

Ecological site R022AX105CA Steep Mountain Drainageways

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.



Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 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 a 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.

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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.

Ecological site concept

This ecological site occurs on steep headwater to first order drainageways in colluvial valleys (valley type II) at elevations typically between 6,400 and 8,000 feet and slopes typically between 5 and 15 percent. Several community types are present. Species such as quaking aspen (*Populus tremuloides*), thinleaf alder (*Alnus incana* ssp. *tenuifolia*), and Lemmon's willow (*Salix lemmonii*) are common. There is a high diversity of associated species.

Associated sites

F022AC003CA	Frigid-Cryic Sandy Slopes This ecological site occurs on northern aspects on colluvial soils with a cryic temperature regime. Mountain hemlock (<i>Tsuga mertensiana</i>) and California red fir (<i>Abies magnifica</i>) mixed forests are present.
F022AE007CA	Frigid, Sandy, Moraines And Hill Slopes This ecological site occurs on moraines, with white fir mixed conifer forests.
F022AE013CA	Frigid, Loamy, Volcanic Mountain Slopes This ecological site occurs primarily on volcanic mountain slopes. A white fir mixed conifer forest is present, with a diverse understory.
F022AE025CA	Loamy Moist Outwash This ecological site occurs on outwash. White fir- Jeffrey pine forests are present, with lush understory of moist indicator species.
F022AF002CA	Frigid, Sandy, Or Loamy Outwash This ecological site occurs on outwash with a Jeffrey pine forest present. It occurs on the drier eastside LRU, with upland shrubs.
F022AF004CA	Frigid, Shallow To Deep, Sandy Mountain Slopes This ecological site occurs on moderately deep soils, on south facing granitic mountain slopes. There is an open Jeffrey pine forest with montane shrubs in the understory.
F022AF005CA	Frigid, Deep To Very Deep, Sandy-Loamy Mountain Slopes This ecological site occurs on deep to very deep soils on north facing granitic mountain slopes. There is a dense white fir- Jeffrey pine forest, with little understory.
F022AF006CA	Loamy Frigid Metamorphic Slopes This ecological site occurs on moderately deep to very deep, metamorphic mountain slopes. There is a white fir mixed conifer forests, with a diverse and productive understory.
F022AX101CA	Moist Colluvial Headwater System This riparian aspen forest occurs on colluvial hillslopes, and typically lacks a true channel or the mountain alder and willow communities.
R022AE217CA	Frigid Volcanic Slopes This ecological site occurs on moderately deep soils over volcanic bedrock. A montane shrub and mixed forb community is present.
R022AX101CA	Frigid Anastomosed System This riparian ecological site occurs on lake deltas, with a DA stream channel type. It may occur, just downstream of this (R022AX105CA) ecological site.
R022AX102CA	Frigid E-C Meadow System This riparian ecological site occurs in low gradient meadows, with a E or C channel type. It may occur below this ecological site, where low sloped meadows have formed.

R022AX103CA	Cryic E Meadow System This riparian ecological site occurs on higher elevation, low sloped meadows with an E type channel. Soils are cryic, with mountain (<i>Salix eastwoodii</i>) or Sierra willow (<i>Salix oresteria</i>) present.
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Similar sites

R022AX102CA	Frigid E-C Meadow System This riparian ecological has similar species as the willow community component, but it occurs on low sloped meadows and E or C type streams with less than 2 percent slopes.
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Table 1. Dominant plant species

Tree	(1) <i>Populus tremuloides</i>
Shrub	(1) <i>Salix lemmonii</i> (2) <i>Alnus incana</i> subsp. <i>tenuifolia</i>
Herbaceous	(1) <i>Veratrum californicum</i> (2) <i>Sphenosciadium capitellatum</i>

Physiographic features

This site occurs on headwater to first order drainageways and floodplains in colluvial valleys (Valley type II). Slopes range from 0 to 15 percent, but are typically above 5 percent. Elevations range from 6,230 feet to 8,790 feet, but more typically between 6,400 and 8,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Flood plain
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to occasional
Elevation	1,899–2,679 m
Slope	0–15%
Water table depth	0–152 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation is 23 to 61 inches, mostly in the form of snow in the winter months from November through April. The average annual air temperature is 41 to 46 degrees Fahrenheit, and the frost-free (>32F) season is 20 to 75 days. The freeze-free (>28F) season is 40 to 120 days.

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

Table 3. Representative climatic features

Frost-free period (average)	45 days
Freeze-free period (average)	60 days
Precipitation total (average)	1,067 mm

Influencing water features

This site is associated with small, steep drainageways with subsurface, intermittent or perennial flow.

Soil features

There are several soils associated with this ecological site. They are associated with different fluvial surfaces, and vary in wetness and organic matter accumulation. These soils are all very deep, and formed in alluvium mixed with colluvium or alluvium derived from mixed material. The soil moisture regime is aquic and the soil temperature regime is frigid. Surface rock cover is typically absent, but subsurface gravels range from 3 to 80 percent.

Soils by fluvial surface:

CC1, Drainageway

The soil for this component has not been developed in NASIS, but pedon data has been collected at several sites, and will be added in the future. The soils have 15 inches of organic horizons over sandy soils below. Taxonomy is Typic Endoaquents. Water features are near the surface, and the soil remains wet throughout most of summer. CC1 is associated with this component.

CC2, Floodplain

The Tahoe, gravelly phase (coarse-loamy, mixed, superactive, acid, frigid Cumulic Humaquepts) soil occurs in areas where alluvium has accumulated, forming sloped meadows. This component occurs at the lower elevations of this ecological site. The surface texture is mucky silt loam and subsurface textures are mucky silt loam and gravelly coarse sand. The Tahoe, gravelly phase component is not flooded or ponded to occasionally or flooded or ponded for up to long durations, CC2 is associated with this soil component.

CC3, Drainageway, sideslopes

The dominant soil associated with this site is a higher order component, Aquic Xerorthents. It occurs on the side slopes of small drainageways. The soils have formed in a mix of alluvium and colluvium. The surface texture is sandy loam, with subsurface textures of sandy loam, coarse sandy loam, gravelly sandy loam, loamy coarse sand, and sandy loam. CC3 is associated with this site.

This ecological site occurs as a major component in the following mapunit in the Lake Tahoe Basin Soil Survey (CA693).

Map unit; Map unit name; Component; Phase; Percent

9011;Oxyaquic Cryorthents-Aquic Xerorthents-Tahoe complex, 0 to 15 percent slopes;Aquic Xerorthents;;28
9011;Oxyaquic Cryorthents-Aquic Xerorthents-Tahoe complex, 0 to 15 percent slopes;Tahoe;gravelly;15
7232;Waca very gravelly medial coarse sandy loam, 30 to 50 percent slopes;Typic Epiaquents;;1

This site is correlated to the Aquic Xerorthent component (1 to 2 percent) in 37 map units in the Lake Tahoe Basin Soil Survey, including map units 7101, 7111, 7112, 7122, 7123, 7131, 7132, 7133, 7141, 7142, 7143, 7151, 7152, 7153, 7211, 7221, 7231, 7232, 7233, 7241, 7242, 7422, 7423, 7424, 7426, 7427, 7428, 7484, 7485, 7486, 7487, 7488, 7489, 7521, 7522, 7523, and 7526.

Table 4. Representative soil features

Parent material	(1) Alluvium–granite (2) Colluvium–volcanic breccia
Surface texture	(1) Loamy sand (2) Mucky silt loam
Family particle size	(1) Sandy
Drainage class	Poorly drained to very poorly drained
Permeability class	Moderate
Soil depth	152 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	9.91–18.54 cm
Soil reaction (1:1 water) (0-101.6cm)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–80%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Abiotic Features:

This ecological site occurs on steep headwater to first order drainageways in colluvial valleys. Stream channels are absent, small rills or a Rosgen A or Ba channel type. As presently mapped, this riparian complex has high variability. It is dominant in one mapunit, and associated with the higher order Aquic Xerorthents component (1 to 2 percent composition) in 38 mapunits. The headwater and first order streams are the most common system, so are the focus of this ecological site. Lower elevation reaches, with Order 2 and 3 streams, are currently mapped as this ecological site but should be developed as another ecological site. These areas are not adequately described in this ESD.

Hydrologic factors:

This riparian ecological site is composed of several components that may or may not occur side by side along the drainageway. It is primarily dependent upon subsurface flow, but may also naturally have a small Rosgen A or Ba channel below the sloped meadow. At the headwater sections of this riparian complex water discharges from seeps or springs in concave swales, or at bedrock faults. Water tables in the wettest areas are near the surface throughout most of the summer. Spring snowmelt can create sheet flooding across the drainageway and associated sloped meadows. Lower in the drainageway, or in steeper sections, small A or Ba channels develop.

Disturbance Factors:

During the mid-1800's approximately 80 percent of the forests in Tahoe were clear-cut during the Comstock era (Elliott-Fisk et al. 1996). Tree removal increased erosion on adjacent mountain slopes and increased sediment supply to these systems. Removal of trees would also have reduced water loss to evapotranspiration and increased water flow into the streams. The side effects of the logging era on the stream morphology are unknown, but likely increased sediment supply and stream volume in these systems. Davis (DAVIS (1996) reports increased erosion between 1850 and 1900 based on analysis of cores from Lake Tahoe. The erosion was attributed to logging, grazing and road development during this period. During the same period, there was an increase in the algae *Pediastrum*, and an increase in sedge (*Carex* spp.) pollen, possibly due to increased nutrient loading into the lake and tributaries.

The meadows in the Lake Tahoe Basin were grazed in the past by cattle and sheep. Over 13 dairy farms were active in the basin, and most meadows were fenced for cattle grazing. Sheep roamed the mountains, and denuded much of the forbs and grasses (Elliott-Fisk et al. 1996). Cattle concentrate in riparian habitats because of access to water and forage, shade and gentle landscapes (Kie and Boroski 1996). Cattle may have affected the present composition of vegetation by selectively grazing palatable species such as grasses, and trampling susceptible species. Grazing can affect channel morphology by removing bank stabilizing vegetation such as willows, and by trampling stream banks when accessing the stream.

Beavers were once thought to be non-native to the Sierra Nevada, but carbon dating of old beaver dams has shown that beavers were in the Sierra Nevada since AD 580 (James and Lanman 2012, Landman et al. 2012). Beaver trapping and extirpation efforts eliminated beavers from the higher Sierra Nevada by mid-1800s. Beavers were reintroduced into the Lake Tahoe Basin from 1939 to 1949 (Beier and Barrett 1987) after 100 years or more of absence. Nine beavers were introduced from the Snake River in Idaho to the Truckee River. Since then populations have expanded to many watersheds around Lake Tahoe. In 1987 there were 0.72 colonies (3.5 beavers) per km of stream along the Truckee River (Beier and Barrett 1987).

These small streams do not provide the deep shallow water preferred for making beaver ponds, but beaver cut thinleaf alder and willow from these areas, and carry them to their dams typically downstream from these sites.

Ecological sites associated with lotic stream systems are developed using channel evolution models. Stream systems are dynamic and continually evolve to reach a stable equilibrium. Streams develop identifiable stages of development based on channel morphology (Rosgen 1997). These stages are identified using a state and transition model based on stream evolution models.

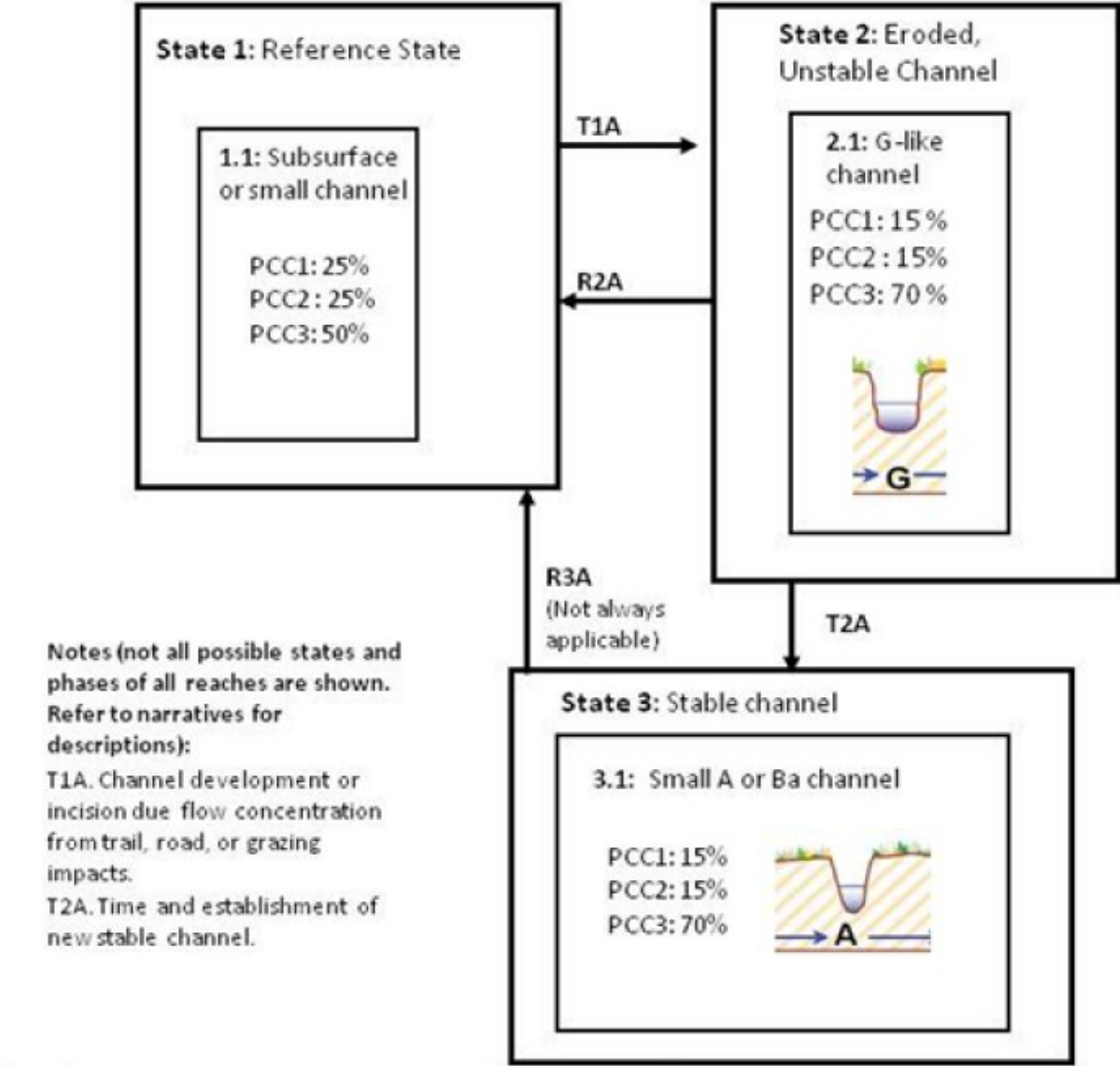
The reference state is typically the pre-settlement, most successional advanced and hydrologically stable community phase (numbered 1.1), and the community phases that result from natural and human disturbances. Community phase 1.1 is deemed the phase representative of the most successional advanced pre-European plant/animal community including beaver activity and hydrologic conditions that influence its composition and production. Because this phase is partly determined from reconstruction and/or historic literature, some speculation is necessarily involved in describing it.

All tabular data listed for a specific community component within this ecological site description represent a summary of one or more field data collection plots taken in modal communities within the community component. Although such data are valuable in understanding the community component (kinds and amounts of ground and surface materials, canopy characteristics, community phase overstory and understory species, production and composition, and growth), they do not represent the absolute range of characteristics or an exhaustive listing of all species that may occur in that phase over the geographic range of the ecological site.

State and transition model

R022AX105CA, Steep Mountain Drainageway Complex

Populus tremuloides / *Salix lemmonii* - *Alnus incana* ssp. *tenuifolia* / *Veratrum californicum* - *Sphenosciadium capitellatum*
(quaking aspen / Lemmon's willow - mountain alder / California false hellebore - woollyhead parsnip)



I.D.	Plant Association	Fluvial Surface/Landform
1	Thinleaf alder-Lemmon's willow	Drainageway
2	Lemmon's willow and sedges	Floodplain
3	Quaking aspen	Drainageway, margins

Figure 6. R022AX105CA STM

State 1
Reference State

This is the reference state for this ecological site.

Community 1.1

Subsurface or small channel



Figure 7. Area view



Figure 8. CC1



Figure 9. CC2



Figure 10. CC3

This phase does not have a defined channel. There may be small rivulets, or signs of surface flow through sedges or moss. This phase occurs at headwater seeps, or where slopes break from steeper drainage slopes, and flow goes subsurface. This phase has several community components that do not always occur together in one location, but repeat along the length of the stream. CC1, Drainageway This community occurs in the steeper, more confined seeps and springs. It is dominated by thinleaf alder and Lemmon's willow. Thinleaf alder prefers flowing water, and although there may not be a surface channel, the steeper slopes and sandy soils, allow for rapid subsurface flow. Thinleaf alder often occurs on areas subject to flooding and high disturbances, however these areas are relatively stable. Thinleaf alder fixes nitrogen, captures fine sediments in its roots during spring sheep flows, and produces copious amounts of leaf litter. These attributes help develop a nutrient rich soil surface. Lemmon's willow is more tolerant to prolonged saturation and will occur in areas with lower slopes, or finer soil textures. Common species in this community component are Columbian monkshood (*Aconitum columbianum*), Pacific onion (*Allium validum*), western columbine (*Aquilegia formosa*), Brewer's bittercress (*Cardamine breweri*), fringed willowherb (*Epilobium ciliatum*), scarlet fritillary (*Fritillaria recurva*), bedstraw (*Galium* sp.), common cowparsnip (*Heracleum maximum*), starry false lily of the valley (*Maianthemum stellatum*), Brewer's miterwort (*Mitella breweri*), seep monkeyflower (*Mimulus guttatus*), woollyhead parsnip (*Sphenosciadium capitellatum*), and fowl mannagrass (*Glyceria striata*). CC2, Floodplain This community occurs in broader sloping meadows. Recent alluvium may be deposited over older outwash deposits. Lemmon's willow and sedges are dominant, with a diversity of associated species. Geyer willow (*Salix geyeriana*) and shining willow (*Salix lucida*) are occasionally present. Thinleaf alder occurs in patches, or along surface channels. Whitestem gooseberry (*Ribes inerme* var. *inerme*) is present under the canopy of willows, and roundleaf snowberry (*Symphoricarpos rotundifolius*) occurs on the drier meadow edges. This community is heavily dominated by grass and grass-likes. Nebraska sedge (*Carex nebrascensis*) is common and often abundant. Other grass grass-like include bentgrass (*Agrostis* sp.), water sedge (*Carex aquatilis*), slenderbeak sedge (*Carex athrostachya*), other sedges (*Carex* spp.), slimstem reedgrass (*Calamagrostis stricta*), nearlyblack sedge (*Carex subnigricans*), Northwest Territory sedge (*Carex utriculata*), blister sedge (*Carex vesicaria*), tufted hairgrass (*Deschampsia cespitosa*), slender hairgrass (*Deschampsia elongata*), fowl mannagrass (*Glyceria striata*), rushes (*Juncus* spp.), straightleaf rush (*Juncus orthophyllus*), and muhly (*Muhlenbergia* sp.). In drier or more disturbed areas brome (*Bromus* sp.), meadow barley (*Hordeum brachyantherum*), squirreltail (*Elymus elymoides*), and Kentucky bluegrass (*Poa pratensis*) increase. Common forbs include common yarrow (*Achillea millefolium*), nettleleaf giant hyssop (*Agastache urticifolia*), Pacific onion, Brewer's angelica (*Angelica breweri*), fireweed

(*Chamerion angustifolium* ssp. *circumvagum*), Sierra larkspur (*Delphinium glaucum*), fringed willowherb (*Epilobium ciliatum*), largeleaf avens (*Geum macrophyllum*), Sierra stickseed (*Hackelia nervosa*), common cowparsnip (*Heracleum maximum*), tinker's penny (*Hypericum anagalloides*), primrose monkeyflower (*Mimulus primuloides*), slender cinquefoil (*Potentilla gracilis*), western polemonium (*Polemonium occidentale*), arrowleaf ragwort (*Senecio triangularis*), woollyhead parsnip (*Sphenosciadium capitellatum*), western aster (*Symphyotrichum ascendens*), aster (*Symphyotrichum* sp.), Fendler's meadow-rue (*Thalictrum fendleri*), and California false hellebore (*Veratrum californicum*). Quaking aspen and Sierra lodgepole pine (*Pinus contorta* var. *murrayana*) may be present in low amounts. CC3, Drainageway margins This community occurs on the margins of the drainageway, and a short distance up the adjacent hillslope. Quaking aspen groves are present with variation in wetness and understory composition. The fact that aspen are clonal and share a community root system to some extent, may explain why aspen extend up the hillslope onto drier conditions. They may be translocating water from the wetter sites via their root system to support clones on the hillslopes. Shrubs that may be present included thinleaf alder Saskatoon serviceberry (*Amelanchier alnifolia*), wax currant (*Ribes cereum*), gooseberry currant (*Ribes montigenum*), Scouler's willow (*Salix scouleriana*), and roundleaf snowberry (*Symphoricarpos rotundifolius*). Blue wildrye is the most common grass, with bentgrass and mountain brome present in small amounts. Common forbs include lupine (*Lupinus* sp.), starry false lily of the valley, mountain monardella (*Monardella odoratissima*), sweetcicely (*Osmorhiza berteroi*), slender cinquefoil (*Potentilla gracilis*), Fendler's meadow-rue (*Thalictrum fendleri*). In wetter areas, species from CC2 occur in the understory, particularly common yarrow (*Achillea millefolium*), common cowparsnip (*Heracleum maximum*), woollyhead parsnip (*Sphenosciadium capitellatum*), and California false hellebore (*Veratrum californicum*). This aspen community can be seral to conifer species. White fir (*Abies concolor*), or at the higher elevations California red fir (*Abies magnifica*), are present in the understory. Sierra lodgepole pine may also be present.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	11	2018	3923
Grass/Grasslike	–	897	2802
Forb	22	476	841
Tree	–	84	168
Total	33	3475	7734

State 2 Unstable Channel

This state is an unstable state with an actively eroding gully or G type channel.

Community 2.1 G type channel



Figure 12. G Channel

This phase has a single or multiple eroded gully-like channels. In some areas small sections of the stream caved in to subsurface channels, eventually connecting to a continuous surface channel. Erosion is evident along the banks. This can be a natural process caused by infrequent large flood events, or by human induced triggers. The effect on the vegetation is as general drying of the meadow, as subsurface flow is intercepted and drained more rapidly from the site. In some cases the water table is lowered by a foot or more. The community composition remains relatively similar, but upland species may replace wetland obligate species as the site becomes drier. CC1, Drainageway This community may remain similar in composition to State 1, since it is in the wettest area, and thinleaf alder may benefit from the increased surface flow. CC2, Floodplain This community will be most impacted by drying conditions. Thinleaf alder may increase along the new gully like channel. The meadow edges may see an increase of upland species such as roundleaf snowberry (*Symphoricarpos rotundifolius*), brome (*Bromus* sp.), meadow barley (*Hordeum brachyantherum*), squirreltail (*Elymus elymoides*), and Kentucky bluegrass (*Poa pratensis*). Forbs such as common yarrow (*Achillea millefolium*), fireweed (*Chamerion angustifolium* ssp. *circumvagum*), Sierra stickseed (*Hackelia nervosa*), slender cinquefoil (*Potentilla gracilis*), arrowleaf ragwort (*Senecio triangularis*), woollyhead parsnip (*Sphenosciadium capitellatum*), western aster (*Symphyotrichum ascendens*), aster (*Symphyotrichum* sp.), Fendler's meadow-rue (*Thalictrum fendleri*), and California false hellebore (*Veratrum californicum*) may increase in place of sedges. Quaking aspen and Sierra lodgepole pine (*Pinus contorta* var. *murrayana*) may increase. CC3, Drainageway margins This community may be unaffected by hydrologic changes in this phase.

State 3

Re-established stable channel

This state has a small stable A or Ba type channel. The banks are sloped, and vegetated and stabilized by thinleaf alder or other roots. Moss is common on the banks or gravels and cobbles.

Community 3.1

A or Ba Type Channel



Figure 13. A Channel

This phase is defined with a stable A or Ba channel type. Due to the confinement of the channel, flooding does not occur on the meadow, CC2. In some areas these meadows may still have a connection to the spring or seep, and maintain high water tables throughout the year. Community composition remains similar to state 1, but CC2 may become drier and dominated by more upland species as identified in State 2.

Transition 1.1a State 1 to 2

This transition is triggered by grazing, road development, or trails that increase flow to the channel and cause it to down cut into an unstable G type channel.

Restoration pathway 2.1a State 2 to 1

Restoration approaches vary depending upon the site and the triggers that initiated channel erosion. Grazing does not occur in most of these sites currently, but if grazing does occur, fences should keep livestock out of these areas. Drainage structures on roads and trails should be developed, so increased run off does not flow into these streams. Road crossing should be designed so channels can cross at their proper gradient and culverts or dips allow for sufficient flow. In some areas streams may need physical restoration, such as adding stream gradient structures and sedge plantings to raise the stream level.

Transition 2.1a State 2 to 3

This transition occurs when the channel has widened over time, and has more sloped banks with vegetation. This may occur if disturbances are removed or managed properly or as the channel adjusts to accommodate the disturbances.

Restoration pathway 3.1A

State 3 to 1

Restoration approaches vary depending upon the site, and not all sites should be restored to State 1. State 3 can exist as a natural condition. However, if restoration to State 1 is assessed as appropriate, restoration approaches would be similar as outlined in restoration pathway 2.1A.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	Drainageway			897–2242	
	thinleaf alder	ALINT	<i>Alnus incana ssp. tenuifolia</i>	897–1233	55–85
	Lemmon's willow	SALE	<i>Salix lemmonii</i>	56–1009	5–15
	shining willow	SALU	<i>Salix lucida</i>	0–56	0–1
2	Floodplain			1345–3923	
	Lemmon's willow	SALE	<i>Salix lemmonii</i>	224–2802	10–55
	Geyer willow	SAGE2	<i>Salix geyeriana</i>	0–2018	0–30
	thinleaf alder	ALINT	<i>Alnus incana ssp. tenuifolia</i>	0–224	0–8
	whitestem gooseberry	RIINI	<i>Ribes inerme var. inerme</i>	0–168	0–5
	shining willow	SALU	<i>Salix lucida</i>	0–22	0–1
	roundleaf snowberry	SYRO	<i>Symphoricarpos rotundifolius</i>	0–11	0–1
3	Drainageway margins			11–280	
	roundleaf snowberry	SYRO	<i>Symphoricarpos rotundifolius</i>	0–112	1–15
	gooseberry currant	RIMO2	<i>Ribes montigenum</i>	0–56	0–5
	Scouler's willow	SASC	<i>Salix scouleriana</i>	0–56	0–1
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	0–28	0–2
	wax currant	RICE	<i>Ribes cereum</i>	0–11	0–1
	thinleaf alder	ALINT	<i>Alnus incana ssp. tenuifolia</i>	0–1	0–15
Grass/Grasslike					
1	Drainageway			0–39	
	fowl mannagrass	GLST	<i>Glyceria striata</i>	0–39	0–3
2	Floodplain			897–2802	
	sedge	CAREX	<i>Carex</i>	56–1681	5–60
	Northwest Territory sedge	CAUT	<i>Carex utriculata</i>	0–168	0–8
	tufted hairgrass	DECE	<i>Deschampsia cespitosa</i>	0–78	0–5
	blister sedge	CAVE6	<i>Carex vesicaria</i>	0–67	0–3
	nearlyblack sedge	CASU7	<i>Carex subnigricans</i>	0–56	0–8
	slenderbeak sedge	CAAT3	<i>Carex athrostachya</i>	0–39	0–3
	bentgrass	AGROS2	<i>Agrostis</i>	0–22	0–2
	slimstem reedgrass	CAST36	<i>Calamagrostis stricta</i>	0–17	0–1
	slender hairgrass	DEEL	<i>Deschampsia elongata</i>	0–11	0–1
	brome	BROMU	<i>Bromus</i>	0–11	0–1
	water sedge	CAAQ	<i>Carex aquatilis</i>	0–11	0–1

	straightleaf rush	JUOR	<i>Juncus orthophyllus</i>	0–11	0–1
	muhly	MUHLE	<i>Muhlenbergia</i>	0–11	0–1
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–11	0–1
	rush	JUNCU	<i>Juncus</i>	–	0–15
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	–	0–8
	meadow barley	HOBR2	<i>Hordeum brachyantherum</i>	–	0–2
	squirreltail	ELEL5	<i>Elymus elymoides</i>	–	0–1
	fowl mannagrass	GLST	<i>Glyceria striata</i>	–	0–1
3	Drainageway margins			0–34	
	mountain brome	BRMA4	<i>Bromus marginatus</i>	0–34	0–2
	blue wildrye	ELGL	<i>Elymus glaucus</i>	0–17	0–2
	bentgrass	AGROS2	<i>Agrostis</i>	0–6	0–1
Forb					
1	Drainageway			336–650	
	common cowparsnip	HEMA80	<i>Heracleum maximum</i>	11–224	1–5
	western columbine	AQFO	<i>Aquilegia formosa</i>	0–84	0–10
	Columbian monkshood	ACCO4	<i>Aconitum columbianum</i>	6–84	1–8
	Pacific onion	ALVA	<i>Allium validum</i>	0–78	0–5
	starry false lily of the valley	MAST4	<i>Maianthemum stellatum</i>	0–45	0–2
	Brewer's miterwort	MIBR6	<i>Mitella breweri</i>	0–22	0–3
	woollyhead parsnip	SPCA5	<i>Sphenosciadium capitellatum</i>	0–11	0–1
	seep monkeyflower	MIGU	<i>Mimulus guttatus</i>	0–6	0–1
	Brewer's bittercress	CABR6	<i>Cardamine breweri</i>	0–6	0–1
	fringed willowherb	EPCI	<i>Epilobium ciliatum</i>	0–6	0–1
	scarlet fritillary	FRRE	<i>Fritillaria recurva</i>	0–6	0–1
	bedstraw	GALIU	<i>Galium</i>	0–6	0–1
	violet	VIOLA	<i>Viola</i>	0–1	0–1
2	Floodplain			280–841	
	common cowparsnip	HEMA80	<i>Heracleum maximum</i>	0–280	0–10
	California false hellebore	VECA2	<i>Veratrum californicum</i>	0–280	0–10
	Pacific onion	ALVA	<i>Allium validum</i>	0–168	0–10
	Brewer's angelica	ANBR5	<i>Angelica breweri</i>	0–84	0–5
	common yarrow	ACMI2	<i>Achillea millefolium</i>	0–28	0–2
	aster	SYMPH4	<i>Symphyotrichum</i>	0–28	0–2
	largeleaf avens	GEMA4	<i>Geum macrophyllum</i>	0–17	0–1
	Sierra stickseed	HANE	<i>Hackelia nervosa</i>	0–11	0–1
	slender cinquefoil	POGR9	<i>Potentilla gracilis</i>	0–11	0–1
	western polemonium	POOC2	<i>Polemonium occidentale</i>	0–11	0–1
	arrowleaf ragwort	SETR	<i>Senecio triangularis</i>	0–11	0–1
	woollyhead parsnip	SPCA5	<i>Sphenosciadium capitellatum</i>	0–11	0–1
	western aster	SYAS3	<i>Symphyotrichum ascendens</i>	0–11	0–1
	Fendler's meadow-rue	THFE	<i>Thalictrum fendleri</i>	0–11	0–1

	nettleleaf giant hyssop	AGUR	<i>Agastache urticifolia</i>	0–11	0–1
	fireweed	CHANC	<i>Chamerion angustifolium ssp. circumvagum</i>	0–11	0–1
	Sierra larkspur	DEGL3	<i>Delphinium glaucum</i>	0–6	0–1
	fringed willowherb	EPCI	<i>Epilobium ciliatum</i>	0–6	0–1
	tinker's penny	HYAN2	<i>Hypericum anagalloides</i>	0–6	0–1
	primrose monkeyflower	MIPR	<i>Mimulus primuloides</i>	0–1	0–1
3	Drainageway margins			22–56	
	Fendler's meadow-rue	THFE	<i>Thalictrum fendleri</i>	0–34	0–3
	sweetcicely	OSBE	<i>Osmorhiza berteroi</i>	0–11	0–2
	slender cinquefoil	POGR9	<i>Potentilla gracilis</i>	0–11	0–1
	lupine	LUPIN	<i>Lupinus</i>	0–11	0–1
	starry false lily of the valley	MAST4	<i>Maianthemum stellatum</i>	0–11	0–1
	mountain monardella	MOOD	<i>Monardella odoratissima</i>	0–11	0–1
Tree					
2	Floodplain			0–146	
	quaking aspen	POTR5	<i>Populus tremuloides</i>	0–90	0–5
	Sierra lodgepole pine	PICOM	<i>Pinus contorta var. murrayana</i>	0–56	0–3
3	Drainageway margins			28–168	
	quaking aspen	POTR5	<i>Populus tremuloides</i>	56–112	45–75
	white fir	ABCO	<i>Abies concolor</i>	0–56	0–5
	California red fir	ABMA	<i>Abies magnifica</i>	0–11	0–1

Animal community

This site provides critical habitat for several species of birds. Thinleaf alder and willows provide shelter for small mammals, deer, bears and coyotes. Their branches and nesting habitat for a variety of birds.

Hydrological functions

This ecological site provides for water catchment, sediment and nutrient storage.

Recreational uses

These areas provide an opportunity to see a diversity of wildlife and wildflowers. Trails should be developed to avoid compaction and water diversion within the drainageways and associated meadows.

Wood products

Thin leaf alder was used by Native Americans to make a red dye. The wood is sometimes used to make wood crafts, such as bowls (USDA 2006). Lemmon's willow is and has been used by Native Americans for basket making, bows and arrows, and other instruments. Willows contain salicin, a chemical related to aspirin (USDA 2003). Quaking aspen can be used for pulp, flake and other composite products, although it is not recommended to harvest quaking aspen in this area. Parts of quaking aspen are edible. The inner bark can be dried and ground into a meal to use with other starches for bread or mush. The catkins can be eaten raw, and the cambium can be eaten raw or in a soup (USDA 2003).

Inventory data references

The following NRCS vegetation and soil plots were used to describe this ecological site:

State 1:
093
093b
093c
GR02H12
MH04034
LO03087
RIP04038
TCC04148
TCC04H148

Type locality

Location 1: Washoe County, NV	
UTM zone	N
UTM northing	4339651
UTM easting	250177
General legal description	The type location is in Lake Tahoe Nevada State Park, on the southeast shore of Marlette Lake.

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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:**
