

## Ecological site R022BI217CA Frigid Lacustrine Flat

Accessed: 05/18/2024

### 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.

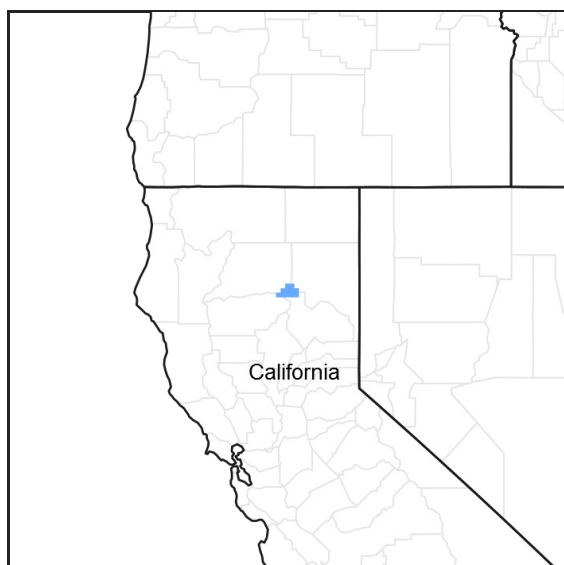


Figure 1. Mapped extent

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): 022B–Southern Cascade Mountains

Site Concept –

Riparian Complex: Hydrologically connected by shared water table and/or small E type stream channel.

Slopes: Generally between 0 to 3 percent.

Landform: Relict glacial lakes and lake terraces

Soils: Very deep, poorly to very poorly drained soils that formed in volcanic ash over glaciolacustrine deposits or in stream channel alluvium over glaciolacustrine deposits. There are stratified layers of fine and coarse sediments.

Gleyed soil colors are present below the organic horizons.

Temp regime: Frigid.

MAAT: 41 to 44 degrees F (5.0 to 6.6 degrees C).

MAP: 37 to 65 inches (940 to 1,651 mm).

Soil texture: Herbaceous peat and herbaceous mucky slightly decomposed plant material.

Surface fragments: 0

Vegetation: Several graminoid meadow communities.

### Associated sites

|             |  |
|-------------|--|
| F022BI102CA | <b>Frigid Bouldery Glacially Scoured Ridges Or Headlands</b><br>This open red fir forest site is found on the hillslopes nearby.                   |
| F022BI108CA | <b>Frigid Moist Sandy Lake Or Stream Terraces</b><br>This is a wet Sierra lodgepole pine site on stream and lake terraces adjacent to the meadows. |
| F022BI112CA | <b>Frigid Sandy Loam Moraines Or Lake Terraces</b><br>This dense red fir- white fir forest is found on deeper soils on the nearby hillslopes.      |

## Similar sites

|             |  |
|-------------|--|
| R022BI202CA | <b>Frigid Alluvial Flat</b><br>This meadow is associated with stream alluvium and has significant water inflow from springs. |
| R022BI206CA | <b>Cryic Lacustrine Flat</b><br>This site is also associated with relict glacial lakes but is cryic and has an E channel.    |

**Table 1. Dominant plant species**

|            |   |
|------------|---|
| Tree       | Not specified   |
| Shrub      | Not specified   |
| Herbaceous | (1) <i>Carex nebrascensis</i><br>(2) <i>Carex vesicaria</i> |

## Physiographic features

This ecological site is found on wet meadows that formed on relict glacial lakes and lake terraces. The elevation range for this site is from 5,960 and 6,760 feet. Slopes are between 0 and 3 percent.

This area is frequently flooded and/or ponded. The water table remains at or near the surface throughout the year in the wetter areas of the meadow. In topographically higher or drier areas of the meadow, the water table may drop to below 55 inches during October, November, and December.

**Table 2. Representative physiographic features**

|                    |   |
|--------------------|---|
| Landforms          | (1) Glacial lake (relict)<br>(2) Lake terrace |
| Flooding duration  | Brief (2 to 7 days) to long (7 to 30 days)    |
| Flooding frequency | Rare to frequent                              |
| Ponding duration   | Brief (2 to 7 days) to long (7 to 30 days)    |
| Ponding frequency  | Rare to frequent                              |
| Elevation          | 1,817–2,060 m                                 |
| Slope              | 0–3%  |
| Ponding depth      | 3–15 cm                                       |
| Water table depth  | 0–152 cm                                      |
| Aspect             | Aspect is not a significant factor            |

## 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 37 to 65 inches (940 to 1,651 mm) and the mean annual temperature ranges from 41 to 44 degrees F (5.0 to 6.6 degrees C). The frost free (>32F) season is 60 to 85 days. The freeze free (>28F) season is 75 to 190 days.

**Table 3. Representative climatic features**

|                               |          |
|-------------------------------|----------|
| Frost-free period (average)   | 85 days  |
| Freeze-free period (average)  | 190 days |
| Precipitation total (average) | 1,651 mm |

## Influencing water features

This site is associated with palustrine emergent wetlands that occasionally have an E or a C type stream channel, which enters or exits the lake basin. This site is also associated with upland areas that do not have wetland characteristics.

## Soil features

This site is associated with the Histic Humaquepts, Lake Sediments and Histic Humaquepts, Frequently Flooded soil components. The Histic Humaquepts, Lake Sediments component consists of very deep, poorly drained soils that formed in volcanic ash over glaciolacustrine deposits. The Histic Humaquepts, Frequently Flooded component consists of very deep, very poorly drained soils that formed in stream channel alluvium over glaciolacustrine deposits. These soils have several organic horizons of herbaceous peat and herbaceous muck that ranges in total depth from 5 to 14 inches. There is fair amount of organic material but the soil pits do not meet the organic soil depth criteria of 16 inches (40 cm) to be considered a fen. These soils have stratified layers of fine and coarse sediments. Textures include ashy silt loams, ashy coarse sandy loams, and ashy loamy sand, among others. The AWC is moderate in the upper 60 inches of soil. There are gleyed colors below the organic horizons. Free water can occur in the coarse textured horizons, creating an artesian aquifer.

This ecological site has been correlated with the following map units and components within the CA789 Soil Survey Area:

DMU Component percent

105 Histic Humaquepts, Lake Sediments 1  
130 Histic Humaquepts, Lake Sediments 55  
130 Histic Humaquepts, Frequently Flooded 30  
148 Histic Humaquepts, Lake Sediments 2  
148 Histic Humaquepts, Frequently Flooded 1

**Table 4. Representative soil features**

|  |                                       |
|--|---------------------------------------|
| Surface texture  | (1) Mucky<br>(2) Peaty                |
| Family particle size                                     | (1) Loamy                             |
| Drainage class   | Poorly drained to very poorly drained |
| Permeability class                                       | Moderately slow to moderate           |
| Soil depth   | 152 cm                                |
| Surface fragment cover <=3"                              | 0%                                    |
| Surface fragment cover >3"                               | 0%                                    |
| Available water capacity<br>(0-101.6cm)                  | 11.94–23.04 cm                        |
| Soil reaction (1:1 water)<br>(0-101.6cm)                 | 5.6–7.3                               |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 0–50%                                 |
| Subsurface fragment volume >3"<br>(Depth not specified)  | 0%                                    |

## Ecological dynamics

This ecological site is found in meadows and along channels in relict glacial lakes. These lakes formed from glacial melt water that allowed fine clay and silts to settle out. There are coarse textured layers intermixed with fine layers. The coarse layers may have been deposits from stream channel alluvium, wave action or difference in melt water velocities over time. Finer sediments are often above coarser buried profiles that represent the different depositional environments as the lakes filled in (NRCS, 2010). They have experienced gradual lowering of lake levels, because of reduced water input since post glacial melt water filled these basins. Infilling of these lakes is also occurring from continued lacustrine sediment deposition and accumulation of organic matter. Aquatic and emergent palustrine plant communities establish in shallow areas near shore. The vegetation produces organic matter from dead plant material and live root mats. Vegetation also traps sediment with leaves and roots. The lake margins fill with material that eventually supports drier meadow communities. Over time vegetation continues to expand into the shallow lakes and areas of open water diminish. The degree of infill is related to the size and depth of the lake. This process also occurs on shallow inlets of larger lakes. The seasonal fluctuation of lake levels determines the growing season and distribution of vegetation. These lakes and meadows receive water from upstream channels and have outlet channels. The water flow goes subsurface through the meadow or mixes with the open water of the lake. In larger drainages a defined stream channel may dissect the meadow on its course to the lake, but the composition and spatial distribution of the majority of plant communities is related more to lake levels than to stream channel dynamics.

Nebraska sedge (*Carex nebrascensis*), Northwest Territory sedge (*Carex utriculata*) and/or blister sedge (*Carex vesicaria*) dominate this site. Tufted hairgrass (*Deschampsia cespitosa*) is more prevalent in drier areas. Willows (*Salix* spp.) are generally restricted to the perimeter of the meadow or are along a stream channel. A moist lodgepole pine site is found on drier lake terraces. See the Sierra lodgepole pine/California false hellebore - blue wildrye (F022B1108CA) ecological site for more information regarding this forest site. In the open water, aquatic plants such as yellow pond-lily (*Nuphar lutea*) and watershield (*Brasenia schreberi*) may be present.

This ecological site is a complex of riparian plant community components that 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 gradual infilling, rather than focusing on the succession of one plant community 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 et al. 2003, Bestelmeyer et al. 2009, and Stringham and Shaver 2003.

## State and transition model

## R022BI217CA- Frigid Lacustrine Flats

(% Composition is an estimate based on limited plot and observation data)

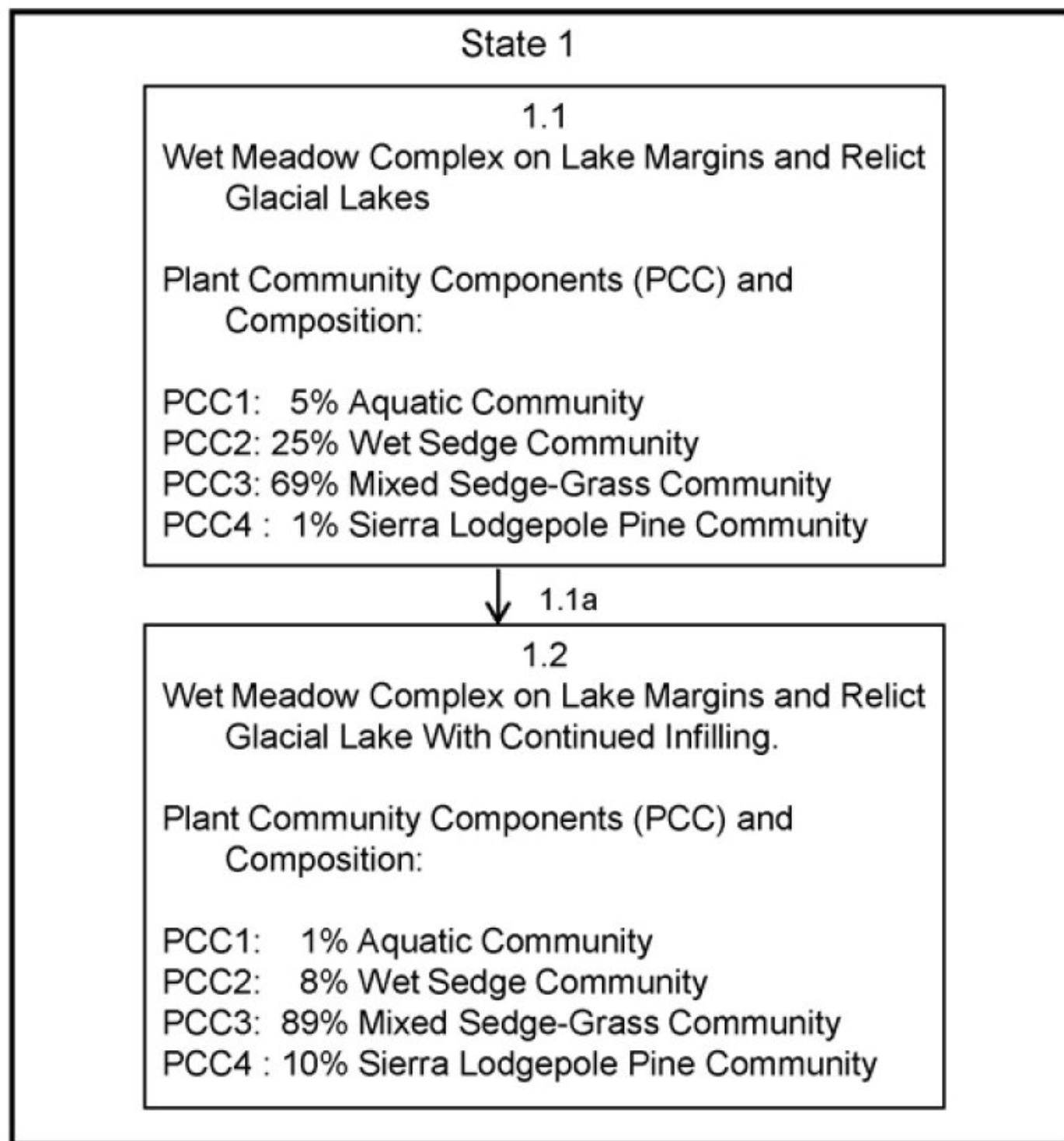


Figure 3. Frigid Lacustrine Flat Model

### State 1

### State 1

This state is the reference state and is similar to the historic condition for this site. Altered states were not observed for this ecological site. The relict glacial lakes are all in different stages of infilling of sediment and vegetation. This process could be considered an eventual evolution to a new state, but it is described in this ecological site as a continuum within this state.

## Community 1.1

### Wet Meadow Complex



Figure 4. Frigid Lacustrine Flats

This community phase has four associated plant community components. They are listed below from wettest, PCC1 the Aquatic Community, to driest. Open water is present, but not included at a community component. There may be a large deep lake associated with this site, such as Snag Lake in Lassen Volcanic Park, or just a small area of open water as in Cameron Meadow in the photo above. Not all plant communities found in these meadows are described in this ecological site, just the dominant components.

PCC1: 5% Aquatic Community This community exists in open water. This area remained covered in standing water through most of the year. The soil may be exposed at the end of summer in very dry years. Yellow pond-lily (*Nuphar lutea*) is often present. Pondweeds (*Potamogeton* sp.), watershield (*Brasenia schreberi*) and other aquatic species may be present. Data was not collected for this community component.

PCC2: 25% Wet Sedge Community The Wet Sedge Community forms the boundary between open water and emergent palustrine vegetation. This community has standing water for most of the season. Northwest Territory sedge (*Carex utriculata*) and/or blister sedge (*Carex vesicaria*) form an almost monotypic community. It is difficult to distinguish these two sedges. They sometimes grow together or in separate niches. Blister sedge may be present in areas which have quicker draw down of water. These sedges are able to withstand total inundation for several months, and produce dense rhizomatous root mats. Spikerush (*Eleocharis* sp.), small floating mannagrass (*Glyceria borealis*), and mosses may be present.

PCC3: 69% Mixed Sedge-Grass Community This community dominates most of these meadows. It is seasonally ponded and saturated for shorter durations than PCC2, but the water table remains high through the growing season. There is variation between sites as to dominant species. Nebraska sedge (*Carex nebrascensis*), capitate sedge (*Carex capitata*), mountain rush (*Juncus arcticus* ssp. *littoralis*), and Howell's rush and (*Juncus howellii*) can have high cover. Nebraska sedge is a heavily rhizomatous wetland plant that can form almost monotypic stands. It can survive total inundation for 3 months (Hoag, 1998.). It is not generally found in areas where the water table drops to less than 1 meter below the surface late in the growing season. Tufted hairgrass (*Deschampsia cespitosa*) can be present throughout this community, but tends to increase at the drier margins. There is variety of forbs in this community but they generally have low cover, however tundra aster (*Oreostemma alpinum* var. *alpinum*) and western mountain aster (*Symphotrichum spathulatum* var. *spathulatum*) may have up to 30 percent cover. Common graminoid species are slenderbeak sedge (*Carex athrostachya*), golden sedge (*Carex aurea*), bluejoint (*Calamagrostis canadensis*), Reynolds' sedge (*Carex raynoldsii*), sedges (*Carex* spp.), analogue sedge (*Carex simulata*), meadow barley (*Hordeum brachyantherum*), toad rush (*Juncus bufonius*), swordleaf rush (*Juncus ensifolius*), and Sierra rush (*Juncus nevadensis*). Other forbs are common yarrow (*Achillea millefolium*), willowherbs (*Epilobium* sp.), alpine gentian (*Gentiana newberryi*), tinker's penny (*Hypericum anagalloides*), ash penstemon (*Penstemon cinicola*), Lemmon's yampah (*Perideridia lemmonii*), Drummond's cinquefoil (*Potentilla drummondii*), sticky cinquefoil (*Potentilla glandulosa*), slender cinquefoil (*Potentilla gracilis*), Oregon saxifrage (*Saxifraga oregana*), Oregon checkerbloom (*Sidalcea oregana* ssp. *spicata*), longstalk clover (*Trifolium longipes*), and violet (*Viola* sp.).

PCC4: 1% Sierra Lodgepole Pine Community This plant community is generally adjacent to this site in a distinct line around the meadow, but it is sometimes on dry positions within the meadow. Ecological site F022B1108CA describes the wet Sierra lodgepole pine forest that is found on adjacent higher stream and lake terraces. Please refer to ecological site F022B1108CA, for more information on ecological dynamics that affect the Sierra lodgepole pine forest. As forest cover increases more shade tolerant understory species are present. Grasses are mixed and include alpine bentgrass (*Agrostis humilis*), bluejoint (*Calamagrostis Canadensis*), blue wildrye (*Elymus glaucus*),

alpine timothy (*Phleum alpinum*), muhly (*Muhlenbergia* spp.), and meadow barley (*Hordeum brachyantherum*). A variety of sedges (*Carex* spp.) may be present in small amounts. Other plants on this site are bigleaf lupine (*Lupinus polyphyllus*), monkeyflower (*Mimulus* spp.), sweetcicely (*Osmorhiza berteroi*), whitestem gooseberry (*Ribes inerme*), arrowleaf ragwort (*Senecio triangularis*), longstalk clover (*Trifolium longipes*), and California false hellebore (*Veratrum californicum* var. *californicum*). Total understory production is around 800 to 1,000 pounds per acre. The production data in the table below is a compilation of PCC2 and PCC3. ESIS does not currently support multiple tables for several community types in one phase. To identify species by plant community component refer to the narrative above rather than the table.

## Community 1.2

### Wet Meadow Complex- Natural Infilling

This phase is similar to community phase 1.1, but the site is drier due to gradual infilling of the glacial lakes. These meadows have varying degrees of wetness and areas of open water depending upon the size and depth of the relict glacial lake. In some areas this site is found along delta of large lakes that may or may not be drying out over time. The Mixed Sedge-Grass Community increases with lower water tables at the expense of the Aquatic and Wet Sedge Communities. Since the water table is lower along the margins of the meadow, the Sierra Lodgepole Pine Community can establish in this area. Estimate of Plant Community Components (PCC) and Composition: PCC1: 1% Aquatic Community PCC2: 8% Wet Sedge Community PCC3: 89% Mixed Sedge-Grass Community PCC4: 10% Sierra Lodgepole Pine Community

## Pathway 1.1a

### Community 1.1 to 1.2

This site continues to infill with organic matter and sediments.

## Additional community tables

Table 5. Community 1.1 plant community composition

| Group                  | Common Name               | Symbol | Scientific Name                                    | Annual Production<br>(Kg/Hectare) | Foliar Cover<br>(%) |
|------------------------|---------------------------|--------|--|-----------------------------------|---------------------|
| <b>Grass/Grasslike</b> |                           |        |  |                                   |                     |
| 1                      | <b>Grass/grasslike</b>    |        |  | 308–1749                          |                     |
|                        | Nebraska sedge            | CANE2  | <i>Carex nebrascensis</i>                          | 135–336                           | 10–25               |
|                        | blister sedge             | CAVE6  | <i>Carex vesicaria</i>                             | 45–336                            | 5–20                |
|                        | Northwest Territory sedge | CAUT   | <i>Carex utriculata</i>                            | 45–252                            | 5–15                |
|                        | tufted hairgrass          | DECE   | <i>Deschampsia cespitosa</i>                       | 7–219                             | 1–10                |
|                        | Howell's rush             | JUHO   | <i>Juncus howellii</i>                             | 6–168                             | 1–15                |
|                        | capitate sedge            | CACA13 | <i>Carex capitata</i>                              | 56–168                            | 5–15                |
|                        | sedge                     | CAREX  | <i>Carex</i>                                       | 11–112                            | 3–8                 |
|                        | mountain rush             | JUARL  | <i>Juncus arcticus ssp. littoralis</i>             | 4–45                              | 1–8                 |
|                        | swordleaf rush            | JUEN   | <i>Juncus ensifolius</i>                           | 0–34                              | 0–5                 |
|                        | toad rush                 | JUBU   | <i>Juncus bufonius</i>                             | 0–11                              | 0–5                 |
|                        | bluejoint                 | CACA4  | <i>Calamagrostis canadensis</i>                    | 0–11                              | 0–2                 |
|                        | smooth brome              | BRIN2  | <i>Bromus inermis</i>                              | 0–7                               | 0–2                 |
|                        | Raynolds' sedge           | CARA6  | <i>Carex raynoldsii</i>                            | 0–6                               | 0–2                 |
|                        | analogue sedge            | CASI2  | <i>Carex simulata</i>                              | 0–6                               | 0–2                 |
|                        | small floating mannagrass | GLBO   | <i>Glyceria borealis</i>                           | 0–6                               | 0–2                 |
|                        | meadow barley             | HOBR2  | <i>Hordeum brachyantherum</i>                      | 0–6                               | 0–2                 |
|                        | Sierra rush               | JUNE   | <i>Juncus nevadensis</i>                           | 0–6                               | 0–1                 |
|                        | golden sedge              | CAAU3  | <i>Carex aurea</i>                                 | 0–4                               | 0–2                 |
|                        | spikerush                 | ELEOC  | <i>Eleocharis</i>                                  | 0–3                               | 0–1                 |
|                        | slenderbeak sedge         | CAAT3  | <i>Carex athrostachya</i>                          | 0–3                               | 0–1                 |
| <b>Forb</b>            |                           |        |  |                                   |                     |
| 1                      | <b>Forbs</b>              |        |  | 13–333                            |                     |
|                        | tundra aster              | ORALA2 | <i>Oreostemma alpigenum var. alpigenum</i>         | 13–157                            | 2–20                |
|                        | western mountain aster    | SYSPS  | <i>Symphyotrichum spathulatum var. spathulatum</i> | 0–123                             | 0–10                |
|                        | alpine gentian            | GENE   | <i>Gentiana newberryi</i>                          | 0–9                               | 0–3                 |
|                        | common yarrow             | ACMI2  | <i>Achillea millefolium</i>                        | 0–6                               | 0–2                 |
|                        | ash penstemon             | PECI2  | <i>Penstemon cinicola</i>                          | 0–6                               | 0–2                 |
|                        | Lemmon's yampah           | PELE5  | <i>Perideridia lemmonii</i>                        | 0–4                               | 0–2                 |
|                        | Drummond's cinquefoil     | PODR   | <i>Potentilla drummondii</i>                       | 0–4                               | 0–2                 |
|                        | sticky cinquefoil         | POGL9  | <i>Potentilla glandulosa</i>                       | 0–4                               | 0–2                 |
|                        | slender cinquefoil        | POGR9  | <i>Potentilla gracilis</i>                         | 0–4                               | 0–2                 |
|                        | Oregon saxifrage          | SAOR2  | <i>Saxifraga oregana</i>                           | 0–4                               | 0–2                 |
|                        | willowherb                | EPILO  | <i>Epilobium</i>                                   | 0–2                               | 0–2                 |
|                        | longstalk clover          | TRLO   | <i>Trifolium longipes</i>                          | 0–2                               | 0–1                 |
|                        | violet                    | VIOLA  | <i>Viola</i>                                       | 0–2                               | 0–1                 |
|                        | Oregon checkerbloom       | SIORS  | <i>Sidalcea oregana ssp. spicata</i>               | 0–2                               | 0–1                 |
|                        | tinker's penny            | HYAN2  | <i>Hypericum anagalloides</i>                      | 0–1                               | 0–1                 |



## Animal community

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

## Hydrological functions

The hydrological function of this meadow is to provide a catchment for water, sediments, and nutrients. The meadow allows sediment from melting spring snow to settle out and trap nutrients in surface and subsurface flows. This meadow also provides water storage, which is slowly released down the drainage throughout the year.

## Recreational uses

This site provide beautiful open vistas with opportunities for wildflower and wildlife viewing. Trails should be constructed on drier ground bordering the meadow.

## Inventory data references

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

789308- Type location  
789376  
789378  
789392

## Type locality

|                               |  |
|-------------------------------|--|
| Location 1: Lassen County, CA |  |
| Township/Range/Section        | T30 N R6 E S3  |
| UTM zone                      | N  |
| UTM northing                  | 4483390  |
| UTM easting                   | 643879   |
| General legal description     | The type location is about 1.1 miles north of Inspiration Point, 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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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.

## Contributors

Marchel M. Munnecke

## 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:**

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