth and blackish cankers. The sooty-bark canker and the Cryptosphaeria canker fungi can kill a tree in just one to ten years, while the others may never kill the tree. These fungi are a natural part of the aspen ecology, and are essential at times to create death in the old trees and generate new cycles of regeneration (Johnson et al. 1995).

White trunk rot fungus (Phellinus tremulae) decays the base of the aspen tree, reducing wood quality and weakening the structure of the tree. It tends to infest older trees and makes them susceptible to wind throw. The white truck rot fungus develops hoof shaped conks, which can aid in the identification of infected trees (Ostry and Walters 1983).

Other pathogens are root diseases like Armillaria spp., which weaken the tree and often causes wind throw. Some boring insects and beetles also attack aspens, but generally do not kill the tree. The holes in the bark created by these insects can lead to secondary infection by stem cankers. Foliage diseases such as ink-spot (Ciborina whetzelii) and defoliating insects such as aspen tortrix (Choristoneura conflictana) and western tent caterpillar (Malacosoma californicum) generally do not kill aspen trees, unless severe infestations continue for several years. Again all of these diseases and pest are part of the natural cycle of the aspen ecology (Shepperd et al. 2006).

The reference state consists of the most successionally advanced community phase (numbered 1.1) as well as other community phases, which result from natural and human disturbances. Community phase 1.1 is deemed the phase representative of the most successionally advanced pre-European plant/animal community including periodic natural surface fires that influenced its composition and production. Because this phase is determined from the oldest modern day remnant forests and/or historic literature, some speculation is necessarily involved in describing it.

All tabular data listed for a specific community phase within this ecological site description represent a summary of one or more field data collection plots taken in communities within the community phase. Although such data are valuable in understanding the phase (kinds and amounts of ground and surface materials, canopy characteristics, community phase overstory and understory species, production and composition, and growth), it typically does not represent the absolute range of characteristics nor an exhaustive listing of species for all the dynamic communities within each specific community phase.

State and transition model

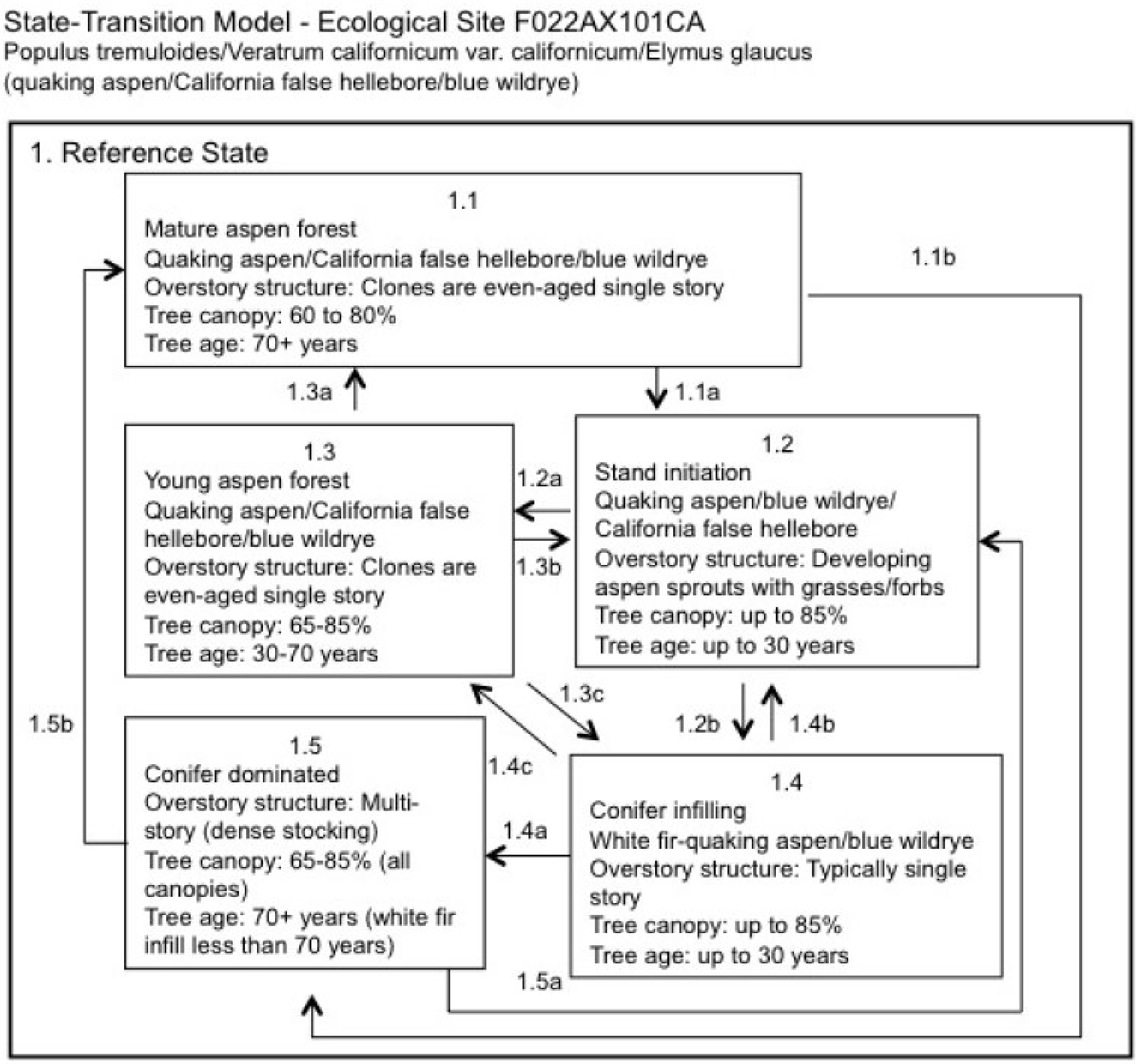

Figure 6. F022AX101CA

State 1
Reference

Community 1.1
Mature aspen forest

Figure 7. Community phase 1.1

This community phase is characterized by clones of older aspen. Clones are typically even-aged single story and may be adjacent to other clones of the same or different ages. The understory is a rich herbaceous community dominated by blue wildrye and California false hellebore. A very high diversity of forb species is present. Shrubs may be present but are not abundant.

Forest overstory. The overstory of mature aspen ranges from 40 to 60 feet tall, and dominants are typically around 100 years old. Stands near meadow openings often have a mid-layer of trees around 25 feet in height, and a perimeter and understory layer of new root sprouts. Canopy cover is usually high with an average of 70 percent cover.

Forest understory. The understory is a rich community of forbs and grasses that provide approximately 90 percent cover. California false hellebore and blue wildrye are the most abundant understory species. Other frequently encountered forbs include Gray's licorice-root (Ligusticum grayi), western sweetroot (Osmorhiza occidentalis), western buttercup (Ranunculus occidentalis), Fendler's meadow-rue (Thalictrum fendleri), Sierra stickseed (Hackelia nervosa), twinleaf bedstraw (Galium bifolium), hairy arnica (Arnica mollis), American yellowrocket (Barbarea orthoceras), and seep monkeyflower (Mimulus guttatus). Many different forb species may be present, with 26 recorded at a single location. Shrubs are sparse, but species may include roundleaf snowberry (Symphoricarpos rotundifolia), wax current (Ribes cereum), and Lemmon's willow (Salix lemmonii). Regenerating aspen stems are present at 8 to 12 percent cover.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Forb	717	1070	1423
Grass/Grasslike	112	168	224
Tree	8	11	17
Shrub/Vine	–	–	11
Total	**837**	**1249**	**1675**

Community 1.2
Stand initiation

After a canopy replacing event such as fire, disease or insect infestation, surviving aspen roots will sprout prolifically. Understory plant cover may also be high.

Forest understory. Young aspen root sprouts can have high cover along with mixed forbs and grasses. There is no plot data on this community phase, but variations of the species listed in phase 1.1 would be present.

Community 1.3
Young aspen forest

This is a healthy young aspen grove of one or more clones that quickly transitions to a relatively mature aspen grove within 30 to 40 years. Height and diameter growth of communities in this phase are likely the highest of all phases. The understory is lush and diverse with patches of aspen root sprouts in openings with disturbance.

Forest overstory. This young aspen grove has high canopy cover, from pole to near mature sized trees. Tree height ranges from 15 to 40 feet. Several age classes may be present, but typically clones making up the interior of a stand will be even-aged.

Forest understory. The understory is diverse, with a high frequency and cover of blue wildrye and California false hellebore, as well as a diversity of other forbs.

Community 1.4
Conifer infilling

Figure 9. Community phase 1.4

This community phase is dominated by quaking aspen, but white fir and/or Sierra lodgepole pine are increasing in size and cover. White fir tends to infill on the drier areas of the aspen grove and, depending on the site, may not completely dominate over the aspen. Sierra lodgepole pine is more tolerant of wet soils.

Community 1.5
Conifer dominated

Figure 10. Community phase 1.5

This community phase is dominated by white fir, with some tall, dying aspen trees evident in mid and lower canopy stories. Over time, evidence of aspen may be missing completely. The understory may have low to no plant cover because of the high canopy cover and shading from white fir.

Pathway 1.1a
Community 1.1 to 1.2

High mortality fire, disease or insect infestations are the primary disturbances that lead to stand initiation, phase 1.2.

Pathway 1.1b
Community 1.1 to 1.5

Mature aspen forest

Conifer dominated

If disturbances are excluded and a conifer seed source is present, conifers including white fir and Sierra lodgepole pine may infill into the stand, ultimately developing towards phase 1.5.

Pathway 1.2a
Community 1.2 to 1.3

The natural pathway is to community phase 1.3, a young aspen grove. This pathway is followed with rapid height growth of aspen. Small moderate-severity fires or selection thinning treatments may help maintain growth and health of the aspen grove.

Pathway 1.2b
Community 1.2 to 1.4

When fire is excluded from the system and a seed source is in close proximity, white fir and/or Sierra lodgepole pine may infill under the aspen overstory (community phase 1.4).

Pathway 1.3a
Community 1.3 to 1.1

This is the natural pathway for this community phase, which evolved with patches of relatively frequent surface and moderate severity fires, or partial tree mortality from a pest outbreak. Manual thinning or prescribed burning can be implemented to replace the natural disturbances which would have removed portions of the tree canopy may increase health and growth of remaining trees. This pathway leads to community phase 1.1.

Pathway 1.3b
Community 1.3 to 1.2

In the event of a canopy fire or high mortality pest attack, this community phase would return to Community Phase 1.2. Without sufficient mortality of older aspen and sunlight reaching the forest floor, the hormone mechanism to stimulate root resprouting may be weak.

Pathway 1.3c
Community 1.3 to 1.4

If fire or pest infestations do not occur and there is a seed source for conifers, then this phase will shift towards the conifer infilling community phase (phase 1.4).

Pathway 1.4b
Community 1.4 to 1.2

Density of ground fuels increases with the dying aspen, and young conifers create ladder fuels, creating conditions conducive to high intensity canopy fire. A severe fire would initiate stand regeneration (phase 1.2). Prescribed fire or clear-cutting could also be used to stimulate stand regeneration.

Pathway 1.4a
Community 1.4 to 1.5

Conifer infilling

Conifer dominated

If fire and other disturbances continue to be excluded from this system the conifer dominated community phase develops (phase 1.5).

Pathway 1.5b
Community 1.5 to 1.1

Conifer dominated

Mature aspen forest

The natural event of a moderate or surface fire in this forest is unlikely due to fuel loading and ladder fuels. Manual treatment to remove the white fir and fuels with or without prescribed burns could be implemented to shift this forest back to the mature aspen community phase (phase 1.1). This assumes that enough upper and mid story aspen can form a reasonable canopy and withstand windthrow and snow breakage. A high mortality disease or pest infestation on the white fir could also create a shift towards phase 1.1 under the same assumptions. It is more likely that a return to phase 1.1 would occur via a severe fire or clear-cut that transitions this community towards phase 1.2., from which natural succession to phase 1.1 may occur.

Pathway 1.5a
Community 1.5 to 1.2

At this point, risk of a severe crown fire is high and, should one occur, would initiate stand initiation (phase 1.2), providing that enough aspen rootstocks with regenerative potential are present beneath the white fir overstory. Prescribed fire or clear-cutting could also be used to stimulate stand regeneration.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
1	**Trees**			8–17	
	quaking aspen	POTR5	*Populus tremuloides*	8–17	80–105
Forb					
2	**Forbs**			717–1423	
	California false hellebore	VECAC2	*Veratrum californicum var. californicum*	560–1143	1–25
	western buttercup	RAOC	*Ranunculus occidentalis*	90–191	1–20
	twinleaf bedstraw	GABI	*Galium bifolium*	11–34	1–10
	Sierra stickseed	HANE	*Hackelia nervosa*	11–22	1–15
	western sweetroot	OSOC	*Osmorhiza occidentalis*	1–17	0–5
	Fendler's meadow-rue	THFE	*Thalictrum fendleri*	0–17	0–1
	hairy arnica	ARMO4	*Arnica mollis*	1–11	0–2
	American yellowrocket	BAOR	*Barbarea orthoceras*	0–11	0–1
	water minerslettuce	MOCH	*Montia chamissoi*	1–6	0–5
	Gray's licorice-root	LIGR	*Ligusticum grayi*	0–6	0–3
	starry false lily of the valley	MAST4	*Maianthemum stellatum*	0–6	0–1
	seep monkeyflower	MIGU	*Mimulus guttatus*	1–6	0–1
	Sierra pea	LANE3	*Lathyrus nevadensis*	0–6	0–1
	Torrey's blue eyed Mary	COTO	*Collinsia torreyi*	0–6	0–1
	field horsetail	EQAR	*Equisetum arvense*	0–6	0–1
	Sierra baby blue eyes	NESP	*Nemophila spatulata*	0–6	0–1
	common yarrow	ACMI2	*Achillea millefolium*	0–6	0–1
	common dandelion	TAOF	*Taraxacum officinale*	0–6	0–1
Grass/Grasslike					
3	**Grasses/Grasslikes**			112–224	
	blue wildrye	ELGL	*Elymus glaucus*	112–224	20–50
	sedge	CAREX	*Carex*	0–6	0–2
	slimstem reedgrass	CAST36	*Calamagrostis stricta*	0–6	0–2
Shrub/Vine					
4	**Shrubs**			0–11	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–2	0–1
	wax currant	RICEC2	*Ribes cereum var. cereum*	0–2	0–1
	Lemmon's willow	SALE	*Salix lemmonii*	0–2	0–1
	roundleaf snowberry	SYRO	*Symphoricarpos rotundifolius*	0–2	0–1

Table 7. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
quaking aspen	POTR5	*Populus tremuloides*	Native	–	60–80	–	–

Table 8. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
blue wildrye	ELGL	*Elymus glaucus*	Native	–	20–50
sedge	CAREX	*Carex*	Native	–	0–2
slimstem reedgrass	CAST36	*Calamagrostis stricta*	Native	–	0–2
Forb/Herb					
California false hellebore	VECA2	*Veratrum californicum*	Native	–	1–25
western buttercup	RAOC	*Ranunculus occidentalis*	Native	–	1–20
Sierra stickseed	HANE	*Hackelia nervosa*	Native	–	1–15
Fendler's meadow-rue	THFE	*Thalictrum fendleri*	Native	–	1–10
twinleaf bedstraw	GABI	*Galium bifolium*	Native	–	1–10
western sweetroot	OSOC	*Osmorhiza occidentalis*	Native	–	0–5
Gray's licorice-root	LIGR	*Ligusticum grayi*	Native	–	0–3
hairy arnica	ARMO4	*Arnica mollis*	Native	–	0–2
water minerslettuce	MOCH	*Montia chamissoi*	Native	–	0–1
American yellowrocket	BAOR	*Barbarea orthoceras*	Native	–	0–1
seep monkeyflower	MIGU	*Mimulus guttatus*	Native	–	0–1
Torrey's blue eyed Mary	COTO	*Collinsia torreyi*	Native	–	0–1
Sierra pea	LANE3	*Lathyrus nevadensis*	Native	–	0–1
common dandelion	TAOF	*Taraxacum officinale*	Native	–	0–1
Sierra baby blue eyes	NESP	*Nemophila spatulata*	Native	–	0–1
common yarrow	ACMI2	*Achillea millefolium*	Native	–	0–1
field horsetail	EQAR	*Equisetum arvense*	Native	–	0–1
Shrub/Subshrub					
rimelia lichen	RICE2	*Rimelia cetrata*	Native	–	0–1
Lemmon's willow	SALE	*Salix lemmonii*	Native	–	0–1
roundleaf snowberry	SYRO	*Symphoricarpos rotundifolius*	Native	–	0–1
Tree					
quaking aspen	POTR5	*Populus tremuloides*	Native	–	8–12

Table 9. Community 1.5 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
white fir	ABCO	*Abies concolor*	Native	–	60–70	–	–
quaking aspen	POTR5	*Populus tremuloides*	Native	–	2–8	–	–
Sierra lodgepole pine	PICOM	*Pinus contorta var. murrayana*	Native	–	0–2	–	–

Table 10. Community 1.5 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Forb/Herb					
arrowleaf ragwort	SETR	*Senecio triangularis*	Native	–	0–2

Animal community

Birds tend to be more frequent in aspen stands than in the neighboring conifer forest, and seem to prefer the larger mature aspens (Shepperd et al. 2006). Birds that are commonly found in aspen stands include warbling vireo (Vireo gilvus), Empidonax flycatcher (Empidonax spp.), housewren (Troglodytes troglodytes), and Oregon junco (Junco hyemalis thuberi). Several cavity nesting birds in this area include flickers (Colaptes spp.), woodpeckers (Picoides spp. and Melanerpes spp.), chickadees (Parus spp.), and nuthatches (Sitta spp.). Secondary colonizers like owls and sparrows also inhabit aspen cavities. Beavers often use aspen for logs and dams, and deer browse the young aspen and other vegetation in the understory.

Hydrological functions

This site is associated with seasonally wet areas. Good vegetative cover is crucial to reduce sediment transport.

Recreational uses

Many trails are established in the aspen areas to view wildlife, flowers, and seasonal fall colors of the aspen.

Wood products

Although aspen is not use commercially in this area, in the eastern United States, the wood is used primarily for pulp and particleboard, especially waferboard and oriented strandboard. Aspen fibers can be used to make fine paper, and its lumber is used for making boxes, crates, pallets, and furniture (Howard, 1996).

Other information

Site index documentation:

Edminster (1987) and Baker (1925) were used to determine aspen site index and forest growth, respectively. Low to High values of Site index and CMAI (culmination of mean annual increment) give an indication of the range of inherent productivity of this ecological site. Site index relates to height of dominant trees over a set period of time and CMAI relates to the average annual growth of wood fiber in the boles/trunks of trees. Site index and CMAI listed in the Forest Site Productivity section are in units of feet and cubic feet/acre/year, respectively. Both site index and CMAI are estimates; on-site investigation is recommended for specific forest management units for each soil classified to this ecological site. The historical and actual basal area of trees within a growing stand will greatly influence CMAI.

Trees appropriate for site index measurement typically occur in stands of community phase 1.3 and, if trees do not have heart rot, phase 1.1. Site trees are selected according to guidance in the cited publications. Please refer to the Tahoe Basin Area Soil Survey for detailed site index information by soil component.

Extensive literature is available on aspen ecology, genetics, and restoration. For further information look for the following publications online:

Shepperd, Wayne D., Paul C. Rodgers, David Burton, and Dale L. Bartos. 2006. Ecology, biodiversity, management, and restoration of aspen in the Sierra Nevada. Gen. Tech. Rep. RMRS-GTR-178. Ft. Collins, CO (http://www.fs.fed.us/rm/pubs/rmrs_gtr178.pdf)

Shepperd, Wayne D.: Binkley, Dan; Bartos, Dale L.; Stohlgren, Thomas J.; and Eskew, Lane G., compilers. 2001. Sustaining Aspen in Western Landscapes: Symposium Proceedings; 13-15 June 2000; Grand Junction, CO. Proceedings RMRS-P-18. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 460 p (http://www.fs.fed.us/rm/pubs/rmrs_p18.html)

Populus tremuloides. In: Fire Effects Information System.
Available: http://www.fs.fed.us/database/feis/

Table 11. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
quaking aspen	*POTR5*	65	65	36	36	100	735	–	

Inventory data references

The following NRCS- TEUI plots were used to describe this ecological site:

Cae04211- site location
Rip04023
Rip04035
Rip04037
Tcc03h103
Tcc04148

Type locality

Location 1: Douglas County, NV	
Township/Range/Section	T14N R19E S18
UTM zone	N
UTM northing	4329796
UTM easting	250162
General legal description	Highway 50 to Spooner summit. Take forest service road 14N32, behind fire station. Plot is in aspen grove west of Duane Bliss Peak.

Other references

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Johnson, D. W., J. S. Beatty, and T. E. Hinds. 1995. Cankers on western quaking aspen. USDA Forest Service.

Ostry, M. E. and J. W. Walters. 1983. How to identify and minimize white trunk rot of aspen. USDA Forest Service North Central Research Station.

Shepperd, W. D., P. C. Rogers, D. Burton, and D. L. Bartos. 2006. Ecology, biodiversity, management, and restoration of aspen in the Sierra Nevada. RMRS-GTR-178, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

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Contributors

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Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
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:**