USDA Natural Resources Conservation Service

Ecological site R004BX101CA
Upper prairie, mountain slopes, sandstone and mudstone, clay loam

Accessed: 05/14/2025

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.
F004BX114CA	**Oregon white oak/perrenial and annual grasses, mountain slopes, sandstone and mudstone, clay loam** F004BX114CA may be found in conjunction with this site.
R004BX103CA	**Lower prairie, earthflows, sandstone and mudstone, gravelly loam** R004BX013CA may be found in conjunction with this site.
R004BX104CA	**Middle prairie, mountain slopes, sandstone and mudstone, gravelly clay loam** R004BX104CA may be found in conjunction with this site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site is found east of Redwood Creek in the Bald Hills. It occurs on uniform to slightly convex, strongly sloping summits and shoulders of broad ridges and steep upper-mountain slopes.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Mountain slope (3) Barrier flat
Flooding frequency	None
Ponding frequency	None
Elevation	502–3,386 ft
Slope	1–50%
Water table depth	60 in
Aspect	SW

Climatic features

The climate has warm, dry summers and cool, moist winters. The upper prairies are often above the influence of summer fog. The mean annual temperature ranges from 50 to 59 degrees F*. The mean annual precipitation ranges from 85 to 100 inches, and usually falls from October to May.

* From Schoolhouse Peak Climate Data

Table 3. Representative climatic features

Frost-free period (average)	240 days
Freeze-free period (average)	240 days
Precipitation total (average)	93 in

Influencing water features

There are no influencing water features on this site.

Soil features

These well-drained soils developed from colluvium and residuum derived from sandstone and siltstone. They are moderately to highly acidic at 40 inches with a dominantly loamy subsurface and rock content ranging from non-gravelly to very gravelly. These soils are generally very deep with areas that are moderately deep to a paralithic or lithic contact.

This ecological site is tentatively correlated to the following soils: Redwood National and State Parks

MU Component

480 Dolason (siltstone and sandstone)
480 Countshill (siltstone and sandstone)
480 Airstrip (siltstone and sandstone)
481 Airstrip (siltstone and sandstone)
481 Dolason
481 Countshill

Table 4. Representative soil features

Surface texture	(1) Loam (2) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	40–80 in
Surface fragment cover <=3"	0–35%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	2–9 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	4.5–5.5
Subsurface fragment volume <=3" (Depth not specified)	0–50%
Subsurface fragment volume >3" (Depth not specified)	0%

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. Within the Bald Hills, invasion of prairie and oak woodland by conifers has lead to a conversion to forest in a very short period of time (Sugihara and Reed, 1987). Successive rates may be slower on poorly drained heavy soils. Historically, there was very little overlap between the prairie, oak, and conifer systems within the park (Sugihara and Reed, 1987).

The effect of the rodent population on seed dispersal and distribution of grasses is unknown but likely makes an important contribution to diversity.

State and transition model

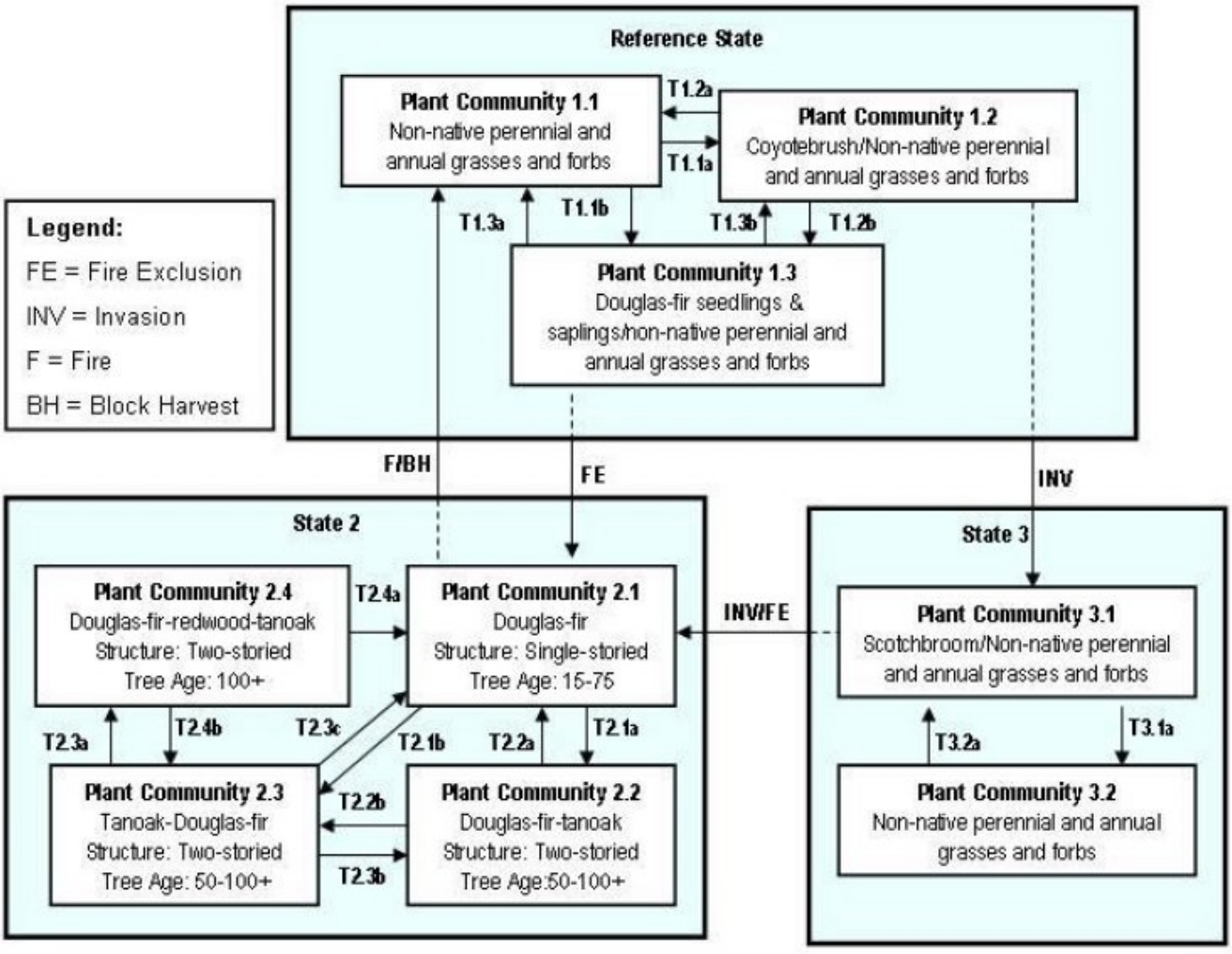

Figure 6. Upper prairie model

State 1
Scotch broom-coyotebrush/western brackenfern-annual grasses and forbs

Community 1.1
Scotch broom-coyotebrush/western brackenfern-annual grasses and forbs

Plant Community 4. The scotch broom/coyotebrush/western brackenfern, annual grasses, and forbs plant community is one that develops in areas that have been cultivated or disturbed, or areas from which fire has been excluded. Coyotebrush and scotch broom readily invade both disturbed and undisturbed areas, particularly along roadsides. Coyotebrush (*Baccharis pilularis*) establishes via seed and is capable of sprouting following fire (Steinberg, 2002). Scotch broom (Cystisus scoparius) is an invasive shrub that reproduces via seed and maintains itself through prolific seeding and vegetative sprouting (Zouhar, 2005). Western brackenfern reproduces primarily

vegetatively and via spores (Crane, 1990). Populations of western brackenfern appear to be favored by fire through the sprouting of rhizomes. Areas are also rapidly colonized by new plants established from spores (Page, 1986). Biomass production of perennial and annual grasses and forbs generally increase following fire (Heady, 1972). 4a) Prescribed fire may temporarily reduce populations of shrubs and forbs in grassland communities. The intensity and timing of prescribed fire has varying effects on plant response and are not well understood, and long-term studies on the effects of burning are lacking (Antonio et al). Seeding following a spring burn could help to establish native perennial populations where they are lacking (Wilson and Clark, 1998). Mechanical treatment of shrubs and the reestablishment of some native grasses through seeding may be possible, though not to historic levels. See PC# 2. 4b) With fire exclusion, Douglas-fir may gradually invade into prairies. Road building and soil disturbance from harvesting activities also make a desirable seedbed for Douglas-fir natural regeneration (Sugihara and Reed, 1987).

State 2
Douglas-fir-redwood-tanoak

Community 2.1
Douglas-fir-redwood-tanoak

Plant Community 8. The plant community is dominated by Douglas-fir and redwood (*Sequoia sempervirens*) in the overstory and tanoak in the sub-canopy. At the lower elevations on this site redwood could dominate over Douglas-fir.

State 3
Douglas-fir

Community 3.1
Douglas-fir

Plant Community 5. This plant community is primarily composed of Douglas-fir (*Pseudotsuga menziesii*) that has infilled from adjacent seed sources. Invasion of prairie and oak woodland by conifers has lead to a conversion to forests in a very short period of time (Sugihara and Reed, 1987). 5a) Over a period of time, without fire, tanoak (Lithocarpus densiflorus) may infill from adjacent seed sources. Seedling infill will accumulate over time without disturbance, and significant amounts may take several decades to develop under conifer stands (Tappeiner, et al, 1986). See PC#6. 5b) The grassland community could be restored with the use of fire or tree girdling, mechanical treatment, and reestablishment of native grasses if the succession to conifers is in the early stages. See PC#2. 5c) If fire were introduced into the system in the early stages of conifer encroachment, the natural succession process could be temporarily halted and set back to shrubs. See PC# 4.

State 4
Annual grasses and forbs

Community 4.1
Annual grasses and forbs

Plant Community 3. This plant community is composed of annual grasses and forbs that may include bristly dogstail (*Cynosurus echinatus*), annual vernalgrass (*Anthoxanthum aristatum*), silver hairgrass (*Aira caryophyllea*), soft chess (Bromus hordeaceous), rattail fescue (*Vulpia myuros*), and velvet grass (Holcus lantanus). Common forbs include: hairy catsear (*Hypochaeris radicata*), curly dock (*Rumex crispus*) and common sheep sorrel (*Rumex acetosella*). Western brackenfern (*Pteridium aquilinum*), a native forb is also commonly found. 3a) Periodic prescribed fire and/or drill seeding may restore some native grass populations, though not to the historic levels. See PC#2. Prescribed grazing and/or prescribed fire could cause a shift from annual grasses and forbs back to a perennial-dominated plant community. More aggressive introduced perennial species such as tall oatgrass continue to be part of the community. Annual vernalgrass, an introduced annual, may also increases in cover. Spring burning may be more successful in reducing tall oatgrass than fall burning (Wilson and Clark, 1998); other studies indicate that spring burning may be detrimental to established native populations such as California oatgrass (National Park Service, 2005). Studies indicate that the effects of fire on native grasses are variable and further study is needed (Antonio et al, date?). 3b) Fire exclusion from the site may allow for the eventual invasion of the site by shrubs

including scotch broom (Cystisus scoparius) and coyotebrush (*Baccharis pilularis*). Disturbance from uncontrolled grazing may leave exposed soil subject to brush invasion. See PC#4.

State 5
Douglas-fir-tanoak

Community 5.1
Douglas-fir-tanoak

Plant Community 6. A Douglas-fir and tanoak plant community develops as a result of fire exclusion and tanoak infill. 6a) With a period of fire exclusion, shade-tolerant redwood seedlings slowly infill over time. Redwood saplings were found in prairies colonized by Douglas-fir 80 to 200 years ago (Sugihara and Reed, 1987). Douglas-fir regeneration may eventually become less successful in the absence of created openings. See PC#8. 6b) The use of chemical control would kill young tanoak, leaving Douglas-fir. See PC#5. 6c) A fire of moderate intensity with partial stand replacement could kill patches of younger Douglas-fir and tanoak. Prolific basal sprouting of tanoak would be expected. Vigorous height growth of tanoak could allow it to dominate the canopy for a period of time. Block harvesting the Douglas-fir/tanoak stand could have similar results. See PC#7.

State 6
Introduced perennial and annual grasses and forbs

Community 6.1
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*), annual vernalgrass (*Anthoxanthum aristatum*), 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*), California oatgrass (*Danthonia californica*) and bentgrass (Agrostis spp.). Species composition by weight % Tall oatgrass 23-25% Annual vernalgrass 10-20% Bristly dogstail 10-15% Bentgrass 2-12% Common velvetgrass 13-15% Soft brome 5-7% Blue wildrye 7-14% California oatgrass 8-11% Western brackenfern 5-10% Hairy catsear 5-10% Sheep sorrel 3-6% Total Dry Weight Production: Dolason Favorable year: 6,800 lbs./acre Average year: 4,500 lbs./acre Unfavorable year: 1,500 lbs./acre Countshill Favorable year: 4,700 lbs./acre Average year: 3,200 lbs.acre Unfavorable year: 1,500 lbs./acre Airstrip Favorable year: 4,700 lbs./acre Average year: 3,100 lbs./acre Unfavorable year: 1,500./lbs/acre 2a) Fire may stimulate growth of native perennials by reducing competition (D'Antonio, et al), but may also increase the amount of introduced perennials and forbs (Keeley, 1981). 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 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. Spring burning may be more successful in reducing tall oatgrass than fall burning (Wilson and Clark, 1998); other studies indicate that spring burning may be detrimental to established native populations such as California oatgrass (National Park Service, 2005). Studies indicate that the effects of fire on native grasses are variable and further study is needed (Antonio et al, date?) See PC#2. 2b) As with the historic plant community, annual grasses such as bristly dogstail (*Cynosurus echinatus*) and the forb, hairy catsear (*Hypochaeris radicata*) may become more prevalent in areas subject to uncontrolled grazing or in areas that have been disturbed. See PC#3. 2c) Western brackenfern (*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) Fire exclusion or disturbance such as road building may allow for infill of Douglas-fir into prairies. See PC#5.

State 7
Tanoak-Douglas-fir

Community 7.1
Tanoak-Douglas-fir

Plant Community 7. A tanoak and Douglas-fir dominated plant community could develop temporarily following fire or block harvesting, if the disturbance is severe enough. Sprouting tanoak responds vigorously following cutting or burning and initially outgrows any Douglas-fir that becomes established. 7a) Infill of Douglas-fir may occur at the time of disturbance, or residual trees may seed following fire. Over time Douglas-fir will overtop the tanoak and dominate the canopy. See PC#6.

State 8
Native perennial grasses and forbs

Community 8.1
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 brackenfern (*Pteridium aquilinum*) was a common native forb. 1a) Regular burning of prairies by Native Americans stimulated the growth of grasses and eliminated invading shrubs and trees. Native perennial grasslands are favored by periodic burning. 1b) Uncontrolled grazing may have led to domination of introduced annual grasses and forbs. See PC#3. 1c) With European settlement in the mid-1800s, the use of fire largely ceased. Seeding of introduced perennials was practiced in the Bald Hills area. Uncontrolled grazing of domestic livestock may have also contributed to an increase in annual grasses and forbs (Heady, 1977). Introduced perennials and annuals have out-competed native grasses and dominated the plant community in some areas (Murphy and Ehrlich, 1989). See PC#2.

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

Hydrological functions

Runoff class is medium to high.

Hydrologic groups:

Airstrip 480 --C
Airstrip 481 --B
Countshill 480 --C
Countshill 481 --C
Dolason 480 --B
Dolason 481 --C

Recreational uses

Recreational use and development may be limited by slopes and the amount of rock fragment.

Wood products

No wood products are available on this site.

Other products

Cultural material and food gathering still occurs in some areas of the prairies.

Inventory data references

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

Component and Pedon#

Airstrip
03-039
03-052
78-02
03-072p

Countshill
03-031
83-03
78-02
03-045
03-211p
03-21

Dolason
03-013
78-008
78-009
03-057
89-009
03-212
06-018

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Contributors

Judy Welles

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:

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

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

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

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:**

17. **Perennial plant reproductive capability:**