USDA Natural Resources Conservation Service

Ecological site R010XY032OR
Meadow Fen 14+ PZ

Last updated: 12/13/2023
Accessed: 05/12/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 010X–Central Rocky and Blue Mountain Foothills

This MLRA covers the Blue and Seven Devils Mountains of Oregon, Washington and Idaho. The area is characterized by thrust and block-faulted mountains and deep canyons composed of sedimentary, metasedimentary, and volcanic rocks. Elevations range from 1,300 to 9,800 feet (395 to 2,990 meters). The climate is characterized by cold, wet winters and cool, dry summers. Annual precipitation, mostly in the form of snow, averages 12 to 43 inches (305 to 1,090 millimeters) yet ranges as high as 82 inches (2,085 millimeters) at upper elevations. Soil temperature regimes are predominately Frigid to Cryic and soil moisture regimes are predominately Xeric to Udic. Mollisols and Andisols are the dominant soil orders. Ecologically, forests dominate but shrub and grass communities may occur on south aspects and lower elevations as well as in alpine meadow environments. Forest composition follows moisture, temperature and elevational gradients and typically ranges from ponderosa pine and Douglas-fir plant associations at lower elevations, grand fir at middle elevations and subalpine fir and Engelmann spruce at upper elevations. Historical fire regimes also correlated with these forest types and ranged from frequent surface fires in ponderosa pine - Douglas Fir forest types to mixed and stand replacing fire regimes in grand fir and subalpine fir types. A large percentage of the MLRA is federally owned and managed by the U.S. Forest Service for multiple uses.

Classification relationships

Mid-Montane Wetland Plant Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests:
MM2914 - *Carex aquatilis* (Modal)
MM2917 - *Carex utriculata*

RIPARIAN AND WETLAND VEGETATION OF CENTRAL AND EASTERN OREGON:
CEGL001802 - *Carex aquatilis* Association (Modal)
CEGL001562 - *Carex utriculata* Association

Ecological site concept

This site occurs on peat accumulating fen habitats in the Blue Mountains of Oregon. On these sites, groundwater discharge maintains perennially moist or saturated soils. Moist soils (Aquic soil moisture regimes) and cool temperatures (Cryic soil temperature regimes) create the conditions that support sedge (Carex spp.) dominated plant communities with organic surface horizons and high constancy of moss cover within plant interspaces. In comparison to sometimes adjacent wet meadow communities, these sites have organic rather than mineral surface horizons, and more frequent saturation near the surface leading to a higher proportion of wetland obligate emergent vegetation. Historical ecological dynamics would have been highly influenced by climate cycles and their interactions with groundwater recharge and discharge.

Associated sites

R010XY001OR	**Cold Wet Meadow** May occur adjacent to fen sites but is drier and has a lower percentages of sedges and rushes.

Similar sites

R010XY001OR	**Cold Wet Meadow** May occur adjacent to fen sites but is drier and has a lower percentages of sedges and rushes.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Carex* (2) *Juncus*

Physiographic features

This site occurs in the mid to high elevations of the Blue Mountains of Oregon. Often occurring in complex with wet meadow and meadow sites, these fens are found in depressions and around springs in mountain meadows, or where subsurface flows are impeded by restrictive layers leading to a persistently elevated water tables. Frequent flooding and ponding occur on this site and saturation at or above the surface of the soils occurs year round. Slopes range from 0 to 3 percent. Elevations range from 4,500 - 6,000 feet (1,400 to 1,800 meters) above sea level.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Fen (2) Mountains > Depression (3) Mountains > Flood plain
Flooding duration	Long (7 to 30 days)
Flooding frequency	Frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent
Elevation	1,372–1,829 m
Slope	0–3%
Ponding depth	15–30 cm
Water table depth	3–46 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate for this site is cold with a cryic soil temperature regime and a short frost free period. Mean annual precipitation is 14 and greater inches per year which occurs primarily as snow. Subsurface flows augment soil moisture significantly and create the conditions for an aquic soil moisture regime. Mean annual temperatures range from 36 to 43° F (2 to 6° C). The average daily minimum and maximum temperatures are 21 and 61° (-17 to 16 degrees C) respectively. Climate graphs are based on the nearest available climate stations to representative site locations and are provided to indicate general climate patterns.

Table 3. Representative climatic features

Frost-free period (characteristic range)	0-20 days
Freeze-free period (characteristic range)	20-50 days
Precipitation total (characteristic range)	356-914 mm
Frost-free period (average)	10 days

Freeze-free period (average)	30 days
Precipitation total (average)	559 mm

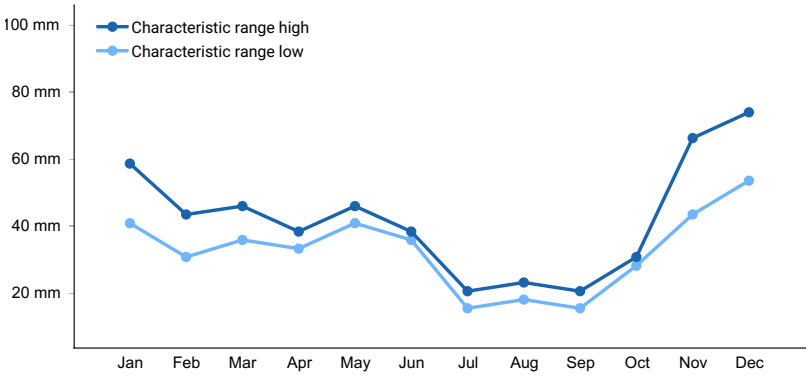


Figure 1. Monthly precipitation range

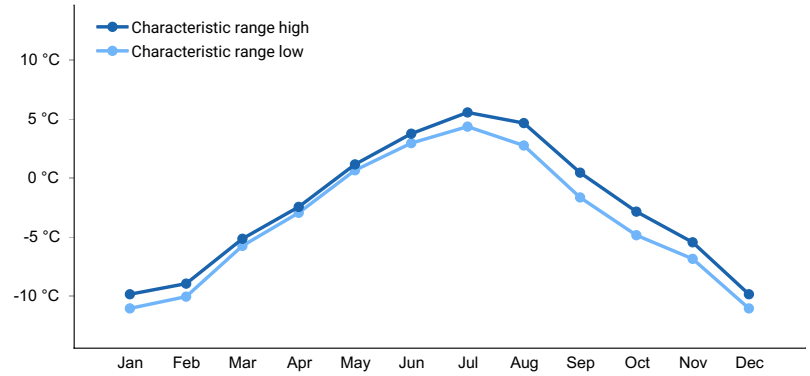


Figure 2. Monthly minimum temperature range

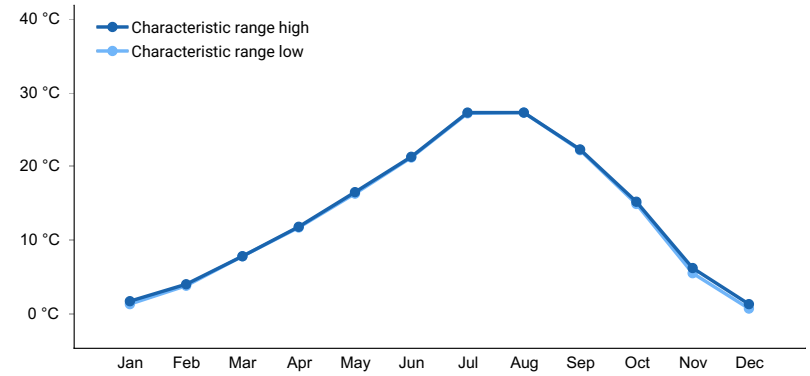


Figure 3. Monthly maximum temperature range

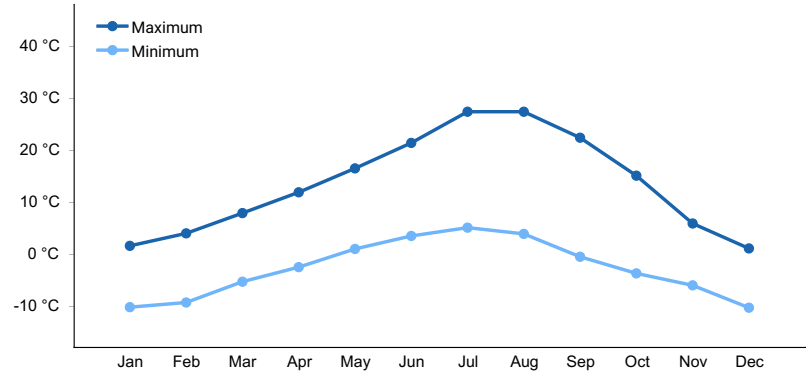


Figure 4. Monthly average minimum and maximum temperature

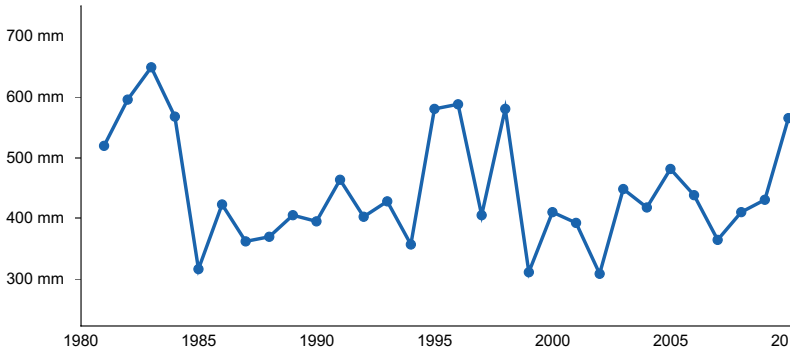


Figure 5. Annual precipitation pattern

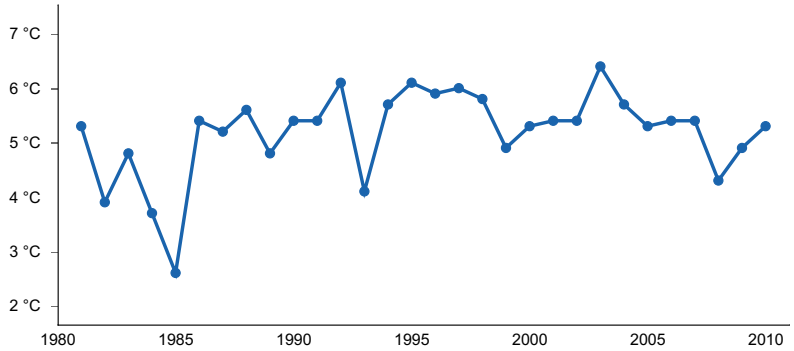


Figure 6. Annual average temperature pattern

Climate stations used

- (1) SENECA [USC00357675], Seneca, OR
- (2) AUSTIN 3 S [USC00350356], Prairie City, OR

Influencing water features

Fens occur where groundwater emerges from mountain springs with a discharge rate and a geomorphic context that allow for the accumulation of peat and development of organic soils. Persistently moist or saturated soils distinguish these fen sites from wet meadows which have more variable water tables that often drop below the surface for a significant part of the year. Unlike fens, wet meadows are also often found along stream courses and influenced by surface water. Unlike bogs, which often receive a majority of moisture from precipitation and have more acidic soils, fens have more alkaline soils. Compared to marsh areas, deep surface water does not persist year round.

Wetland description

This site occurs in lentic (standing water) wetland areas that classify as Palustrine Persistent Emergent Wetlands under the Cowardin System.

Soil features

The soils of this site are typically very deep and very poorly drained with a floating organic layer. These histosols have thick organic horizons composed of plant matter in varying stages of decomposition due to extended periods of soil saturation. Upper horizons have moderately rapid to rapid permeability whereas moderately slow permeability characterizes subsurface horizons. Typical organic surface horizons with peat, mucky peat or muck textures may extend to variable depths (typically between 30 and 80 inches below the surface), under which subsurface mineral horizon textures may range from silt loams, sandy loams or clay loams. Mineral horizons are typically composed of glaciofluvial deposits. These parent materials have been shown to be closely associated with fen habitats in the nearby Eastern Cascades due to slower permeability in comparison to volcanic parent materials (Aldous et al. 2015). See Stanbro for a typical soil associated with this site.

Table 4. Representative soil features

Parent material	(1) Mossy organic material (2) Glaciofluvial deposits–igneous rock
Surface texture	(1) Mucky (2) Muck (3) Peat
Family particle size	(1) Loamy
Drainage class	Very poorly drained
Permeability class	Moderately slow to rapid
Depth to restrictive layer	152–203 cm
Soil depth	152–203 cm
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–15%
Available water capacity (0-101.6cm)	25.4–50.8 cm
Soil reaction (1:1 water) (0-101.6cm)	4.8–6.4
Subsurface fragment volume <=3" (10.2-152.4cm)	5–50%
Subsurface fragment volume >3" (10.2-152.4cm)	0–10%

Ecological dynamics

The reference plant community of this site is dominated by herbaceous species capable of withstanding long periods of soil saturation and low nutrient concentrations. In particular, this site is dominated by sedge species whose aerenchymatous roots facilitate respiration in otherwise low oxygen conditions. Extensive rhizomes allow these sedge species to reproduce asexually and respond to above ground disturbance by resprouting. Studies in similar wet meadow systems dominated by water sedge (*Carex aquatilis*) and Northwest territory sedge (*Carex utriculata*) indicate that belowground biomass in these herbaceous dominated systems is vastly greater than aboveground biomass (Dwire et al. 2004). Slow decomposition of plant matter under low oxygen conditions in these soils allow for the accumulation of substantial soil carbon banks overtime. Organic soils and low oxygen conditions do not favor high shrub cover on this site, yet willow species may occur in areas with aerated flowing water or mineral soil exposure. Fluctuations in species composition and relative productivity may vary yearly with seasonal climatic changes such as precipitation and extreme temperatures.

While there is little direct evidence of fire return intervals for these communities in the Blue Mountains, it is likely that fires were infrequent due to moist conditions (35 to 100+ year fire frequency; stand replacement fire severity) (Powell et al. 2007). Fen plant communities are typically considered resilient to wildfire and capable of regaining pre-fire composition relatively quickly following fire (Jules et al. 2011, Kittredge et al. 2015). However, when high soil moisture conditions are altered due to drainage activities fire frequency may be increased, peat formation may be altered, and nutrient availability changed; potentially facilitating encroachment of shrub and tree species (Kittredge et al. 2015, Sulwinski et al. 2020). Since fens require relatively stable water levels for the development of organic soils and persistence of hydrophytic vegetation, alterations to hydrology may impact these communities. Drainage activities, ditching, road construction, and water withdrawals from springs or groundwater may have direct impacts to fen hydrology leading to cracking or loss of of peat surfaces, shifts in plant species composition and changes in productivity. In a 2017 assessment of wetlands in the Umatilla National Forest of Oregon, over half of groundwater dependent ecosystems, which include fens, had reduced aquifer functionality largely due to groundwater extraction (Dwire et al. 2017).

Grazing of fens by livestock and native ungulates, particularly Rocky Mountain elk (Cervus canadensis nelsoni), has historically been common and still occurs in many allotments. This may be most likely during late summer or fall when moisture levels are lowest and ungulates are less deterred by saturated soil conditions. Long-term improper

grazing of these systems may lead to soil compaction, increases in soil erosion, shifts toward less palatable native species or exotic species and changes in production. Exotic grass species such as reed canary grass (*Phalaris arundinacea*), redtop (*Agrostis gigantea*), meadow barley (*Hordeum brachyantherum*) and Kentucky bluegrass (*Poa pratensis*) may invade disturbed sites and, once established, can be very difficult to eradicate

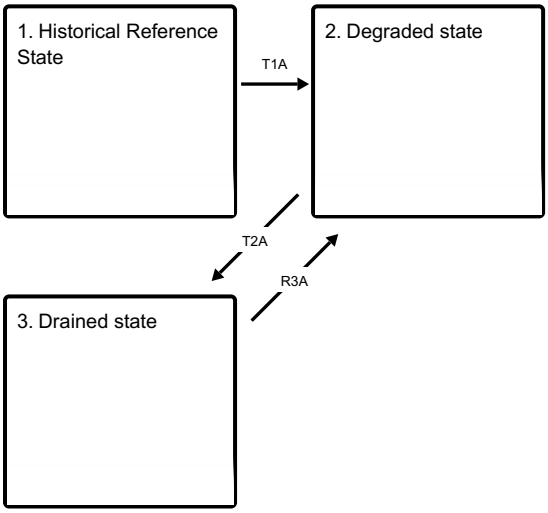
Historical variation in climate, including years of increased snowpack and drought years, would have influenced discharge rates and water tables on this site. Climate change impacts to these systems will be largely influenced by the groundwater hydrology of a particular fen, which depends on the relationship between snowpack and the underlying geology. Snowpack is expected to decline across the mountains of Oregon with a warming climate (Mote et al. 2005). Shifts from snow to rain is expected to be most pronounced at middle elevations of the Cascade and Blue Mountains. Fens in nearby Eastern Cascade systems are typically associated with mid elevation glacial till which is recharged from snowpack draining through porous volcanic substrates. These systems are expected to be vulnerable to shifts in groundwater discharge volume and seasonality under a warming climate (Aldous et al. 2015). How climate change will affect the groundwater hydrology of Blue Mountain fens will depend on the elevation of snowpack sources of groundwater recharge and interactions with underlying geology. Research suggests that expected shifts in precipitation timing and type will have far reaching effects on blue mountain wetland and groundwater-dependent ecosystems (Dwire et al 2018).

Emerging evidence suggests that montane meadows are experiencing conifer encroachment within the last century. Hypotheses for processes driving these vegetation changes range from climate cycles, alterations in fire regime and reductions in sheep grazing. While much of this site has excessively high soil moisture to accommodate significant conifer encroachment, populations of lodgepole pine (*Pinus contorta*) may become established in cold meadows due to altered disturbance regimes.

Since this site occupies a relatively small area, little specific data is available from which to derive robust state and transition models. The model below represents a simplified understanding of ecological dynamics in fens and may be expanded upon as further data becomes available.

State and transition model

Ecosystem states

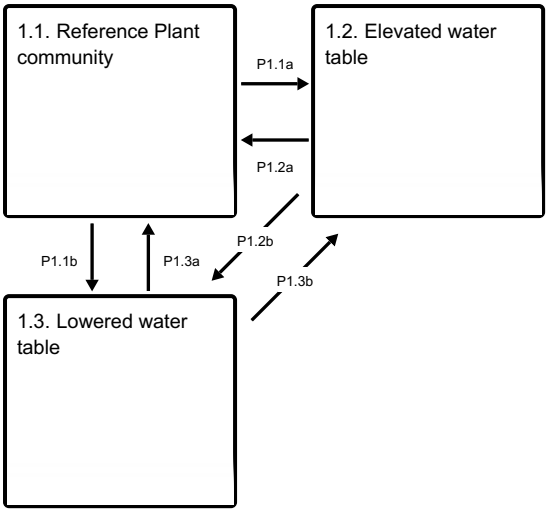


T1A - Prolonged improperly managed grazing by livestock, chronic heavy grazing by elk, or trailing and compaction by recreational use such as hiking or OHV use

T2A - Hydrologic alteration of the site

R3A - Restoration of hydrologic processes

State 1 submodel, plant communities



P1.1a - Water tables are raised for a prolonged period, wildfire occurs

P1.1b - Water tables are lowered for a prolonged period, lack of fire

P1.2a - Water tables return to representative depth

P1.2b - Water tables are lowered for a prolonged period, wildfire occurs

P1.3a - Water tables return to representative depth

P1.3b - Water tables are raised for a prolonged period

State 1
Historical Reference State

This represents the historical reference state in pristine conditions. Variability in depth to water table and seasonal fluctuations support native facultative and obligate wetland vegetation and vegetated communities include all historical functional and structural groups. The historical disturbance regime is intact and driven primarily by climate which influences snowpack and ground water recharge. The resilience and resistance of the site is bolstered by negative feedbacks between peat accumulation, vegetation production and hydrologic processes that maintains a dynamic equilibrium with geomorphological processes.

Dominant plant species

- sedge (*Carex*), grass
- rush (*Juncus*), grass

Community 1.1
Reference Plant community

The reference plant community is composed of approximately 85 percent grass and grasslike, 10 percent forbs and 5 percent shrubs. Water sedge (*Carex aquatilis*), Northwest territory sedge (*Carex utriculata*) and other sedges make up 50 percent of the community with spikerush (*Eleocharis palustris*), Baltic Rush and Sierra Rush make up another 25 percent. Tufted Hairgrass (*Deschampsia cespitosa*) and other cool season grasses will make up the remaining 10 percent of the grass and grasslike component of this community. Booth or geyer willow may occur as the shrub component. Forbs include fringed or hairy willow-herb (*Epilobium ciliatum*), Large-leaf avens (*Geum macrophyllum*) and Bog St. Johnswort (*Hypericum anagalloides*) also known as Tinkers Penny.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2634	3643	4652
Forb	168	252	336
Shrub/Vine	–	28	56
Total	**2802**	**3923**	**5044**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	3-5%
Grass/grasslike foliar cover	85-87%
Forb foliar cover	7-10%
Non-vascular plants	20-40%
Biological crusts	0%
Litter	10-30%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Community 1.2
Elevated water table

This community represents a scenario within historical climate variations where groundwater discharge is increased and water tables are raised for a prolonged period. This is likely to increase the dominance of northwest territory sedge (*Carex utriculata*) relative to other sedges (Anderson 2008) and may decrease the composition of forbs, rushes and grasses.

Community 1.3
Lowered water table

This community represents a scenario within historical climate variations where groundwater discharge is decreased and water tables are lowered for a prolonged period. As water tables are lowered, woody species with less tolerance of low oxygen, saturated conditions may increase relative to sedge species. Willow species as well as saturation tolerant conifers such as lodgepole pine and Engelmann spruce may increase in composition. Baltic rush may increase relative to northwest territory sedge (Anderson 2008).

Pathway P1.1a
Community 1.1 to 1.2

Water tables are raised for a prolonged period as a consequence of sustained above average snowpack, increased aquifer recharge or wildfire in the surrounding watershed. Wildfire occurrence within the fen may further decrease woody species encroachment (Anderson 2008).

Pathway P1.1b
Community 1.1 to 1.3

Water tables are lowered for a prolonged period as a consequence of sustained drought, decreased aquifer recharge, woody species encroachment, lack of wildfire in the surrounding watershed, siltation or peat

accumulation. Lack of fire within the fen may further increase the likelihood of woody species encroachment (Anderson 2008).

Pathway P1.2a
Community 1.2 to 1.1

Water tables return to representative depth due to average climate conditions and wildfire regimes.

Pathway P1.2b
Community 1.2 to 1.3

Water tables are lowered for a prolonged period as a consequence of sustained drought, decreased aquifer recharge, woody species encroachment, lack of wildfire in the surrounding watershed, siltation or peat accumulation. Lack of fire within the fen may further increase the likelihood of woody species encroachment (Anderson 2008).

Pathway P1.3a
Community 1.3 to 1.1

Water tables return to representative depth due to average climate conditions and wildfire regimes.

Pathway P1.3b
Community 1.3 to 1.2

Water tables are raised for a prolonged period as a consequence of sustained above average snowpack, increased aquifer recharge or wildfire in the surrounding watershed. Wildfire occurrence within the fen may further decrease woody species encroachment (Anderson 2008).

State 2
Degraded state

Soils in this state have been compacted or sod broken leading to decreases in water holding capacity, reductions in rooting area for plants, diminished productivity, and increased bareground. Increases in erosion may also occur on sloped sites. Shallow-rooted plant species such as Kentucky bluegrass, Baltic rush, small sedges and forbs may increase . If this state is reached through improperly managed livestock grazing or heavy, chronic, native ungulate utilization, plant community composition may be further impacted. Willow species may decline from extended grazing during late summer and early fall periods where preference is highest relative to herbaceous species. Exotic grasses and forbs adapted to disturbance or with low palatability may also increase.

Dominant plant species

- sedge (*Carex*), grass
- rush (*Juncus*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- arctic rush (*Juncus arcticus*), grass

State 3
Drained state

Site hydrology has been significantly altered by changes in groundwater discharge or seasonality. Water tables may be lowered or may experience more variability leading to decreases in sedge species composition and possible reductions in peat accumulation. Subsequent increases in native grasses adapted to more variable water tables such as tufted hair grass and meadow barley, and non-native grasses such as Kentucky bluegrass, reed canarygrass, and meadow foxtail may occur. Increases in fire frequency may follow drying of the site. More extreme departures from reference hydrologic conditions may lead to more dramatic shifts in species composition such as shrub and tree encroachment.

Dominant plant species

- Kentucky bluegrass (*Poa pratensis*), grass
- meadow foxtail (*Alopecurus pratensis*), grass
- meadow barley (*Hordeum brachyantherum*), grass
- reed canarygrass (*Phalaris arundinacea*), grass
- tufted hairgrass (*Deschampsia cespitosa*), grass

Transition T1A
State 1 to 2

Prolonged improperly managed grazing by livestock, chronic heavy grazing by elk, or trailing and compaction by recreational use such as hiking or OHV use. All of which may lead to the introduction of exotic species and degradation of the soil surface.

Transition T2A
State 2 to 3

Hydrologic alteration of the site through drainage, ditching, source water withdrawls, road construction, intensive logging operations, or ground water extraction of connected aquifers.

Restoration pathway R3A
State 3 to 2

Depending on the nature of the hydrologic alteration, and the intensity and duration of the disturbance, a return to State 2 may be possible. Water withdrawals or pumping may be reduced, roads may be rehabilitated, and ditches or drainage structures may be eliminated, all of which will likely require significant time, effort and cost.

Context dependence. Drainage disturbances that have severely altered abiotic site characteristics (e.g. major reductions in peat accumulations, gully erosion) may not be repairable within a management timeframe.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Sedges**			2354–3531	
	Northwest Territory sedge	CAUT	*Carex utriculata*	785–1177	–
	water sedge	CAAQ	*Carex aquatilis*	785–1177	–
	bigleaf sedge	CAAM10	*Carex amplifolia*	785–1177	–
2	**Other Sedges**			196–392	
	Sheldon's sedge	CASH	*Carex sheldonii*	49–99	–
	Nebraska sedge	CANE2	*Carex nebrascensis*	49–99	–
	woolly sedge	CAPE42	*Carex pellita*	49–99	–
	western inflated sedge	CAEX5	*Carex exsiccata*	49–99	–
3	**Rushes**			196–392	
	common spikerush	ELPA3	*Eleocharis palustris*	95–196	–
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	95–196	–
4	**Grasses**			504–897	
	tufted hairgrass	DECE	*Deschampsia cespitosa*	392–583	–
	bluegrass	POA	*Poa*	112–314	–
Forb					
5	**Forbs**			196–392	
	monkeyflower	MIMUL	*Mimulus*	25–49	–
	tinker's penny	HYAN2	*Hypericum anagalloides*	25–49	–
	dock	RUMEX	*Rumex*	25–49	–
	saxifrage	SAXIF	*Saxifraga*	25–49	–
	sandwort	ARENA	*Arenaria*	25–49	–
	strawberry	FRAGA	*Fragaria*	25–49	–
	willowherb	EPILO	*Epilobium*	25–49	–
	ragwort	SENEC	*Senecio*	25–49	–
Shrub/Vine					
6	**Shrubs**			0–118	
	Geyer willow	SAGE2	*Salix geyeriana*	0–56	–
	Booth's willow	SABO2	*Salix boothii*	0–56	–

Animal community

Wildlife
The main wildlife species of concern on this site are large herbivores-mule deer, elk and antelope. This site may also be home to a variety of small herbivores, birds and their associated predators. Beaver may influence sites where woody riparian species are present and where adjacent lentic or lotic riparian areas facilitate their presence. No known threatened or endangered wildlife species rely on this site for any of their habitat requirements.

Livestock
While this site produces considerable forage, much of this site is unsuitable to livestock use for much of the year due to saturated soils. However, the site may be accessible to grazing during late summer or early fall if water tables have lowered. When soils are moist they may be more prone to compaction. Vegetation may be susceptible to damage by tramping, especially during reproductive periods. Prolonged improperly managed livestock grazing will increase bareground, alter plant community composition, damage the organic soil horizons, increase erosion and pedestalling, and decrease litter cover.

Hydrological functions

This site functions as a zone of moisture storage and release during spring runoff and seasonal moisture events. It also contains hyporheic flows beneath the surface and has anaerobic characteristics.

Recreational uses

None

Wood products

None

Other products

Sphagnum moss

Other information

Adjacent areas of lodgepole pine invades along the fringes of this site. Drainage of this site may result in the collapse of the surface and significant change in the unique hydrologic and vegetative characteristics of this site.

Inventory data references

Data references include Mid-Montane Wetland Plant Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests by Elizabeth A. Crowe and Rodrick R. Clausnitzer and Riparian and Wetland Vegetation of Central and Eastern Oregon by Elizabeth A. Crowe and Bernard L. Kovalchik.

Type locality

Location 1: Grant County, OR	
Latitude	44° 11′ 14″
Longitude	118° 36′ 9″
General legal description	Logan Valley; about 25 miles southeast of John Day and about 20 miles east of Seneca Oregon. Approximately 700 ft. east and 2950 ft south of the NW corner of section 13, T 16S R 33 1/2E.

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Contributors

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Approval

Kirt Walstad, 12/13/2023

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)	Cici Brooks & Alan Bahn
Contact for lead author	
Date	02/05/2007
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

2. **Presence of water flow patterns:** None

3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10% by cover (ref: Mid Montane Wetland Plant Associations of Malheur, Umatilla and Wallowa-Whitman National Forests by Elizabeth A. Crowe and roderick R. Clausnitzer; pg 174)

5. **Number of gullies and erosion associated with gullies:** none

6. **Extent of wind scoured, blowouts and/or depositional areas:** none

7. **Amount of litter movement (describe size and distance expected to travel):** During times of runoff, herbaceous litter may travel across the entire site.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** 80-100%

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Organic layer up to 32" deep; sapric, hemic, fibric organic silt loam

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community will slow and filter runoff; infiltration is slow when saturated.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be**

mistaken for compaction on this site): None

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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: Deep rooted perennial grass/grasslike

    Sub-dominant: Shallow rooted perennial grass/grasslikes>Shallow rooted perennial forbs>Deep rooted perennial shrubs>Shallow rooted annual forbs

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Decadence of deep rooted perennial would be expected with exclusion from herbivory
    Plant mortality of deep rooted perennials would be expected with continuous season long herbivory.

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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):** Normal 5000; Unfavorable 3500; Favorable 6000

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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:** None

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17. **Perennial plant reproductive capability:** Good for hydrophytic vegetation; poor for upland species and conifers; Fair for willows; Poor for shrubs.
