USDA Natural Resources Conservation Service

Ecological site F043AY562ID
Warm-Frigid, Dry-Udic, Unglaciated, Loamy, Mountains, Low Available Water (grand fir/moist herb) Grand Fir / Bride's Bonnet

Last updated: 10/14/2020
Accessed: 04/20/2024

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): 043A–Northern Rocky Mountains

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Description of MLRAs can be found in: United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Available electronically at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624#handbook

LRU notes

Most commonly found in LRU 43A10 (Clearwater Mountains). Also found in adjacent areas of 43A11 (Bitterroot Metasedimentary Zone). Climate parameters were obtained from PRISM and other models for the area. Landscape descriptors are derived from USGS DEM products and their derivatives.

Classification relationships

Relationship to Other Established Classifications:
United States National Vegetation Classification (2008) – A3362 Grand fir – Douglas-fir Central Rocky Mt. Forest and Woodland Alliance.
Washington Natural Heritage Program. Ecosystems of Washington State, A Guide to Identification, Rocchio and Crawford, 2015 –
Northern Rocky Mt. Mesic Montane Mixed Conifer Forest.

Description of Ecoregions of the United States, USFS PN # 1391, 1995 - M333 Northern Rocky Mt. Forest-Steppe-Coniferous Forest-Alpine Meadow Province

Level III and IV Ecoregions of WA, US EPA, June 2010 -15w Western Selkirk Maritime Forest. 15y Selkirk Mountains. 15u Inland Maritime Foothills and Valleys.

This ecological site includes the following USDA Forest Service Plant Associations: ABGR/ACGLD/CLUN, Forest Plant Associations of the Colville Nat. Forest (Williams et. al. 1995) and ABGR/CLUN (Forest Habitat Types of N. Idaho, A Second Approximation, USFS Revised 1991.

Ecological site concept

This ES group is distinguished by an overstory of grand fir and Douglas-fir. Understory shrubs can include *Acer glabrum*, Linnaea borealis, Menziesia ferruginea, *Physocarpus malvaceus*, Spiraea betulifolia, Symphoricarpos occidentalis, and *Vaccinium membranaceum*. Herbaceous layers may be graminoid- or forb-dominated and may include Bromus vulgaris, Calamagrostis rubescens, Carex geyeri, *Clintonia uniflora*, Coptis occidentalis, Cornus canadensis, Linnaea borealis, and Trautvetteria caroliniensis.. It occurs on foothills, mountainsides, and canyon walls. These soils have developed in mixed Mazama tephra deposits over colluvium and residuum from granite or metasedimentary rock. The soils are very deep and have low (<3 inches) available water capacity to a depth of 40 inches. The soils are well drained.This ES group fits into the National Vegetation Standard's Grand Fir - Douglas-fir Central Rocky Mountain Forest & Woodland Alliance and Washington State's Natural Heritage Program's Northern Rocky Mt. Mesic Montane Mixed Conifer Forest.

Table 1. Dominant plant species

Tree	(1) *Abies grandis* (2) *Pseudotsuga menziesii var. glauca*
Shrub	(1) *Rosa gymnocarpa* (2) *Linnaea borealis ssp. longiflora*
Herbaceous	(1) *Clintonia uniflora* (2) *Coptis occidentalis*

Physiographic features

Physiographic Features
Landscapes: Mountains
Landform: mountain slopes, breaks

Elevation (m): Total range = 665 to 1780 m
(2,180 to 5,840 feet)
Central tendency = 1085 to 1360 m
(3,560 to 4,460 feet)

Slope (percent): Total range = 6 to 110 percent
Central tendency = 45 to 70 percent

Aspect: Total range: 75-185-330
Central tendency: 120-185-240

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Mountains > Break
Flooding frequency	None
Ponding frequency	None
Elevation	3,560–4,460 ft
Slope	45–70%
Water table depth	80 in
Aspect	SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	None
Ponding frequency	None
Elevation	2,180–5,840 ft
Slope	0–100%

Water table depth	80 in

Climatic features

Climatic Features
Frost-free period (days): Total range = 85 to 145 days
Central tendency = 95 to 115 days

Mean annual precipitation (cm): Total range = 610 to 1080 mm
(24 to 42 inches)
Central tendency = 750 to 885 mm
(30 to 35 inches)

MAAT (C): Total range = 6.4 to 10.2
(44 to 50 F)
Central tendency = 7.8 to 8.8
(46 to 48 F)

Climate Stations: none

Influencing water features

Water Table Depth:
>200 cm
(>80 inches)

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Soil features

Representative Soil Features

This ecological subsite is associated with several soil components (e.g. Typic Dystrochrepts, and Tigley). The soil components are Vitrandic Dystrudepts, and Vitrandic Hapludalfs. These soils have developed in mixed Mazama tephra deposits over colluvium and residuum from granite or metasedimentary rock. The soils are very deep and have low available water capacity to a depth of 40 inches. The soils are well drained.

Table 4. Representative soil features

Parent material	(1) Volcanic ash (2) Colluvium–basalt (3) Residuum–basalt
Surface texture	(1) Very gravelly, ashy sandy loam (2) Extremely gravelly, ashy loam
Drainage class	Well drained
Permeability class	Moderately rapid to moderate
Depth to restrictive layer	80 in
Surface fragment cover >3"	0%

Available water capacity (0-40in)	2.5 in
Calcium carbonate equivalent (0-60in)	0%
Electrical conductivity (0-60in)	0 mmhos/cm
Soil reaction (1:1 water) (0-60in)	5.3
Subsurface fragment volume <=3" (10-60in)	38%
Subsurface fragment volume >3" (10-60in)	25%

Table 5. Representative soil features (actual values)

Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Depth to restrictive layer	80 in
Surface fragment cover >3"	0%
Available water capacity (0-40in)	2.3–2.8 in
Calcium carbonate equivalent (0-60in)	0%
Electrical conductivity (0-60in)	0 mmhos/cm
Soil reaction (1:1 water) (0-60in)	3.5–6
Subsurface fragment volume <=3" (10-60in)	10–60%
Subsurface fragment volume >3" (10-60in)	0–61%

Ecological dynamics

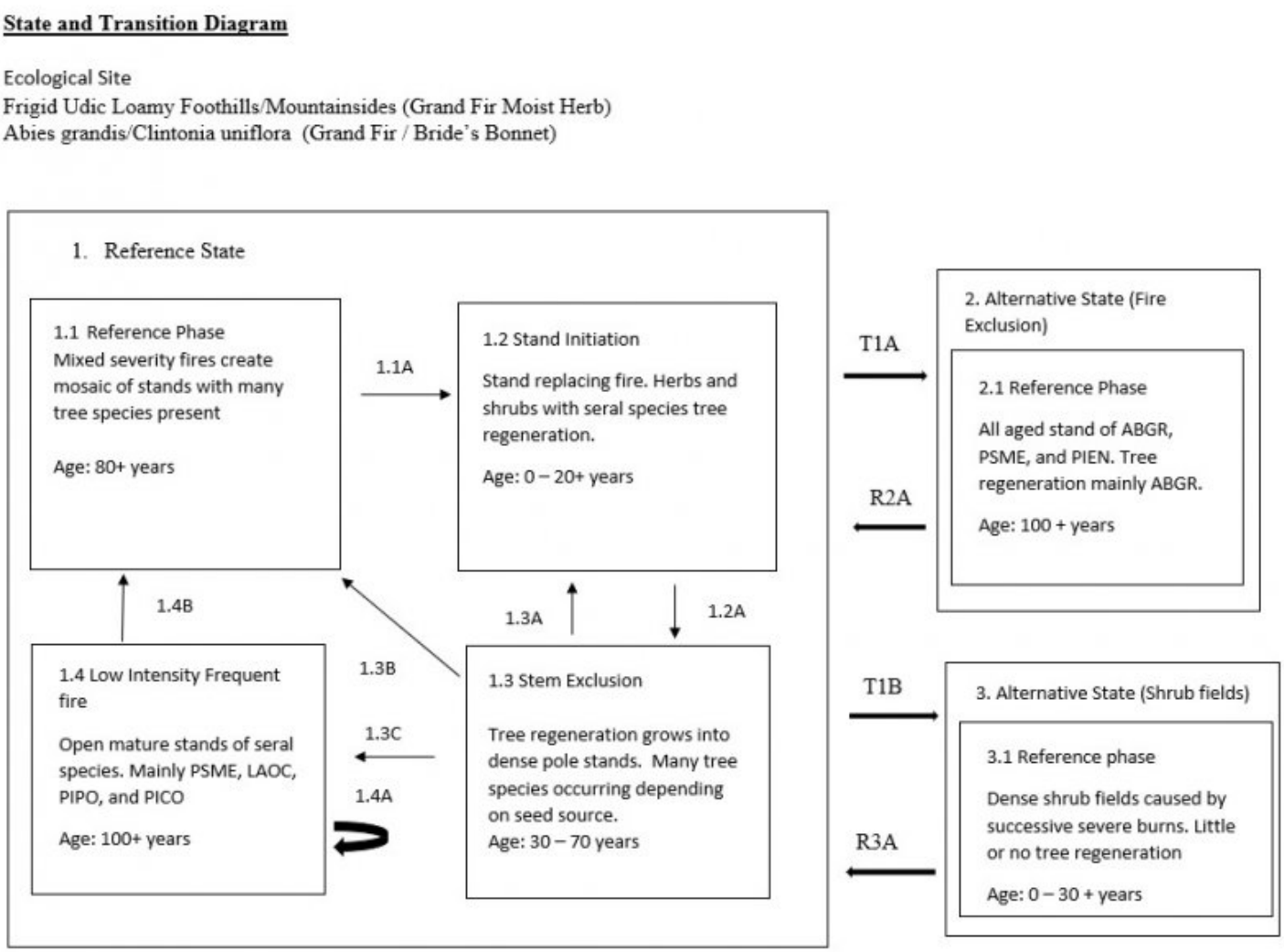
Ecological Dynamics of the Site

This grand fir site is on the moister end of the grand fir series and can have many tree species occurring depending on disturbance and seed source. Douglas-fir is the main seral species and will occur in mature stands with grand fir with fire exclusion. Engelmann spruce can also be present in fire excluded mature stands. With stand replacing or mixed severity disturbance Douglas-fir, western larch, ponderosa pine, western white pine, and lodgepole pine can occur in mixed stands. Quaking aspen, paper birch, and black cottonwood can be present in early to mid-seral stands.

Key understory species include Douglas maple, ninebark, oceanspray, serviceberry, snowberry, twinflower, honeysuckle, Oregon grape, rose, thimbleberry, pachistima, Scouler willow, spirea, pinegrass, brides bonnet, pathfinder, sweetroot, starry solomonplume, western princes pine, and white hawkweed.

Root rot and beetle kill will occur in the mature grand fir – Douglas fir stands. Western white pine once would have been more prevalent in the seral to mature stands, however, blister rust has made it a minor component of current stands. Low intensity frequent fires will favor more open western larch, Douglas-fir, and ponderosa pine stands. Mixed severity fires will create a mosaic of mixed stands of all tree species. Severe fires may create ceanothus brush fields with tree regeneration slow to reclaim the site.

State and transition model



State 1
Reference State

This state is dependent on fire severity and time intervals of fire. Many tree species will grow on this moist grand fir site. Douglas-fir, western larch, western white pine, ponderosa pine, lodgepole pine, Engelman spruce, and grand fir are the major conifer species. Quaking aspen, paper birch and black cottonwood can also be present. This ecological site has good forest productivity for Douglas-fir, western larch, and ponderosa pine. In N. Idaho western white pine would have good productivity. Low severity frequent fires create open stands of larch, Douglas-fir, ponderosa pine, and lodgepole pine. Mixed severity fires create a mosaic of a variety of tree species and different age groups. Tree regeneration after stand replacing fires will be variable depending on seed source. Western larch, western white pine, Douglas-fir, ponderosa pine, and lodgepole pine will be the main species. Western white pine used to play a major role in regeneration, however, the white pine blister rust has reduced its occurrence in regenerating stands. Western larch, Douglas-fir, and ponderosa pine are more prevalent. Reoccurring severe fires in the stand initiation phase can create shrub fields of ceanothus spp., and a variety of other shrubs. Fire exclusion for long periods allow the forest to move to an all aged grand fir, Douglas-fir, and Engelmann spruce stand. Root rot and defoliating insects then becomes are concern in the grand fir and Douglas-fir causing much downed wood and fuel loads.

Characteristics and indicators. Plant List Overstory Trees Douglas-fir (*Pseudotsuga menziesii*) Western Larch (*Larix occidentalis*) Grand fir (*Abies grandis*) Understory trees Grand fir (*Abies grandis*) Understory Shrubs Douglas maple (*Acer glabrum* Douglasii) Western prince's pine (*Chimaphila umbellata*) Serviceberry (Almalachier alinofolia) Oregon grape (Berberis aquifolium) Snowberry (*Symphoricarpos albus*) Twinflower (Linnaea borelalis) Pachistima (Pachistima myrsinities) Ninebark (*Physocarpus malvaceus*) Oceanspray (*Holodiscus discolor*) Shiny leaf spirea (Spirea betulifolia) Big huckleberry (*Vaccinium membranaceum*) (cooler sites) Scouler willow (*Salix scouleriana*)

Utah honeysuckle (*Lonicera utahensis*) Mountain ash (*Sorbus scopulina*) (cooler sites) Understory Herbs Pathfinder (*Adenocaulon bicolor*) Sweetroot (Osmorihiza chilensis) Starry solomonplume (Smilacina stellata) Queencup beadlily (*Clintonia uniflora*) White hawkweed (*Hieracium albiflorum*) Western meadowrue (*Thalictrum occidentale*)

Dominant plant species

- Rocky Mountain Douglas-fir (*Pseudotsuga menziesii var. glauca*), tree
- western larch (*Larix occidentalis*), tree
- grand fir (*Abies grandis*), tree
- Rocky Mountain maple (*Acer glabrum*), shrub
- pipsissewa (*Chimaphila umbellata*), shrub
- Saskatoon serviceberry (*Amelanchier alnifolia*), shrub
- hollyleaved barberry (*Mahonia aquifolium*), shrub
- common snowberry (*Symphoricarpos albus*), shrub
- longtube twinflower (*Linnaea borealis ssp. longiflora*), shrub
- Oregon boxleaf (*Paxistima myrsinites*), shrub
- mallow ninebark (*Physocarpus malvaceus*), shrub
- oceanspray (*Holodiscus discolor*), shrub
- white spirea (*Spiraea betulifolia*), shrub
- thinleaf huckleberry (*Vaccinium membranaceum*), shrub
- Scouler's willow (*Salix scouleriana*), shrub
- common lomatium (*Lomatium utriculatum*), shrub
- Greene's mountain ash (*Sorbus scopulina*), shrub

Community 1.1
Reference Phase

Mixed severity fires create a mosaic of mixed stands of seral species mixed with grand fir. Regeneration could include all the species depending on exposed mineral soil and seed source. Western larch, ponderosa pine, Douglas-fir, and lodgepole pine would be first to regenerate. Western white pine will also be present, but not as prevalent as before due to blister rust. Grand fir will be present, however will come underneath the seral species in time. Quaking aspen can establish after these mixed fires and be a component in the stand. Age: 80+ years

Dominant plant species

- grand fir (*Abies grandis*), tree
- western larch (*Larix occidentalis*), tree
- Rocky Mountain Douglas-fir (*Pseudotsuga menziesii var. glauca*), tree
- hollyleaved barberry (*Mahonia aquifolium*), shrub
- common snowberry (*Symphoricarpos albus*), shrub
- longtube twinflower (*Linnaea borealis ssp. longiflora*), shrub
- Oregon boxleaf (*Paxistima myrsinites*), shrub
- mallow ninebark (*Physocarpus malvaceus*), shrub
- oceanspray (*Holodiscus discolor*), shrub
- white spirea (*Spiraea betulifolia*), shrub
- thinleaf huckleberry (*Vaccinium membranaceum*), shrub
- Scouler's willow (*Salix scouleriana*), shrub
- common lomatium (*Lomatium utriculatum*), shrub
- Greene's mountain ash (*Sorbus scopulina*), shrub

Community 1.2
Stand Initiation

Herbs and shrubs reestablish on site. Ceanothus species can dominate if fire caused soil degradation. Tree regeneration can be mixed or dominated by western larch and lodgepole pine. Ponderosa pine and Douglas-fir can also be present. White pine was a major factor in regeneration before the blister rust reduced its significance. Age: 0 – 20+ years

Community 1.3
Stem Exclusion

Dense stands of mixed seral species or dominated be larch or lodgepole pine. Douglas-fir, ponderosa pine, and western white pine, can be in the stand. Age: 100+ years

Dominant plant species

- western larch (*Larix occidentalis*), tree
- lodgepole pine (*Pinus contorta var. latifolia*), tree
- Rocky Mountain Douglas-fir (*Pseudotsuga menziesii var. glauca*), tree
- ponderosa pine (*Pinus ponderosa*), tree
- western white pine (*Pinus monticola*), tree

Community 1.4
Frequent Low Intensity Fires

Frequent low severity fires create an open stand of mature Douglas-fir, Western larch, ponderosa pine, and lodgepole pine. This condition is perpetuated with continual ground fires. Age: 30 – 70 years

Dominant plant species

- Rocky Mountain Douglas-fir (*Pseudotsuga menziesii var. glauca*), tree
- western larch (*Larix occidentalis*), tree
- lodgepole pine (*Pinus contorta var. latifolia*), tree
- ponderosa pine (*Pinus ponderosa*), tree

Pathway 1.1A
Community 1.1 to 1.2

Stand replacing fire back to the herbs and shrub stage. Regeneration dependent on seed source and brush competition.

Pathway 1.2A
Community 1.2 to 1.3

Tree regeneration grows into dense pole stand. Species can be mixed or dominated by larch or lodgepole.

Pathway 1.3B
Community 1.3 to 1.1

Mixed severity fires create patchy mosaic as in reference plant community phase

Pathway 1.3A
Community 1.3 to 1.2

Stand replacing fire.

Pathway 1.3C
Community 1.3 to 1.4

Frequent low severity fires create open pole stands.

Pathway 1.4B
Community 1.4 to 1.1

Fire interval lengthens, and tree regeneration becomes established. Mixed severity fires create patchy mosaic of seral species and grand fir.

State 2
Fire Exclusion

An all aged stand of grand fir and Douglas-fir with Engelmann spruce mixed in occurs when fire interval is extended 100 years or more. Grand fir will dominate the regeneration in the understory. In the drier areas of this site root rot and defoliating insects can be a problem. Snags and downed wood will be common in these areas. This state will be susceptible to stand replacing fires.

Dominant plant species

- grand fir (*Abies grandis*), tree
- Rocky Mountain Douglas-fir (*Pseudotsuga menziesii var. glauca*), tree
- Engelmann spruce (*Picea engelmannii*), tree

Community 2.1
Fire Exclusion

An all aged stand of grand fir and Douglas-fir with Engelmann spruce mixed in occurs when fire interval is extended 100 years or more. Grand fir will dominate the regeneration in the understory. In the drier areas of this site root rot and defoliating insects can be a problem. Snags and downed wood will be common in these areas. This state will be susceptible to stand replacing fires.

Dominant plant species

- grand fir (*Abies grandis*), tree
- Rocky Mountain Douglas-fir (*Pseudotsuga menziesii var. glauca*), tree
- Engelmann spruce (*Picea engelmannii*), tree

State 3
Shrubfields

Successive severe ground fires create shrub fields for long time periods. Ceanothus species, ninebark, oceanspray, snowberry, spirea, Douglas maple, Scouler willow and serviceberry will dominate preventing tree regeneration.

Dominant plant species

- snowbrush ceanothus (*Ceanothus velutinus*), shrub
- redstem ceanothus (*Ceanothus sanguineus*), shrub
- mallow ninebark (*Physocarpus malvaceus*), shrub
- oceanspray (*Holodiscus discolor*), shrub
- common snowberry (*Symphoricarpos albus*), shrub
- white spirea (*Spiraea betulifolia*), shrub
- Rocky Mountain maple (*Acer glabrum*), shrub
- Scouler's willow (*Salix scouleriana*), shrub
- Saskatoon serviceberry (*Amelanchier alnifolia*), shrub

Community 3.1
Shrubfields

Successive severe ground fires create shrub fields for long time periods. Ceanothus species, ninebark, oceanspray, snowberry, spirea, Douglas maple, Scouler willow and serviceberry will dominate preventing tree regeneration.

Dominant plant species

- snowbrush ceanothus (*Ceanothus velutinus*), shrub
- redstem ceanothus (*Ceanothus sanguineus*), shrub
- mallow ninebark (*Physocarpus malvaceus*), shrub
- oceanspray (*Holodiscus discolor*), shrub
- common snowberry (*Symphoricarpos albus*), shrub

- white spirea (*Spiraea betulifolia*), shrub
- Rocky Mountain maple (*Acer glabrum*), shrub
- Scouler's willow (*Salix scouleriana*), shrub
- Saskatoon serviceberry (*Amelanchier alnifolia*), shrub

Transition T1A
State 1 to 2

100+ years of fire exclusion will move the site to a mature grand fir – Douglas-fir site.

Transition T1B
State 1 to 3

Successive severe burns kill regeneration and maintaining sprouting shrubs dominance.

Restoration pathway R2A
State 2 to 1

Overstory management with ground burning will favor seral species.

Restoration pathway R3A
State 3 to 1

Careful site selection and fire control allow tree regeneration to establish

Additional community tables

References

. 1998. NRCS National Forestry Manual.

. 2017. NRCS Soil and Site Index data for NE WA and N. Idaho.

Cooper, S.V., K.E. Neiman, R. Steele, and D.W. Roberts. 1991. Forest Habitat types of Northern Idaho, A Second Approximation.

Finklin, A.I. 1983. Climate of Priest River Experimental Forest, northern Idaho. Gen. Tech. Rep. INT-159. U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT. 53.

Smith and Fischer. 1997. Fire Ecology of the Forest Habitat Types of Northern Idaho.

Williams, C.K., B.F. Kelley, B.G. Smith, and T.R. Lillybridge. October, 1995. Forested Plant Associations of the Colville National Forest.

Zack, A. 1997. Biophysical Classification- Habitat Groups and Description of Northern Idaho and Northwestern Montana, Lower Clarkfork and Adjacent Areas..

Approval

Curtis Talbot, 10/14/2020

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	04/20/2024
Approved by	Curtis Talbot
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:

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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:**