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Ecological site R022BI209CA
Loamy Seeps

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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): 022B–Southern Cascade Mountains

Site Concept – Riparian Complex: Hydrologically connected by thermal springs, seeps, and active soil movement. Slopes: 10 to 80 percent, but generally less than 50 percent Landform: Seeps on mountain slopes Soils: Very deep, poorly drained soils that formed in slope alluvium over colluvium over till from hydrothermally altered rocks. Temp regime: Frigid. MAAT: 38 to 42 degrees F (3.3 to 5.5 degrees C). MAP: 63 to 119 inches (1,600 to 3,023 mm). Soil texture: Gravelly mucky fine sandy loam Surface fragments: 0 to 18 percent gravel Vegetation: Several montane seep plant communities dominated by graminoid species with willow and mountain alder. Notes: Portions of this site have debris flows and active soil movement.

Associated sites

F022BI113CA	**Frigid Very Deep Loamy Slopes** This is an open red fir forest found on the adjacent hillslopes.
R022BI203CA	**Moderately Deep Fragmental Slopes** This is an open arrowleaf balsamroot- woolly mule-ears site found on adjacent mountain slopes.
R022BI216CA	**Active Hydrothermal Areas (Complex)** This site is associated with the steep, active hydrothermal areas. It is sparsely vegetated and dry.

Similar sites

R022BI211CA	**Spring Complex** This is spring site is dominated by mountain alder and is found on hillslopes.
R022BI217CA	**Frigid Lacustrine Flat** This meadow site is found on lake margins and relic glacial lakes.
R022BI202CA	**Frigid Alluvial Flat** This is a montane meadow-fen site found at lower elevations on more stable sites.

R022BI218CA	**Thermal Seeps** This site is associated with thermal springs near Drakesbad Meadow.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Alnus incana ssp. tenuifolia*
Herbaceous	(1) *Senecio triangularis* (2) *Veratrum californicum*

Physiographic features

This ecological site is occurs on mountain slopes. The majority of this site is in the core of Brokeoff volcano. Elevations range from 5,680 feet to 8,570 feet. Slopes range from 10 to 80 percent, but are generally less than 50 percent.

The wetter areas of this site have a seasonal water table that fluctuates from 0 to 80 inches during spring and early summer and may drop to below 80 inches in the drier months.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Elevation	1,730 – 2,610 m
Slope	10 – 80 %
Water table depth	0 – 200 cm
Aspect	SE, S, SW

Climatic features

This ecological site receives most of its annual precipitation during winter months in the form of snow. The mean annual precipitation ranges from 63 to 119 inches (1,600 to 3,023 mm) and the mean annual temperature ranges from 38 to 42 degrees F (3.3 to 5.5 degrees C). The frost free (>32F) season is 60 to 85 days. The freeze free (>28F) season is 75 to 190 days.

There are no representative climate stations for this site. The nearest one is Manzanita Lake, which receives substantially less precipitation than this area.

Table 3 Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	190 days

Precipitation total (average)	3,020 mm

Influencing water features

This site is associated with intermittent streams and small perennial seeps and springs.

Soil features

The Endoaquepts soil component associated with this site consists of very deep, poorly drained soils that formed in slope alluvium over colluvium over till from hydrothermally altered rocks.

There is a thin layer of leaf litter and twigs over an A horizon that has gravelly mucky fine sandy loam textures with fine textured subsurface horizons. Clay increases with depth from 8 to 40 percent, until the lowest horizon. Subsurface textures in order of increasing depth are; gravelly loam, very gravelly loam, silty clay loam, cobbly silty clay loam, stony silty clay loam, very stony clay, and gravelly clay loam. Redoximorphic features are present beginning at about 6 inches and continuing to 30 inches below the surface. Gleyed soil colors are present below 30 inches.

In some areas there is a layer of till below these seeps. Over this till is fine-textured colluvial material mixed with cobbles and stones. The parent material was derived from hydrothermally altered rock. Acidic steam and water of various temperatures and pH have altered the mineralogy of the rock to produce soils with a significantly higher amount of clay and a lower pH than those soils in the rest of the Park. The soils on the slopes adjacent to this site have pH ranges from 4.7 to 5 in the lower horizons, but the soils associated with this site have pH ranges from 6.5 to 7.2.

This ecological site has been correlated with the following map units and soil components:

Map Unit/ Component /Component percent
789118 Endoaquepts/ 5
789119 Endoaquepts/ 14
789127 Endoaquepts/ 1
789171 Endoaquepts/ 5
789176 Endoaquepts/ 1

Table 4. Representative soil features

Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Very slow
Soil depth	150 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	9.17 – 28.88 cm

Soil reaction (1:1 water) (0-101.6cm)	4.8 – 6.7
Subsurface fragment volume <=3" (Depth not specified)	0 – 30 %
Subsurface fragment volume >3" (Depth not specified)	0 – 30 %

Ecological dynamics

This ecological site is an association of spring-fed seeps on mountain slopes, that have formed within the hydrothermally altered area of Brokeoff Volcano. There are multiple hot and cool springs associated with this site. Each spring has unique physical and biological characteristics. Some of these springs are hot while others are cool in temperature. Most have relatively low flow rates, which create a small stream channel below the source. The hot springs are a small percentage of this ecological site, but are biologically significant. The springs provide a year-round water source for the sloping meadows down slope. This ecological site is associated with the Endoaquepts soil component, a minor component for map units that do not have geothermal features. Consequently, hot springs may not be present in all areas where this site is mapped.

A diversity of plant communities are found within this riparian ecological site. Species composition varies due to proximity to springs, wetness, and soil stability. Common plants include mountain alder (Alnus incana ssp. tenuifolia), sedges (Carex ssp.), arrowleaf ragwort (Senecio triangularis), California false hellebore (Veratrum californicum var. californicum), blue wildrye (Elymus glaucus), fowl mannagrass (Glyceria striata), common cowparsnip (Heracleum maximum), smallwing sedge (Carex microptera), analogue sedge (Carex simulata), seep monkeyflower (Mimulus guttatus) and white marsh marigold (Caltha leptosepala).

This ecological site is a complex of riparian plant communities which are interrelated by hydrology. This is a relatively new concept for ecological sites. The state and transition diagram below illustrates the change in plant community component composition as a result of disturbance, rather than focusing on the succession of one plant community. It may be that a certain plant community component is an early succession plant community that increases after disturbance.

Although there is considerable qualitative experience supporting the pathways and transitions within the State and Transition Model (STM), there is no quantitative information to specifically identify threshold parameters that distinguish between natural equilibrium and altered states in this ecological site. For information on STMs, see the following citations: Bestelmeyer el al. 2003, Bestelmeyer et al. 2009, and Stringham and Shaver 2003.

State and transition model

Figure 3. Loamy Seeps Model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

This site provides basic and valuable resources for wildlife such as water, forage, and cover. The leaves, stems, and seeds of Nebraska sedge, tufted hairgrass, and other grasses and sedges provide forage for wildlife and livestock. The sedges and bunchgrasses provide nesting habitat for waterfowl and cover for small mammals.

Hydrological functions

The hydrologic function of this ecological site is to provide a catchment for water, sediments, and nutrients. These sites allow sediments from spring snow melt to settle out and trap nutrients in surface and subsurface flows. This site stores water and releases it slowly down the drainage throughout the year.

Recreational uses

This site provides beautiful open scenery for wildlife viewing and photography. Caution is recommended travelling in this area because of hydrothermal seeps.

Inventory data references

The following NRCS vegetation plots have been used to describe this ecological site: 789258 Type location 789258B (PCC3) 789281 (PCC5 and PCC6) 789282(PCC3, PCC5 and PCC6) 789344

Type locality

Location 1: Tehama County, CA	
Township/Range/Section	T30 N R4 E S22
UTM zone	N
UTM northing	4477823
UTM easting	624614
General legal description	The type location is about 1/2 a mile SSW of Sulphur Works parking lot in Lassen Volcanic National Park.

Other references

Bestelmeyer, Brandon T.; Brown, Joel R.; Havstad, Kris M.; Alexander, Robert; Chavez, George; and Herrick Jeffrey E.; 2003. Development and Use of State-and-Transition Models for Rangelands. Journal of Range Management, Vol. 56, No. 2 (Mar., 2003), pp. 114-126. Allen Press and Society for Range Management. Stable URL: http://www.jstor.org/stable/4003894

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USDA, NRCS. 2007. The PLANTS Database. National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Available online at: http://plants.usda.gov

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Weixelman, Dave; Weis, Sue; Linton, Fletcher; and Swartz, Heather; 2007. DRAFT: Condition Checklist for Fens in the Montane and Subalpine Zones of the Sierra Nevada and Southern Cascade Ranges, CA.

Wilson, Mark S.; Siering, Patricia L.; White, Christopher L.; Hauser, Michelle E.; and Bartles, Andrea N. (2008). Microbial diversity and dynamics in an acidic hotspring at Lassen Volcanic National Park. Environmental Microbiology, 56 (2), 292-305 (http://www.springerlink.com/content/371xh7144562w637)

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:**

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

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

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

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

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

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

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

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

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

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

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
