USDA Natural Resources
Conservation Service

Ecological site R004BX103CA
Lower prairie, earthflows, sandstone and mudstone, gravelly loam

Accessed: 05/13/2025

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.

Associated sites

F004BX112CA	**Oregon White Oak/Perennial And Annual Grasses, lower mountain slopes, sandstone and mudstone, silty clay loam** F004BX112CA may be found in conjunction with this site.
R004BX101CA	**Upper prairie, mountain slopes, sandstone and mudstone, clay loam** R004BX101CA may be found in conjunction with this site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Arrhenatherum elatius* (2) *Cynosurus echinatus*

Physiographic features

This ecological site is found east of Redwood Creek. It occurs on uniform to slightly concave slump positions of lower mountain inclines. These mountain slopes are moderately steep to steep.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Flow
Flooding frequency	None
Ponding frequency	None
Elevation	67–971 m
Slope	15–50%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is humid with cool, foggy summers and cool, moist winters. Coastal influence limits the diurnal range in temperatures. Summertime temperatures range from 57 to 61 degrees F. The total annual precipitation ranges from 70 to 90 inches and usually falls from October to May.

Table 3. Representative climatic features

Frost-free period (average)	265 days
Freeze-free period (average)	265 days
Precipitation total (average)	2,032 mm

Influencing water features

There are no influencing hydrological features on this site.

Soil features

These very deep soils developed from colluvium, which is derived from earth-flow deposits of mudstone and sandstone. They are moderately well to somewhat poorly drained soils, with a loamy subsurface and rock content ranging from non-gravelly to very gravelly. The soils are slightly acidic to strongly acidic in all horizons except at 40 inches.

Soils that have been tentatively correlated to this ecological site include the following:

Soil Survey Area: CA605 - Redwood National and State Parks

MU Component

659 Rainguage
659 Pigpen

Table 4. Representative soil features

Surface texture	(1) Loam (2) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to somewhat poorly drained
Permeability class	Moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	5–45%
Surface fragment cover >3"	0–5%

Available water capacity (0-101.6cm)	7.62–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.1–7
Subsurface fragment volume <=3" (Depth not specified)	10–50%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

Historically, prairies within the north coast region were thought to have been dominated by native perennial bunchgrasses and numerous associated forbs (Holland and Keil, 1995). Native Americans utilized the prairies within the Bald Hills for food and cultural materials (Sugihara and Reed, 1987). Regular burning stimulated the growth of grasses and eliminated invading shrubs and trees, thereby attracting wildlife. The use of fire for over 5,000 years by Native Americans created a system in equilibrium that controlled the vegetative structure and composition (Sugihara and Reed, 1987).

With the advent of European settlements, changing land use practices significantly altered the vegetation (Sugihara and Reed, 1987). In the 1800s cattle and sheep grazing became widespread. Increased grazing pressure from domestic livestock and range seeding reduced the native perennials and increased the population of introduced perennials and forbs. More studies are needed to understand grazing and native plant interactions (D'Antonio et al). Shifts in the annual plant community caused by grazing are difficult to document. Certain species will increase with favorable weather and grazing conditions.

Non-native grasses often out-compete natives for water, nutrients and growing space (Wilson and Clark, 1998). Tall oatgrass, an introduced perennial within the Bald Hills, is considered an invasive exotic (National Park Service, 2002). One study indicates that early season burning may be more effective in eliminating flowers and developing seeds of tall oatgrass prior to their dispersal (Wilson and Clark, 1998). However, spring burning has a negative effect on the native perennial California oatgrass (National Park Service, 2005). Fall burning has slowed the advance of tall oatgrass within Redwood National Park to some extent (Redwood National Park).

Prescribed burning may favor one species over another. Recent studies indicate that periodic fire may favor perennial species by reducing litter cover and eliminating other plant competition (Huntsinger,et al 1996). Fire may also increase the production of non-natives (Vogl, 1974) and exotic forbs (D'Antonio et al). Long term studies are lacking to evaluate the interaction of prescribed fire, climate, and grazing on both natives and non-native species (D'Antonio et al).

Fire exclusion in the last century has allowed for the encroachment of shrubs, and in some cases trees, into the prairies. Roads established for harvesting purposes left exposed cut and fill slopes that were rapidly invaded by Douglas-fir. Invasion of prairie and oak woodland by conifers has lead to conversion to forest in a very short period of time (Sugihara and Reed, 1987).

State and transition model

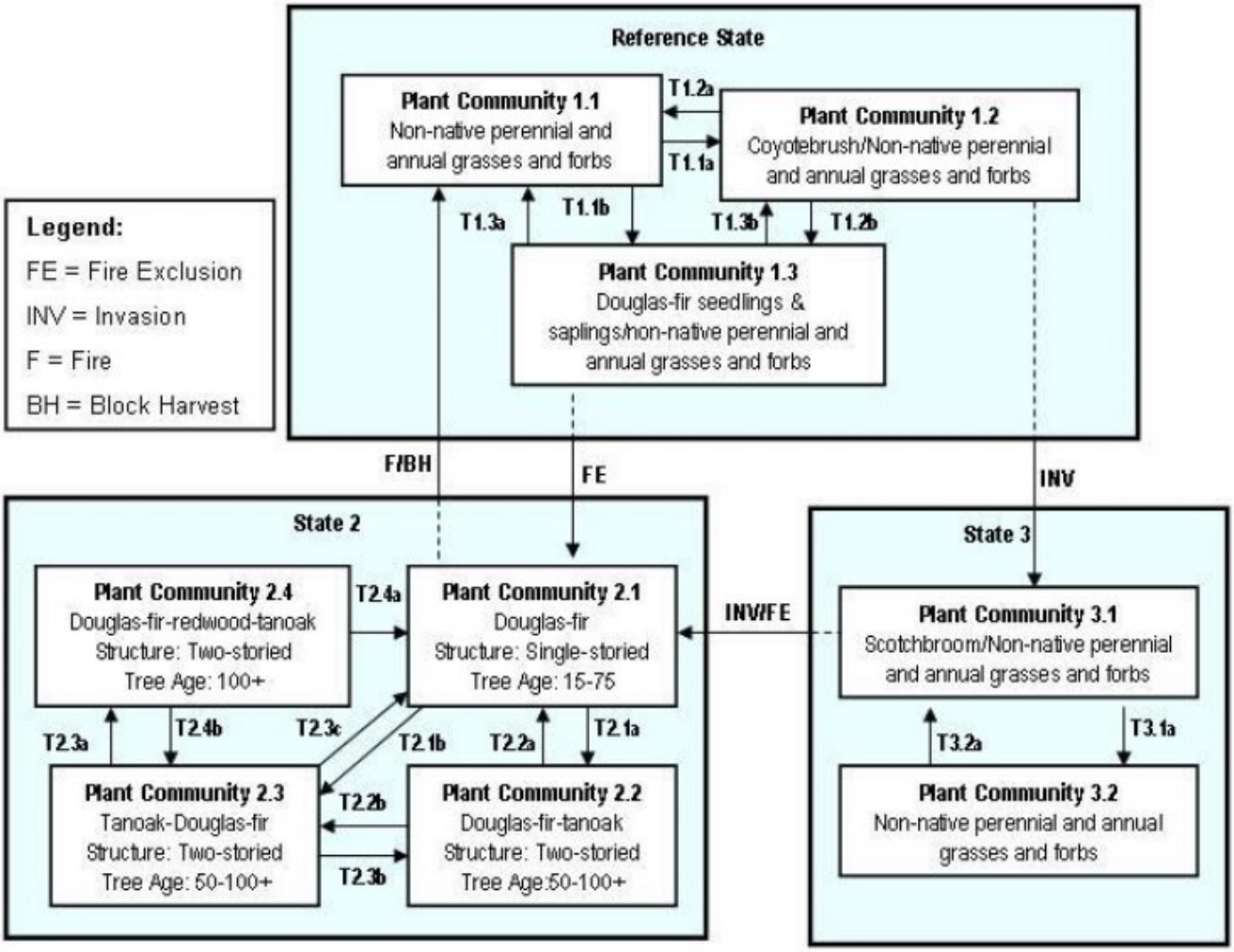

Figure 6. Lower prairie model

State 1
Native perennial grasses and forbs

Community 1.1
Native perennial grasses and forbs

Plant Community 1. It is thought that native perennial grasses and forbs once dominated the grasslands of the Bald Hills (Holland and Keil, 1995). Native American burning sustained this plant community over several thousand years. Native perennial grasses may have included California oatgrass (*Danthonia californica*), blue wildrye (*Elymus glaucus*), and bentgrass (Agrostis spp.). Western brakenfern (*Pteridium aquilinum*) was a common native forb. 1a) Periodic fire utilized by Native Americans maintained the plant community. 1b) Uncontrolled grazing and/or fire exclusion may allow introduced perennials and grasses to become dominant over native perennials. See PC#3. 1c) With the influx of European settlements in the mid-1800s, the use of fire largely ceased. Introduced perennials were range-seeded and became more dominant. These non-native perennials and annuals out-competed the native grasses, and began to dominate the plant community (Murphy and Ehrlich, 1989). Uncontrolled grazing of domestic livestock may have also contributed to an increase in the annual grasses and forbs (Heady, 1977). See PC#2.

State 2
Introduced perennial and annual grasses and forbs

Community 2.1
Introduced perennial and annual grasses and forbs

Plant Community 2. The interpretive plant community is dominated by non-native perennial and annual grasses. They include tall oatgrass (*Arrhenatherum elatius*), orchardgrass (*Dactylis glomerata*), and bristly dogstail grass (*Cynosurus echinatus*). Common perennial and annual forbs include western brackenfern (*Pteridium aquilinum*), common sheep sorrel (*Rumex acetosella*), and hairy catsear (*Hypochaeris radicata*). Native perennial grasses found on the site include blue wildrye (*Elymus glaucus*) and California oatgrass (*Danthonia californica*). Species composition by weight % Bristly dogstail grass 20-40% Orchardgrass 15-20% Tall oatgrass 5-10% Western brakenfern 0-5% Hairy catsear 1-18% Soft brome 0-5% Blue wildrye <1% Sheep sorrel <1% California oatgrass <1% Total dry weight production in a normal year may range from 2100 lbs to 4310 lbs/acre. Data for this site was collected over a limited time period. 2a) Periodic fire would maintain this plant community. 2b) Fire exclusion from the system may allow introduced perennial and annual grasses and forbs to dominate over native grasses. See PC#3 2c) Western brakenfern (*Pteridium aquilinum*), coyotebrush (*Baccharis pilularis*) and scotch broom (Cystisus scoparius) may invade some prairies. Western brackenfern is an aggressive colonizer and its expansion into an area may be increased by fire. Coyotebrush and scotch broom both seed into disturbed areas and sprout following fire. See PC#4. 2d) Douglas-fir may invade areas where fire has been excluded or where other disturbance has exposed mineral soil. See PC#5.

Forest understory. Species composition by weight

Bristly dogstail grass 30%
orchardgrass 15%
soft brome 15%
annual vernalgrass 10%
hairy catsear 10%
California brome 5%
pale flax 5%
tall oatgrass 5%
trefoil 5%

Note: Species composition may vary on other sites due to very limited data collection.

Total Dry Weight Production:

Favorable year: 4500 lbs./acre
Normal year: 2,000 lbs./acre
Unfavorable year: 1,200 lbs./acre

State 3
Coyotebrush-scotch broom/perennial and annual grasses and forbs

Community 3.1
Coyotebrush-scotch broom/perennial and annual grasses and forbs

Plant Community 4. This plant community is dominated by shrubs and introduced grasses. The primary shrub is coyotebrush (*Baccharis pilularis*), but scotch broom (Cystisus scoparius) may be found as well. Introduced perennial grasses may include orchardgrass (*Dactylis glomerata*), and tall oatgrass (*Arrhenatherum elatius*). Introduced annual grasses may consist of bristly dogstail grass (*Cynosurus echinatus*), soft brome (Bromus hordeaceous), and rat-tail fescue (*Vulpia myuros*). Introduced forbs include hairy catsear (*Hypochaeris radicata*), pale flax (Lupinus spp.), vetch (Vicia spp.), and tarweed (Hemizonia spp.). 4a) The coyotebrush/scotch broom plant community may be returned to grassland with prescribed fire, mechanical treatment or removal, in conjunction with the re-establishment of native grasses. See PC#2. 4b) With fire exclusion, the drier portions of these sites may be invaded by Douglas-fir. Existing shrub species may also expand into disturbed areas. Red alder (*Alnus rubra*) may be common on some moist, lower-sloped debris flows. See PC#5. 4c) If fire is re-introduced, brush invasion may be temporarily halted. See PC#3.

State 4
Annual grasses and forbs

Community 4.1
Annual grasses and forbs

Plant Community 3. This plant community is dominated by annual grasses and forbs. Introduced annual grasses may include bristly dogstail grass (*Cynosurus echinatus*), soft brome (Bromus hordeaceous), and rat-tail fescue (*Vulpia myuros*). Introduced forbs include hairy catsear (*Hypochaeris radicata*), pale flax (*Linum bienne*)vetch (Vicia spp.), and tarweed (Hemizonia spp.). Some remnants of perennial grasses may still exist. 3a) When fire is re-introduced to the system, varying effects on vegetation may result. Climatic factors influence the effect of fire on vegetation as well as the use of livestock grazing (D'Antonio et al). Burning may cause an increase in both native and exotic forbs, such as western brackenfern, and in introduced perennials, such as tall oatgrass. Timing of burning appears to be an important factor affecting the presence of the native perennial California oatgrass (Aguello, 1994, Hatch et al, 1999). Cover and frequency may decline with early summer burns versus late summer burning. Mechanical treatment and range seeding could help to reestablish native grasses, though not to historic levels. See PC#2. 3b) Fire exclusion may allow for brush invasion on some sites. Uncontrolled grazing may expose mineral soil that may be readily invaded by coyotebrush or scotch broom. See PC#4. 3c) Fire exclusion and/or disturbance may lead to Douglas-fir infill into grassland. See PC#5.

State 5
Douglas-fir

Community 5.1
Douglas-fir

Plant Community 5. If seed sources are available, Douglas-fir could infill into prairies, while Red alder may seed in debris flows. 5a) Infill of redwood will occur over time, eventually overtopping the Douglas-fir or red alder plant community. Growth and establishment of conifers could be accelerated with chemical control of red alder and conifer tree planting. See PC#6. 5b) Young Douglas-fir invasion may be temporarily halted through the use of fire, in a possible combination with tree girdling. Follow-up mechanical treatment and reestablishment of native grasses would be possible, though would not restore native grass populations to their previous levels. See PC#2.

State 6
Douglas-fir-redwood

Community 6.1
Douglas-fir-redwood

Plant Community 6. The plant community is dominated by Douglas-fir and redwood. Redwood tends to infill under the already established Douglas-fir canopy. 6a) Block harvesting this plant community would potentially cause red alder to dominate if a seed source was present. See PC#5. 6b) Eventually, redwood over-tops the Douglas-fir and dominates the plant community. Without disturbance Douglas-fir is unable to regenerate. See PC#7.

State 7
Redwood-Douglas-fir

Community 7.1
Redwood-Douglas-fir

Plant Community 7. Redwood dominates the plant community, especially at the lower elevations where this site is found. Western hemlock (Tsuga heterophyllia) may be a common associate. 7a) Block harvesting may allow Douglas-fir to infill. See PC#6

Additional community tables

Animal community

Roosevelt elk use the prairies for foraging and resting. Other mammals that utilize the prairie edge for foraging or hunting may include: deer, the short and long-tailed weasel, skunk, coyote, badger, bobcat, bear and mountain lion.

Numerous birds rely on grasslands as a feeding habitat, including the red-tailed hawk, turkey vulture, as well as numerous owls and swallow species. Various mice, voles and moles find habitat in grassland and serve as a food source for birds and larger mammals.

Hydrological functions

Runoff class is medium to high.

Hydrologic groups:

Rainguage--
Pigpen--

Recreational uses

Recreational use and development may be limited by slopes and potential for debris flow.

Wood products

There are no wood products available on this site.

Inventory data references

Range data was collected along transects in the vicinity of the following soil pedons:

Component and Pedon#

Other references

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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:**

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

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

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

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

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

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

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

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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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:**
