USDA Natural Resources
Conservation Service

Ecological site R022AZ033CA
WET WILLOW

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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.

MLRA notes

Major Land Resource Area (MLRA): 022A–Sierra Nevada and Tehachapi Mountains

This ESD was developed using older policy requirements which have been improved with the intent of improving ESD products overall. Users should approach these materials with some caution as the content herein, while likely useful for some purposes, was developed within parameters now recognized as needing varying levels of improvement. As always, a site-specific investigation is highly recommended when site-specific management alternatives are to be developed and/or management decisions are to be made.
Each ESD is an interpretation of the ecological relationships between biotic and abiotic aspects of the landscape. Users of this document should be aware of the limitations of this tool to the extent that specific local conditions may not be entirely captured within the ESD. In particular, management decisions should be supported by site-specific inventories, assessments and planning processes based on the best available information including and extending beyond the ESD.
An ESD is not a permanent determination of ecological dynamics. Rather, each ESD is an evolving body of work intrinsically tied to the soil surveys and data associated with soil map unit components of correlated soil-ecological site relationships. As new information becomes available, updates may be made or may be underway at any given time. Minor updates may be made without announcement when such changes do not modify the ecological site concept, the soils correlated or the state-and-transition model.

Ecological site concept

This ecological site may cross land resource units (LRUs) as a result of site hydrology dictating distribution of the site across the landscape in a manner which may override otherwise landscape scale (LRU) abiotic factors. This site occurs within streams and terraces at mid to high elevations with much of the moisture contributions to the site occurring from snow melt and subsurface springs and frequenntly may not include an apparent channel within a meadow system.

Associated sites

R022AY016NV	**WET MEADOW**
R022AY017NV	**SEMI-WET MEADOW**
R022AY018NV	**DRY MEADOW**
R022AY019NV	**GRAVEL BAR**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix*
Herbaceous	(1) *Carex*

Physiographic features

This site occurs on floodplains adjacent to perennial streams of mountain valleys. Slopes range from 2 to 8 percent. Elevations are 7000 to approximately 11,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Stream (2) Stream terrace (3) Mountain valley
Elevation	7,000–11,000 ft
Slope	2–8%

Climatic features

The climate on this site is subhumid-continental, characterized by cold, moist winters, and cool dry summers. The average annual precipitation is over 20 inches, mostly occurring as snow. The mean annual air temperature ranges from 36 to 39 degrees F. The average frost free growing season is 30 to 60 days. Climate data used to support this section were derived from PRISM and is not specifically tied to any dominant climate station.

Table 3. Representative climatic features

Frost-free period (average)	60 days
Freeze-free period (average)	0 days
Precipitation total (average)	0 in

Influencing water features

This site is associated with perennial streams in mountain valleys.

Soil features

The soils associated with this site are very deep and formed in alluvium and outwash from mixed rock sources. These soils are very poorly drained and have moderate permeability. Surface textures are very fine sandy loams. The subsurface is stratified with loams, sandy loams and loamy coarse sands. Available water capacity is low. These soils are subject occasional flooding for brief periods. The soils are classified as Typic Cryaquolls.

CA724 Eldorado National Forest Area, California, Parts of Alpine, Amador, El Dorado, and Placer Counties
240ty;Granylith-Hargran-Rock outcrop complex, 8 to 30 percent slopes;Typic Cryaquolls

CA729 Toiyabe National Forest Area, California
160;Hopeval complex, 2 to 8 percent slopes;Typic Cryaquolls
240;Granylith-Hargran-Rock outcrop complex, 8 to 30 percent slopes;Typic Cryaquolls
510;Rubble land-Lithnip-Rock outcrop association;Typic Cryaquolls

CA790 Yosemite National Park, California
510t;Rubble land-Lithnip-Rock outcrop association, 8 to 30 percent slopes, mountains, cryic;Typic Cryaquolls

Table 4. Representative soil features

Surface texture	(1) Very fine sandy loam
Family particle size	(1) Sandy
Drainage class	Poorly drained
Permeability class	Moderate

Soil depth	72 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3.7 in
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–6.5
Subsurface fragment volume <=3" (Depth not specified)	6–7%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Fire Ecology:
Fire is probably relatively infrequent in the meadow and streamside habitats willows occupy. In fact, riparian areas frequently act as fire breaks. However, under dry conditions Top-killed willow plants sprout following fire. Quick, hot fires generally result in numerous sprouts per plant.ns, riparian habitats can burn severelyabundant browse for big game animals
Sedges have deep buried rhizomes which usually survive all but the most severe fires. Fire consumes the aboveground tissue of beaked sedge, top-killing the plant. The rhizomes, however, survive most fires, even those that consume organic soils.
Nebraska sedge has deep buried rhizomes which usually survive all but the most severe fires. Fire consumes the aboveground tissue of beaked sedge, top-killing the plant. The rhizomes, however, survive most fires, even those that consume organic soils.
Tufted hairgrass generally survives all but the most severe fires. It usually sprouts from the root crown after aerial portions are burned. Tufts formed by the leaves often protect basal buds from fire damage. Tufted hairgrass seeds occur in the seedbank; after fire tufted hairgrass may regenerate from soil-stored seed. Tufted hairgrass culms and leaves are often killed by fire, though dense tufts may protect some green biomass during low-severity fire. Because Kentucky bluegrass is a cool-season grass, active in the spring and fall, it is most susceptible to fire damage at those times. Late spring fires, after plants have been growing for about a month or more, are the most damaging to Kentucky bluegrass. Burning may enhance see germination of Kentucky bluegrass during the second postfire growing season.

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities

1.1. Reference Plant Community

State 1
Reference State

Community 1.1
Reference Plant Community

The reference plant community is characterized by a dense stand of perennial grasses, grass-like plants and forbs. The representative plant community is dominated by willow, Nebraska sedge and tufted hairgrass. Potential vegetative composition is about 45% grasses and grasslike plants 5% forbs, and 60% shrubs and tree-like shrubs and trees. Approximate ground cover (basal and crown) is 85 to 100 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	2500	3000	3250
Grass/Grasslike	2250	2700	2925
Forb	250	300	325
Total	**5000**	**6000**	**6500**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses/Grasslikes**			2160–4080	
	Nebraska sedge	CANE2	*Carex nebrascensis*	450–675	–
	woolly sedge	CAPE42	*Carex pellita*	450–675	–
	analogue sedge	CASI2	*Carex simulata*	450–675	–
	blister sedge	CAVE6	*Carex vesicaria*	450–675	–
	tufted hairgrass	DECE	*Deschampsia cespitosa*	120–600	–
	Kentucky bluegrass	POPR	*Poa pratensis*	120–480	–
2	**Secondary Perennial Grasses/Grasslikes**			120–600	
	creeping bentgrass	AGST2	*Agrostis stolonifera*	30–180	–
	red fescue	FERU2	*Festuca rubra*	30–180	–
	meadow barley	HOBR2	*Hordeum brachyantherum*	30–180	–
	Coville's rush	JUCOO	*Juncus covillei var. obtusatus*	30–180	–
	Sierra rush	JUNE	*Juncus nevadensis*	30–180	–
	straightleaf rush	JUOR	*Juncus orthophyllus*	30–180	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	30–180	–
	alpine timothy	PHAL2	*Phleum alpinum*	30–180	–
Forb					
3	**Perennial Forbs**			120–600	
	common yarrow	ACMI2	*Achillea millefolium*	30–60	–
	Chamisso arnica	ARCHF	*Arnica chamissonis ssp. foliosa*	30–60	–
	fringed willowherb	EPCI	*Epilobium ciliatum*	30–60	–
	field horsetail	EQAR	*Equisetum arvense*	30–60	–
	water minerslettuce	MOCH	*Montia chamissoi*	30–60	–
	American bistort	POBI6	*Polygonum bistortoides*	30–60	–
	slender cinquefoil	POGR9	*Potentilla gracilis*	30–60	–
	longstalk starwort	STLO2	*Stellaria longipes*	30–60	–
	mountain carpet clover	TRMO2	*Trifolium monanthum*	30–60	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	5–20	–
Shrub/Vine					
4	**Primary Shrubs**			2400–3000	
	Booth's willow	SABO2	*Salix boothii*	800–1000	–
	Geyer willow	SAGE2	*Salix geyeriana*	800–1000	–
	Lemmon's willow	SALE	*Salix lemmonii*	800–1000	–
5	**Secondary Shrubs**			1–32	
	whitestem gooseberry	RIIN2	*Ribes inerme*	1–32	–

Animal community

Livestock Interpretations:
This site is suited to livestock grazing. Grazing management should be keyed to sedge and tufted hairgrass production. In the West, all classes of livestock eat willows, but cattle probably consume more than others because they tend to frequent riparian areas. The palatability of sedges varies with the amount and distribution of palatable grasses and other plants associated with it, with the season of year, and with the amount of moisture in the soil. As

a rule, it is fair forage for sheep and fairly good to good for cattle. Unless the soil is too boggy, cattle readily graze the moist areas where sedges grows. It is also produces a large volume of meadow hay for winter livestock feeding. Tufted hairgrass provides good to excellent forage for all classes of livestock. Tufted hairgrass is a preferred forage species, consistently grazed by sheep. It is often an abundant source of forage throughout its growing season. Kentucky bluegrass is highly palatable in early growth stages and provides nutritious forage for all classes of livestock. In the West, it is often abundant in mountain grasslands, moist and dry mountain meadows, aspen parkland, and open ponderosa pine forests where it is eaten extensively by domestic sheep and cattle. Mountain meadows dominated by Kentucky bluegrass may be relatively limited in extent, but they are highly productive and thus contribute substantial amounts of summer forage.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine tuned by the client by adaptive management through the year and from year to year.

Wildlife Interpretations:
Willows in general are preferred food and building material of beaver. Willow shoots, catkins, buds, and leaves are eaten by ducks and grouse, other birds, and small mammals
Birds are commonly associated with analogue sedge habitats. Sedges are other important forage species for several wildlife species. During the growing season mule deer and bighorn sheep sedges are foraged moderately. Tufted hairgrass is a preferred forage species, consistently grazed by wildlife. Regionally, Kentucky bluegrass can be an important part of the diets of elk, mule deer, and bighorn sheep. On elk winter range, Kentucky bluegrass is one of the most important grasses eaten. Kentucky bluegrass meadows found along mountain streams are often preferred foraging areas of wild ungulates. Bluegrass leaves and seeds are eaten by numerous species of small mammals and songbirds. Bluegrass is often an important food of the cottontail rabbit and wild turkey.

Hydrological functions

Permeability is moderate.

Other products

All willows produce salacin, which is closely related chemically to aspirin. Native Americans used various preparations from willows to treat tooth ache, stomache ache, diarrhea, dysentery, and dandruff. Native Americans also used flexible willow stems for making baskets, bows, arrows, scoops, fish traps, and other items.

Other information

Willow is recommended for use in revegetating disturbed riparian areas. It is especially useful for streambank stabilization. It is
usually planted as rooted or unrooted stem cuttings.

Sedges have a high potential for biomass production and long-term revegetation, and medium potential for erosion control and short-term revegetation. Its establishment requirements are medium to high. Sod from sedges rapidly recolonizes disturbed sites by rhizome expansion. Its rhizomes form dense networks that are effective in stabilizing streambanks and preventing soil erosion.

Tufted hairgrass has a broad ecological range and is useful for revegetation, particularly on disturbances at high elevation or high latitude. Tufted hairgrass occurs on acidic or pyritic mine spoils at high elevations throughout the western United States. It grows at a medium rate compared to other grasses used at these sites; it has a poor rate of spread. Tufted hairgrass has good competitive ability compared to other plants evaluated for high latitude revegetation. It has low to medium potential for short-term revegetation; it has medium to high potential for long-term revegetation. It is a valuable soil stabilizer, especially in wet, acid locations.

Tufted hairgrass has been successfully established by seeding on alpine disturbances. Seeds from locally adapted populations have been most successful. For disturbances on well-developed soils that contain minimum amounts of toxic substances, seeds can be selected from a broad range of relatively well-adapted populations. On sites with limiting spoil characteristics, selection from metal and/or acid tolerant populations is more successful. Some tufted

hairgrass populations are highly tolerant of lead, zinc, copper, or manganese contaminated tailings. Late fall seeding is most successful; seedling establishment is improved if seeds are exposed to cold dormancy over winter.

Type locality

Location 1: Alpine County, CA	
Township/Range/Section	T10N R19E S19
Latitude	38° 41′ 31″
Longitude	119° 56′ 4″
General legal description	Humboldt-Toiyabe National Forest, approximately 0.65 miles from Faith Valley.

Other references

Fire Effect Information System (Online; http://www.fs.fed.us/database/feis/plants/).

USDA-NRCS Plants Database (Online; http://plants.usda.gov/).

Contributors

ALM/GKB

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:

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17. **Perennial plant reproductive capability:**
