



United States Department of Agriculture



Soil & Plant Science  
Division

Natural  
Resources  
Conservation  
Service



# Using BIOS Data for Ecological Sites, STMs, & Rangeland Health Data Development

10/02/2020 | Kendra Moseley, Regional Ecologist, SPSP, NRCS

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# Ecological Sites vs. Ecological Site Descriptions (ESD)

**Ecological Site** – A distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation and in its ability to respond similarly to management actions and natural disturbances.

- *In other words, a kind of land with similar potential and response to management.*

**ESD** – Is the report that characterizes and documents the ecological site concepts synthesizing the existing knowledge, research and associated data of an ecological site (including its climate, soils, hydrology and state-and-transition model) and the interpretation of its characteristics in relation to land use planning and decision-making.



USDA Natural Resources Conservation Service

## Ecological site R021X1005CA Gravelly Loam

Accessed: 03/25/2020

### 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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Herbaceous	(1) <i>Festuca idahoensis</i> (2) <i>Achnatherum</i>

### Physiographic features

This site typically occurs on footslopes and backslopes of hills and mountains throughout Modoc, Lassen, and parts of Shasta counties in Northeastern California.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Elevation	5,300–6,200 ft
Slope	5–30%
Aspect	Aspect is not a significant factor

### Climatic features

The climate is semiarid with cold, moist winters and warm, dry summers. The mean annual precipitation is 12 to 16 inches including about 20 to 40 inches of snow. The mean annual temperature is 44 to 47 degrees F., the mean July temperature is about 62 degrees F., and the mean January temperature is about 24 degrees F. The frost-free period is 80 to 80 days.

Mean monthly precipitation is presented in the maximum precipitation row. Monthly precipitation and temperature are 1971–2000 means from the PRISM Group, Oregon Climate Service, Oregon State University, Corvallis, Oregon (Daly 2006). Frost free period and mean annual precipitation

obtained from map unit descriptions (Modoc National Forest Soil Survey).

Table 3. Representative climatic features

Frost-free period (average)	80 days
Freeze-free period (average)	0 days
Precipitation total (average)	16 in

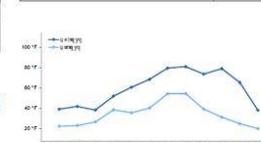


Figure 1. Monthly average minimum and maximum temperature

### Influencing water features

Intermittent streams feeding into permanent higher order streams drain this site.

### Soil features

This site is characterized by moderately deep loam soils weathered from volcanic rock, particularly andesite. Soils are often gravelly at the surface and sometimes throughout the profile. Depth to bedrock is about 20 to 40 inches. These soils are generally well drained. Available water holding capacity is approximately 3 inches. Permeability is moderate.

With 20 to 40 inches of soil, elevation of 5300 to 6200 feet and rainfall of 12 to 16 inches this site differs from the other sites in MLRA 21 because of its very high herbaceous productivity (average = 2000 lb). Unlike most other sites the soils on this site support *Ceanothus* spp. in the shrub layer.

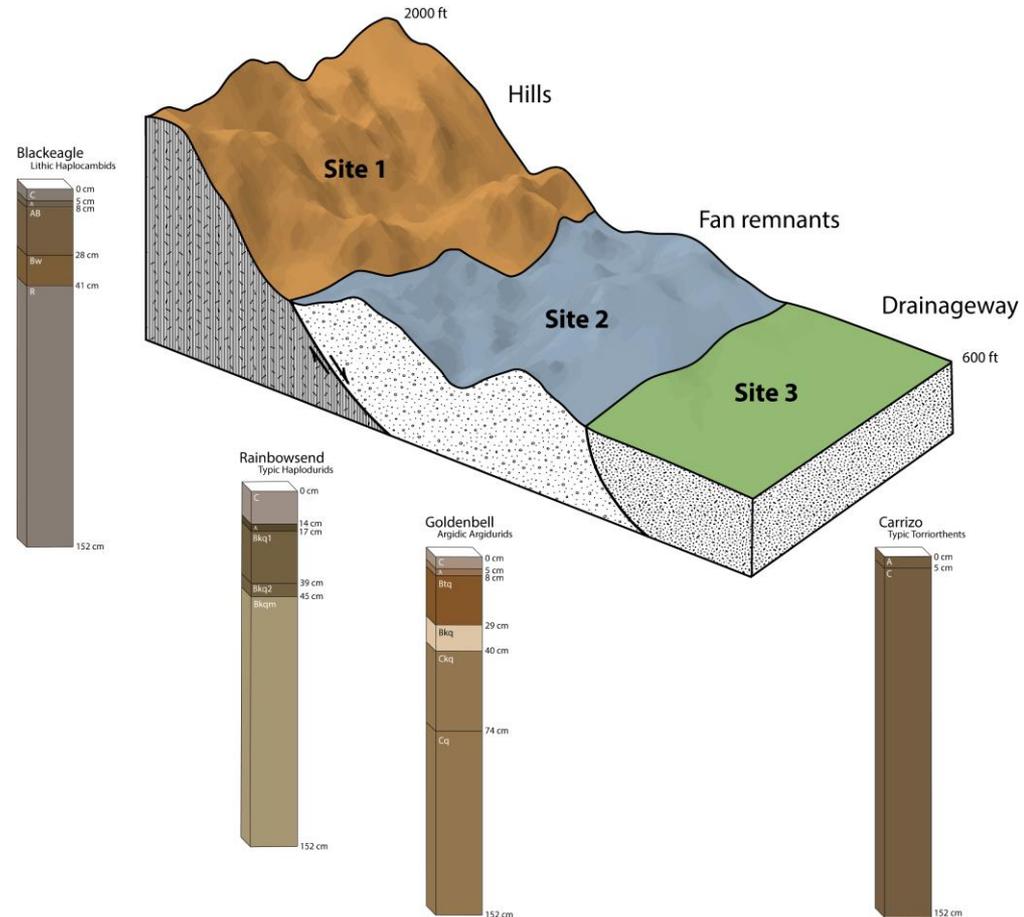


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# The Purpose/Function of Ecological Sites and ESDs

1. Stratify the landscape according to varying ecological potential in order to identify management and restoration targets
2. Assess the risk of persistent degradation and take proactive measures to avoid it
3. Specify constraints to, and opportunities for, desired ecosystem change based on a knowledge of ecological processes
4. Identify specific intervention strategies that can promote desired conditions
5. Design and interpret monitoring based on interventions and expected responses.



# Ecological Site Relationships Across the Landscape

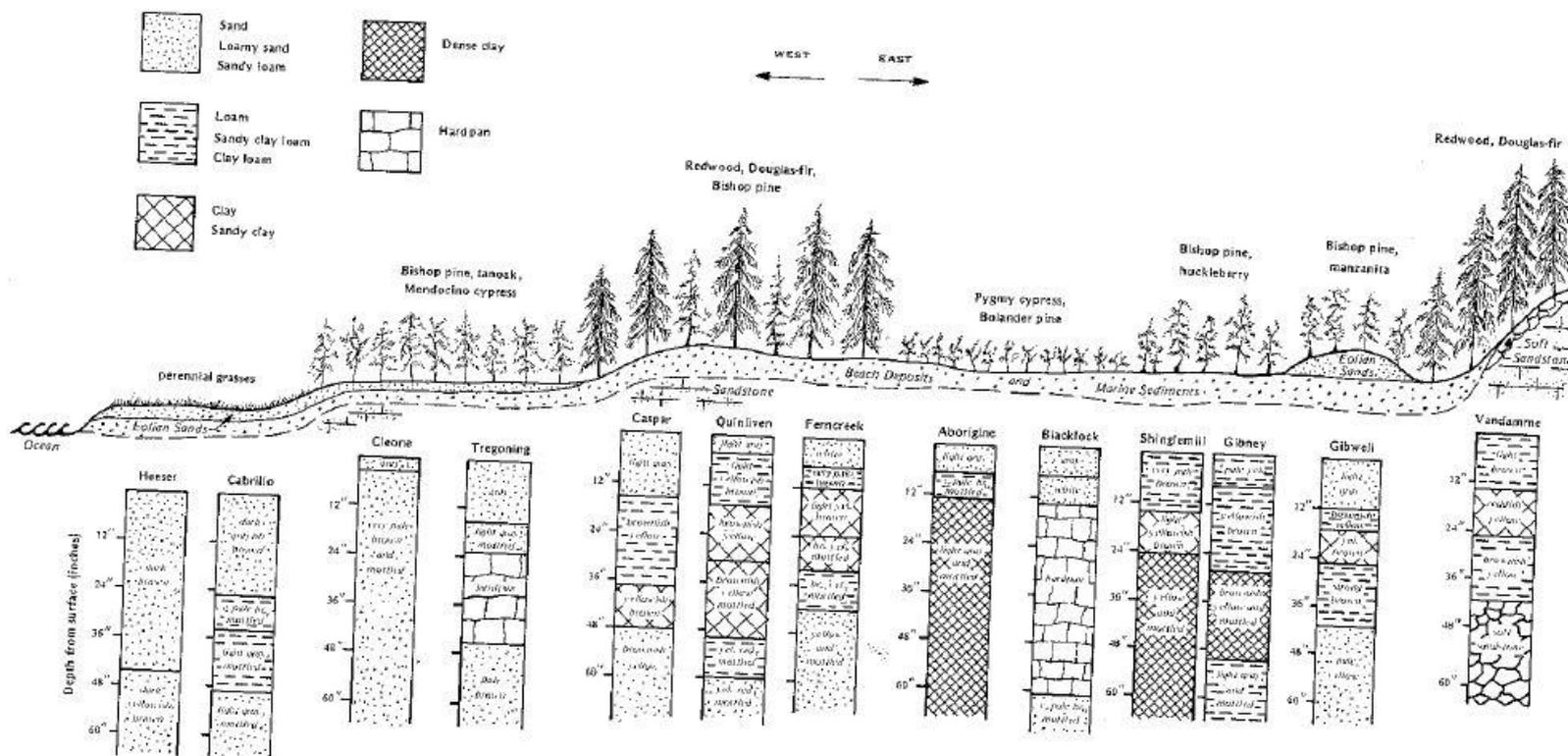
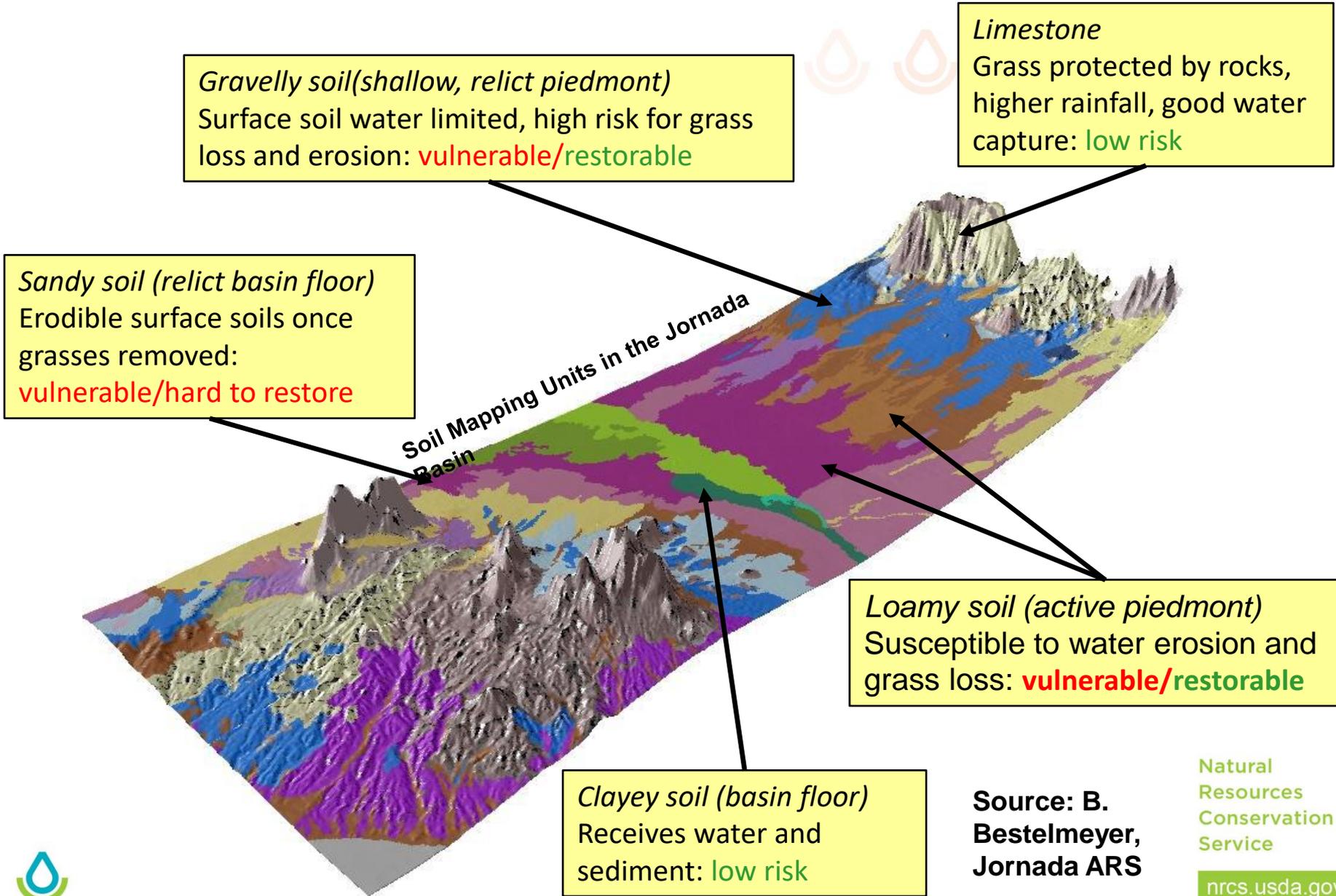


Figure 10.—Idealized illustration of the general relationships among marine terrace soils. This simplified cross-section is typical of the marine terraces near the town of Caspar. The width of the terrace system, from the ocean on the west to the mountainous uplands on the east, is approximately 4 miles at this location. Other cross-sections of the terrace system would reveal different combinations of soils. The upper terrace in this diagram represents perhaps three or more terrace levels. The diagram is not to scale.





**Source: B. Bestelmeyer, Jornada ARS**





Site 1



Site 2

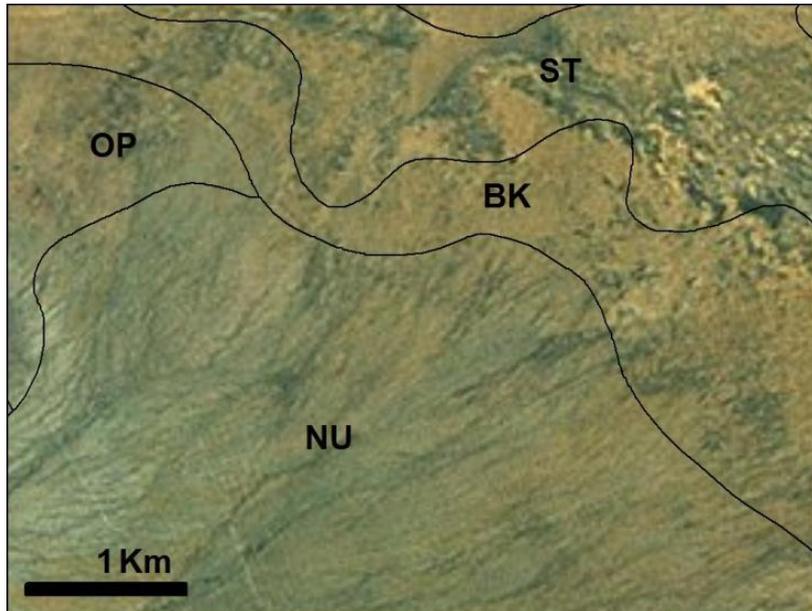


Ecological sites concepts developed based on relationship of soil profiles to soil processes and vegetation pattern



# Ecological Sites are Correlated to Soil Components

Ecological sites classify soil map unit components (soil series phases) of the US National Cooperative Soil Survey



**Map unit/components = Ecological site**

**ST: Stellar association**

40% Stellar clay loam, 0-3% slopes = *Clayey*  
40% Stellar clay loam, 0-3% slopes, flooded = *Bottomland*  
20% other inclusions

**BK: Berino-Dona Ana association**

50% Berino fine sandy loam, 1-5 % slopes = *Sandy*  
30% Dona Ana fine sandy loam, 1-5% slopes = *Sandy*  
20% other inclusions

**OP: Onite-Pajarito association**

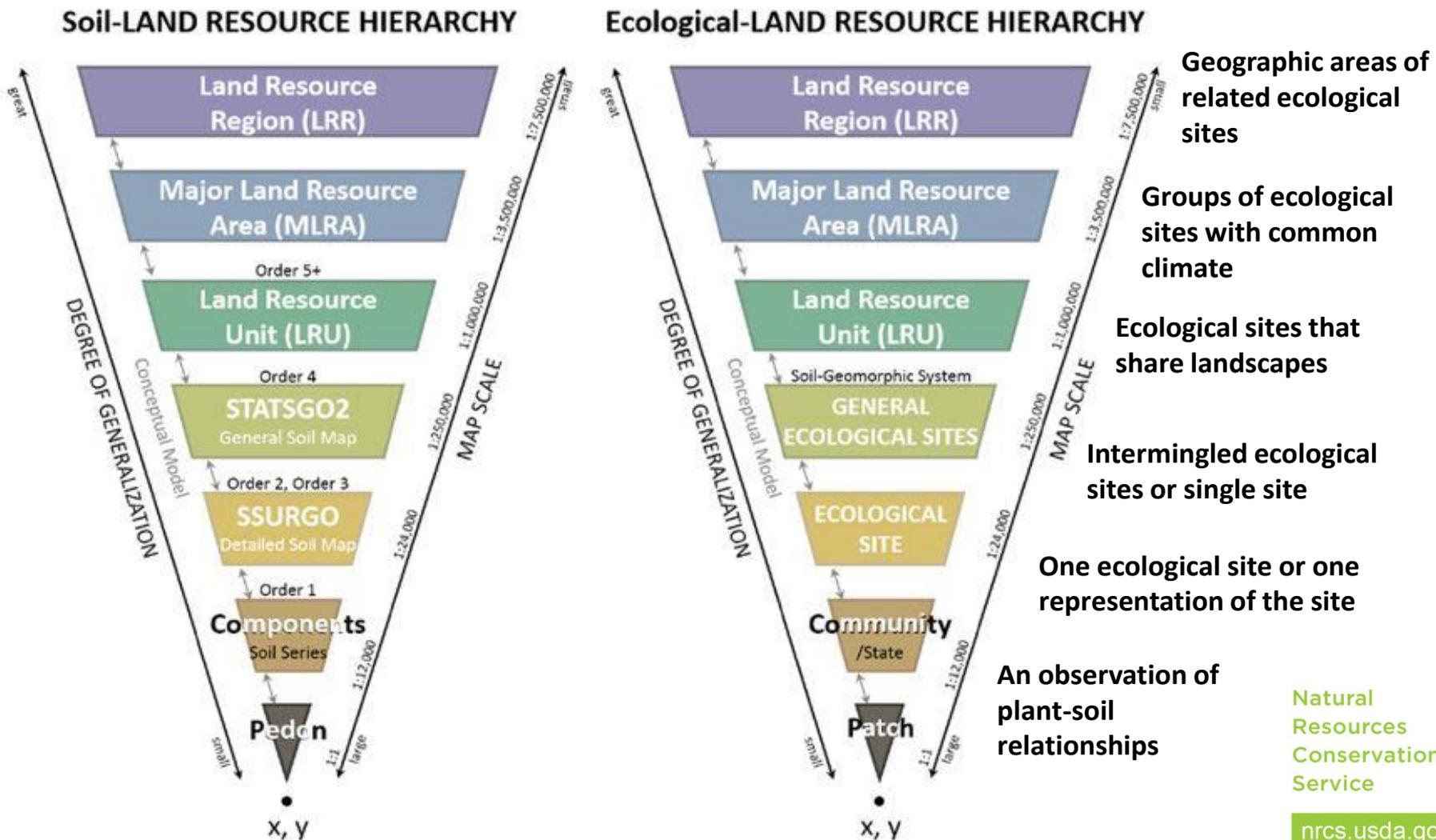
40% Onite loamy sand, 1-4% slopes = *Sandy*  
30% Pajarito fine sandy loam, 0-5% slopes = *Sandy*  
15% Pintura fine sand, 0-5% slopes = *Deep sandy*  
15% other inclusions

*A soil map unit can contain more than one ecological site*

*An ecological site groups several similar soil map unit components*



# Nesting Ecological Sites into Landscape Framework

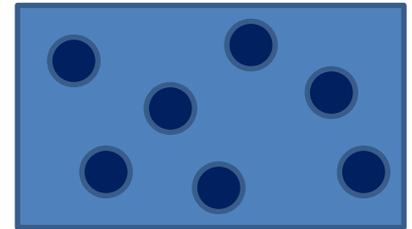
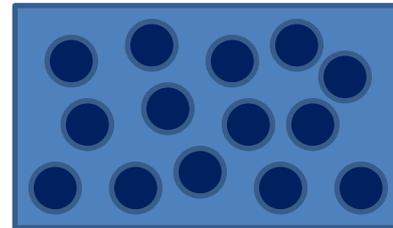
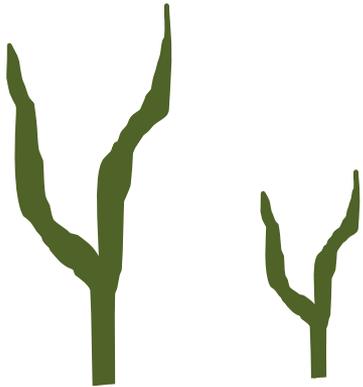


# How Ecological Sites are Differentiated

- Significant differences in the species that are in the characteristic community phase



- Significant differences in the relative proportion of species in the characteristic community phase



- Significant differences in the total annual production of the characteristic community phase

# State-and-Transition Models (STMs)

## A diagram and description of the ecological site community dynamics

- ✓ Discrete community states and phases
- ✓ Transitions indicating change from one community phase or state to another community phase or state
- ✓ Thresholds which indicate the difference between states



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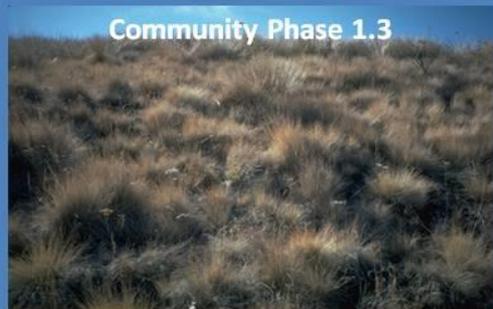
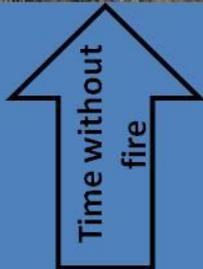
### Reference State



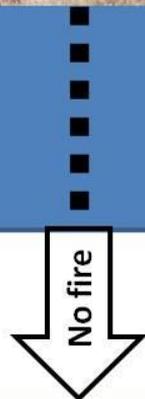
Community Phase 1.1



Community Phase 1.2



Community Phase 1.3



### State 2



Community Phase 2.1

Transitions



### State 3



Community Phase 3.1

Reference state

Illustrates management and restoration potentials

**Ecological Site Descriptions help describe the changes from the reference state to alternative states, based on biotic and abiotic structure and function changes**



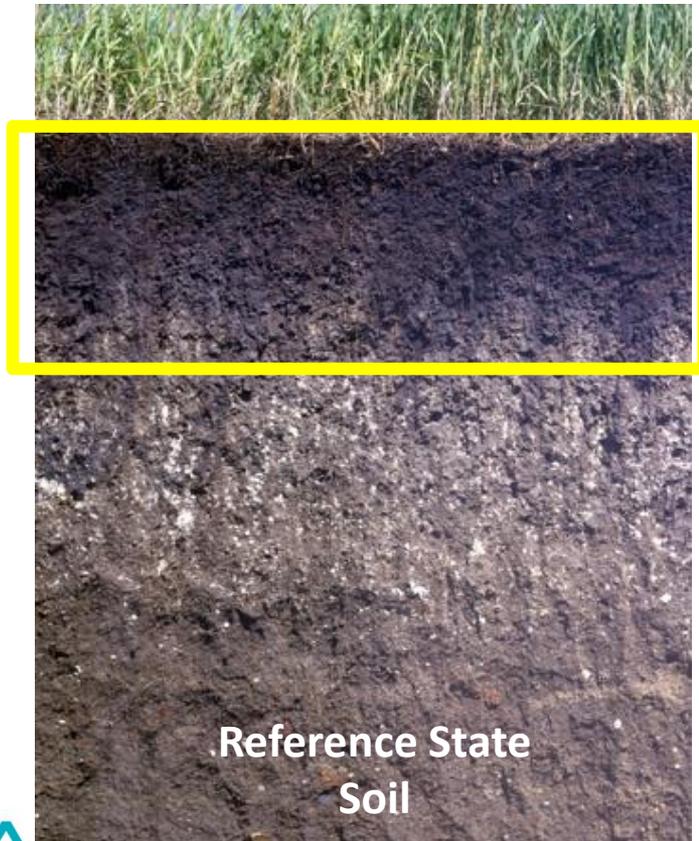
**State 2**

**State 1**

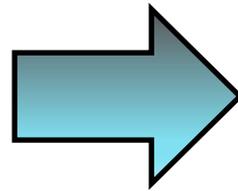


# State-and-Transition Models (STMs)

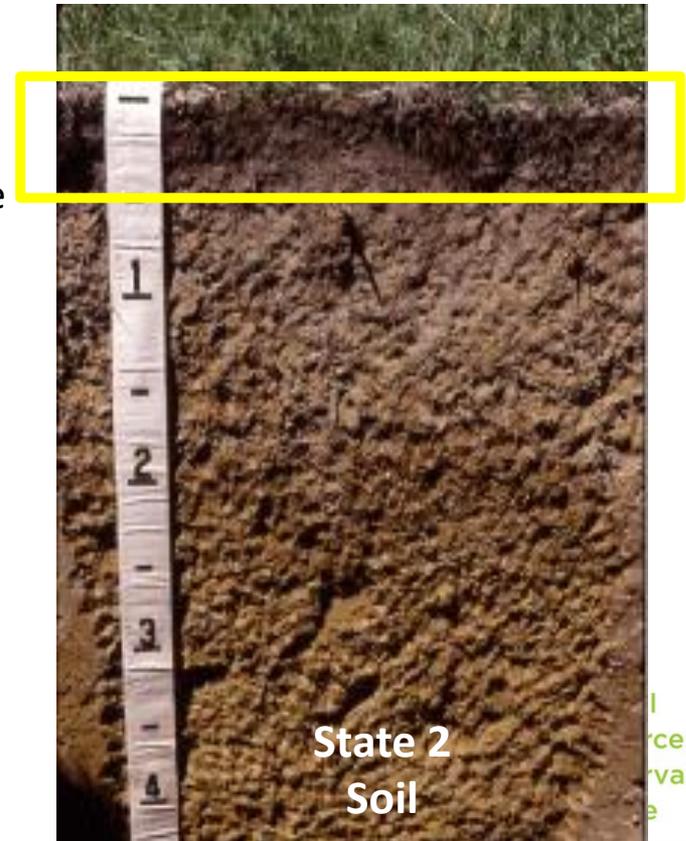
Ecological sites and their STMs describe the soils properties typical of the reference communities, as well as the soil changes possible due to disturbance/management



Reference State  
Soil



- Decreased surface soil stability
- Increased soil erosion potential
- Loss of Organic Matter
- Decreased infiltration
- Increased bulk density
- Decreased porosity

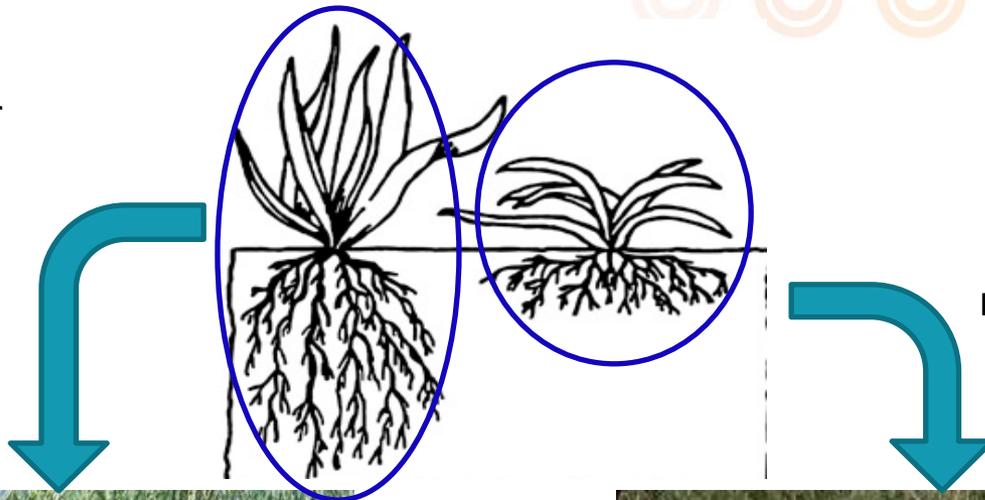


State 2  
Soil



# Ecological Site Vegetation Information

Ecological sites and their STMs describe the vegetation structure & cover typical of the reference communities



As well as changes possible due to disturbance/management in the alternative states

Perennial grass dominant  
Deep, fibrous roots  
No bareground  
1500 lbs/acre



Transition



Annual grass dominant  
Shallow, fibrous roots  
1.5 ft bareground patches  
500 lbs/acre

# Ecological Site Data Collection Strategy

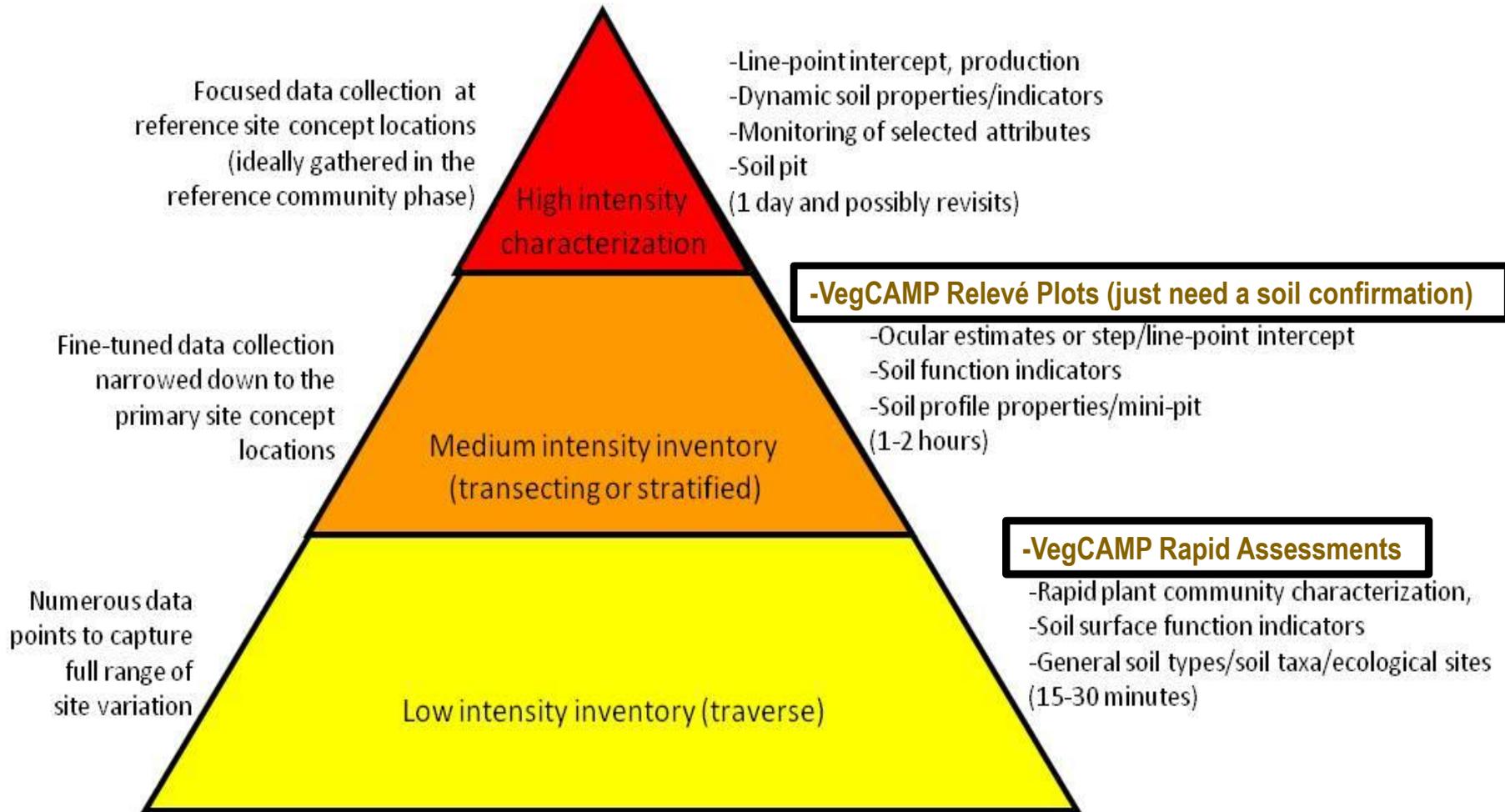


Table 6. Ground cover

Tree foliar cover	0-75%
Shrub/vine/liana foliar cover	0-20%
Grass/grasslike foliar cover	10-40%
Forb foliar cover	0-20%
Non-vascular plants	0%
Biological crusts	0%
Litter	0-20%
Surface fragments >0.25" and <=3"	0%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	-	-	-	-
>0.5 <= 1	-	-	10-40%	0-20%
>1 <= 2	-	-	-	-
>2 <= 4.5	-	0-20%	-	-
>4.5 <= 13	-	-	-	-
>13 <= 40	0-75%	-	-	-

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1				1949–2508	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	189–308	-
2				409–748	
	pullup muhly	MUFI2	<i>Muhlenbergia filiformis</i>	220–440	-
	meadow barley	HOBR2	<i>Hordeum brachyantherum</i>	189–308	-
3				818–1496	
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	220–440	-
				220–440	-
				189–308	-

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Elevation	5,300–6,200 ft
Slope	5–30%
Aspect	Aspect is not a significant factor

- ✓ Site Characteristics
- ✓ Stand structure and age classes
- ✓ Cover % and species lists

### Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 27, 2017 for the Lassen-Modoc project)



For Office Use:	Final database #:	Final vegetation type:	Alliance Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or RA
Database #:	Date:	Name of recorder:	
		Other surveyors:	
Allocation UID:		Location Name:	
GPS name:	For Relevé only: Bearing°, left axis at ID point ___ of Long / Short side		
UTME	UTMN	Zone: 10 NAD83 GPS error: ft./ m./ PDOP	
Decimal degrees: LAT		LONG	
GPS within stand? Yes / No If No, cite from GPS to stand: distance (m) ___ bearing ° ___ inclination ° ___			
and record: Base point ID ___ Projected UTM: UTME ___ UTMN ___			

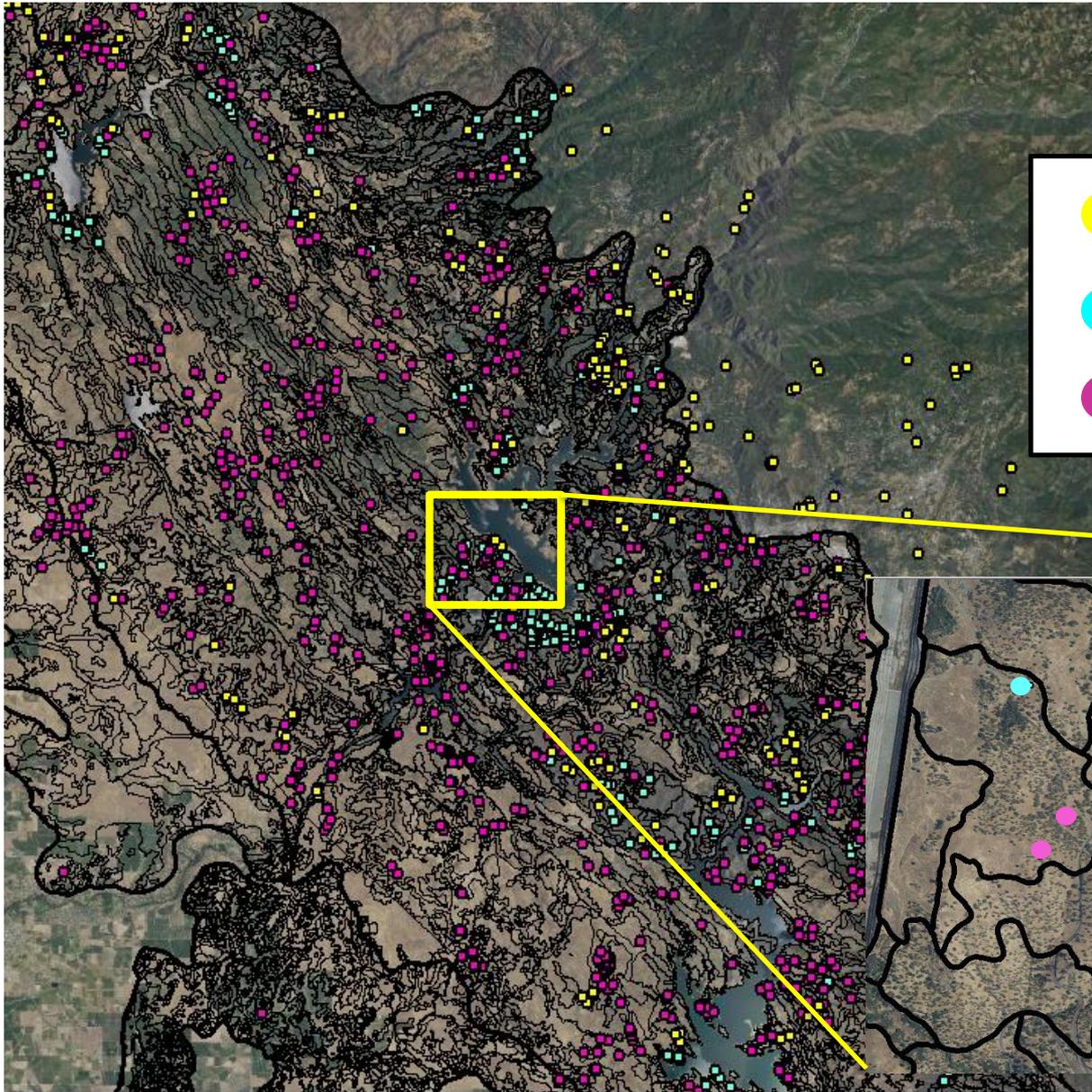
- ✓ Site Characteristics
- ✓ Stand structure and age classes
- ✓ Cover % and species lists

Camera Name:	Cardinal photos at ID point:
Other photos:	
Stand Size (acres): <1, 1-5, >5   Plot Size (m²): 100 / ___   1	
Exposure, Actual %: ___ NE NW SE SW Flat Variable   Ste	
Topography: Macro: top upper mid lower bottom   Mi	
Geology code: ___ Soil Texture code: ___	
Restoration code: 1-None obvious 2-Jumper removal 3-Grass/forbs seeding	
% Surface cover: ___ (Incl. outcrops) (>60cm diam) (<25cm diam)	
% C	
Fire	
Site 1	

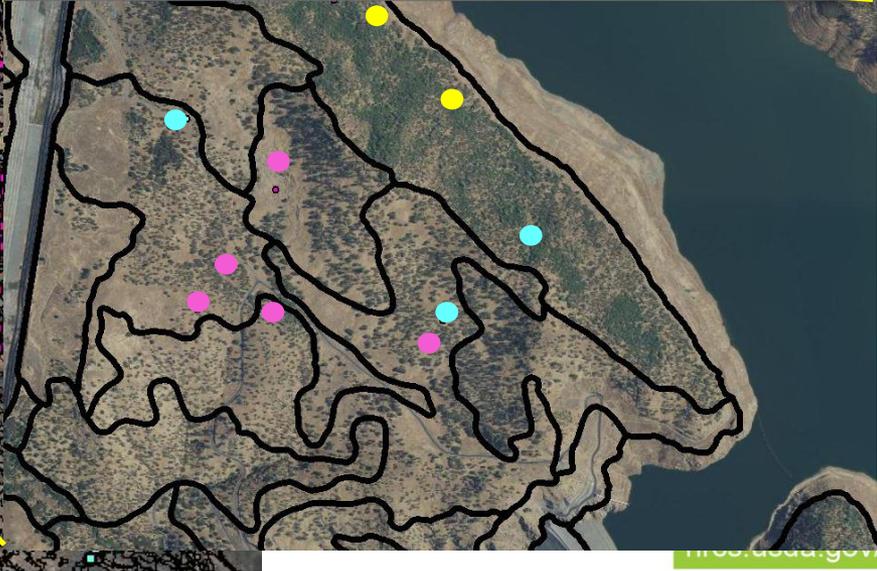
Disturbance code / Intensity (L,M,H): ___ / ___ / ___ "Other" ___
II. HABITAT DESCRIPTION
Tree DBH: <u>T1</u> (<1" dbh), <u>T2</u> (1-6" dbh), <u>T3</u> (6-11" dbh), <u>T4</u> (11-24" dbh), <u>T5</u> (>24" dbh), <u>T6</u> multi-layered (T3 or T4 layer under T5. >60% cover)
Shrub: <u>S1</u> seedling (<3 yr. old), <u>S2</u> young (<1% dead), <u>S3</u> mature (1-25% dead), <u>S4</u> decadent (>25% dead)
Herbaceous: <u>H1</u> (<12" plant ht.), <u>H2</u> (>12" ht.)
III. INTERPRETATION OF STAND
Field-assessed vegetation Alliance name: _____
Field-assessed Association name (optional): _____
Adjacent Alliances/direction: _____ / _____ / _____
Confidence in Alliance identification: L M H Explain: _____
Phenology (E,P,L): Herb Shrub Tree Other identification or mapping information: _____

IV. VEGETATION DESCRIPTION				
% Cover - Conifer tree / Hardwood tree				
Height Class - Conifer tree / Hardwood tree: ___ / ___ Regenerating Tree: ___ Shrub: ___ Herbaceous: ___				
Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m				
Stratum categories: T=Tree, A=SApling, E=SEedling, S=Shrub, H=Herb, N=Non-vascular				
% Cover Intervals for reference: r=trace, +=<1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%				
Stratum	Species	% cover	C	Final species determination





-  Ecological Site  
Vegetation Plot Data
-  BIOS Vegetation Plot Data
-  Soils Point Data



## Identify

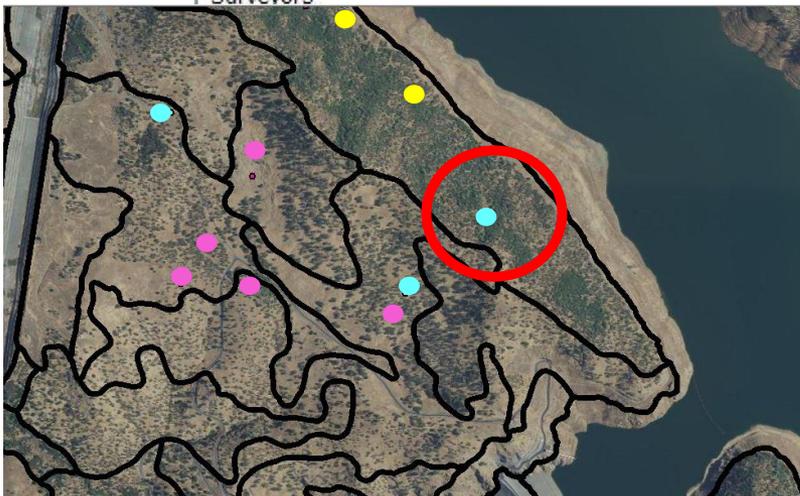
 Identify from: <Top-most layer>

- [-] MLRA18\_VegeClip\_wMUpoly\_ALL
  - [-] Loafercreek-Gopheridge complex, 15 to 30 percent slopes

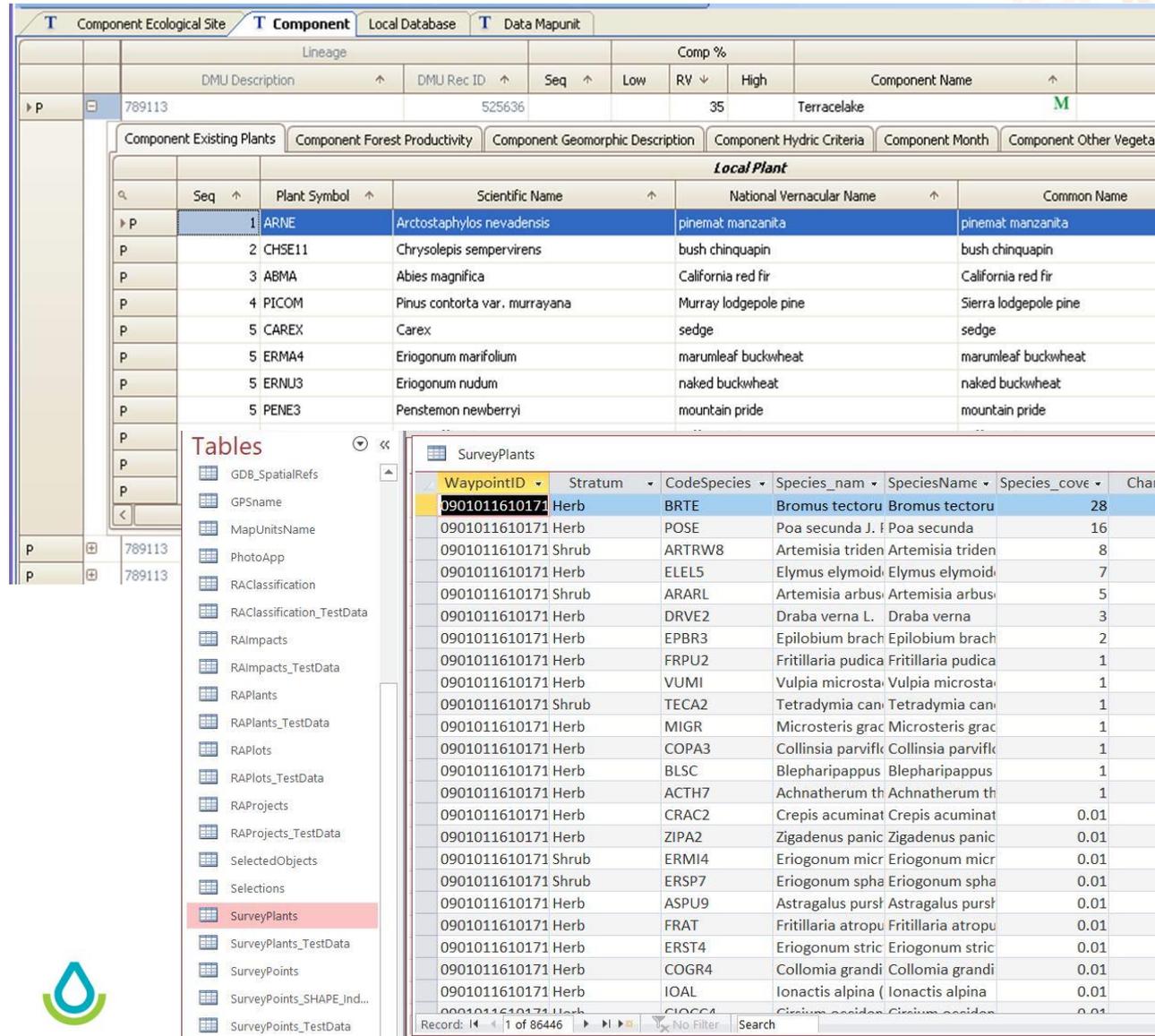
 Location: -46,547.107 -6,573.434 Meters

Field	Value
MUSYM	7086
MUKEY	2440240
Mapunit Name	Loafercreek-Gopheridge complex, 15 to 30 percent slopes
National MU Symbol	2mx8f
FID_MLRA18_CNPSVegePtsClip_MLRA18_Vege_PedonPlots_pointdistance1500ft_MLRA18_PedonClip	2852
WyptID	SNFN0215
SurveyType	Releve
SurveyDate	5/24/2005
Surveyors	*JT, AM

SNFN0215
Releve
5/24/2005
*JT, AM
177
SNFN0215
Quercus douglasii / Bromus spp. – Daucus pusillus
Association



# NASIS (National Soils Information System) – NRCS ES Database



The screenshot displays the NASIS software interface. At the top, there are tabs for 'Component Ecological Site', 'Component', 'Local Database', and 'Data Mapunit'. Below these, a 'Lineage' section shows 'DMU Description' as 789113, 'DMU Rec ID' as 525636, 'Comp %' as 35, and 'Component Name' as Terracelake. A 'Local Plant' table is visible, listing plants with columns for Seq, Plant Symbol, Scientific Name, National Vernacular Name, and Common Name. Below this, a 'Tables' sidebar lists various database tables, with 'SurveyPlants' selected. The 'SurveyPlants' table is shown with columns: WaypointID, Stratum, CodeSpecies, Species\_nam, SpeciesName, Species\_cove, Changed, Notes, Collection, CurrPlantsSyr, and OBJECTID. The table contains 24 rows of data, with the first row highlighted in yellow.

WaypointID	Stratum	CodeSpecies	Species_nam	SpeciesName	Species_cove	Changed	Notes	Collection	CurrPlantsSyr	OBJECTID
0901011610171	Herb	BRTE	Bromus tectoru	Bromus tectoru	28	0			BRTE	1
0901011610171	Herb	POSE	Poa secunda J. F	Poa secunda	16	0			POSE	2
0901011610171	Shrub	ARTRW8	Artemisia triden	Artemisia triden	8	0			ARTRW8	3
0901011610171	Herb	ELEL5	Elymus elymoid	Elymus elymoid	7	0			ELEL5	4
0901011610171	Shrub	ARARL	Artemisia arbus	Artemisia arbus	5	0			ARARL	5
0901011610171	Herb	DRVE2	Draba verna L.	Draba verna	3	0			DRVE2	6
0901011610171	Herb	EPBR3	Epilobium brach	Epilobium brach	2	0			EPBR3	7
0901011610171	Herb	FRPU2	Fritillaria pudica	Fritillaria pudica	1	0			FRPU2	8
0901011610171	Herb	VUMI	Vulpia microsta	Vulpia microsta	1	0			VUMI	9
0901011610171	Shrub	TECA2	Tetradymia can	Tetradymia can	1	0			TECA2	10
0901011610171	Herb	MIGR	Microsteris grac	Microsteris grac	1	0			MIGR	11
0901011610171	Herb	COPA3	Collinsia parvifl	Collinsia parvifl	1	0			COPA3	12
0901011610171	Herb	BLSC	Blepharipappus	Blepharipappus	1	0			BLSC	13
0901011610171	Herb	ACTH7	Achnatherum th	Achnatherum th	1	0			ACTH7	14
0901011610171	Herb	CRAC2	Crepis acuminat	Crepis acuminat	0.01	0			CRAC2	15
0901011610171	Herb	ZIPA2	Zigadenus panic	Zigadenus panic	0.01	0			ZIPA2	16
0901011610171	Shrub	ERMI4	Eriogonum micr	Eriogonum micr	0.01	0			ERMI4	17
0901011610171	Shrub	ERSP7	Eriogonum spha	Eriogonum spha	0.01	0			ERSP7	18
0901011610171	Herb	ASPU9	Astragalus pursl	Astragalus pursl	0.01	0			ASPU9	19
0901011610171	Herb	FRAT	Fritillaria atropu	Fritillaria atropu	0.01	0			FRAT	20
0901011610171	Herb	ERST4	Eriogonum stric	Eriogonum stric	0.01	0			ERST4	21
0901011610171	Herb	COGR4	Collomia grand	Collomia grand	0.01	0			COGR4	22
0901011610171	Herb	IOAL	Ionactis alpina	Ionactis alpina	0.01	0			IOAL	23
0901011610171	Herb	CIOPCA	Cirsium acida	Cirsium acida	0.01	0			CIOPCA	24

All individual plot data should be entered into a database that can be queried.

VegCAMP Access Database



# Information in ESD

## Ecological dynamics

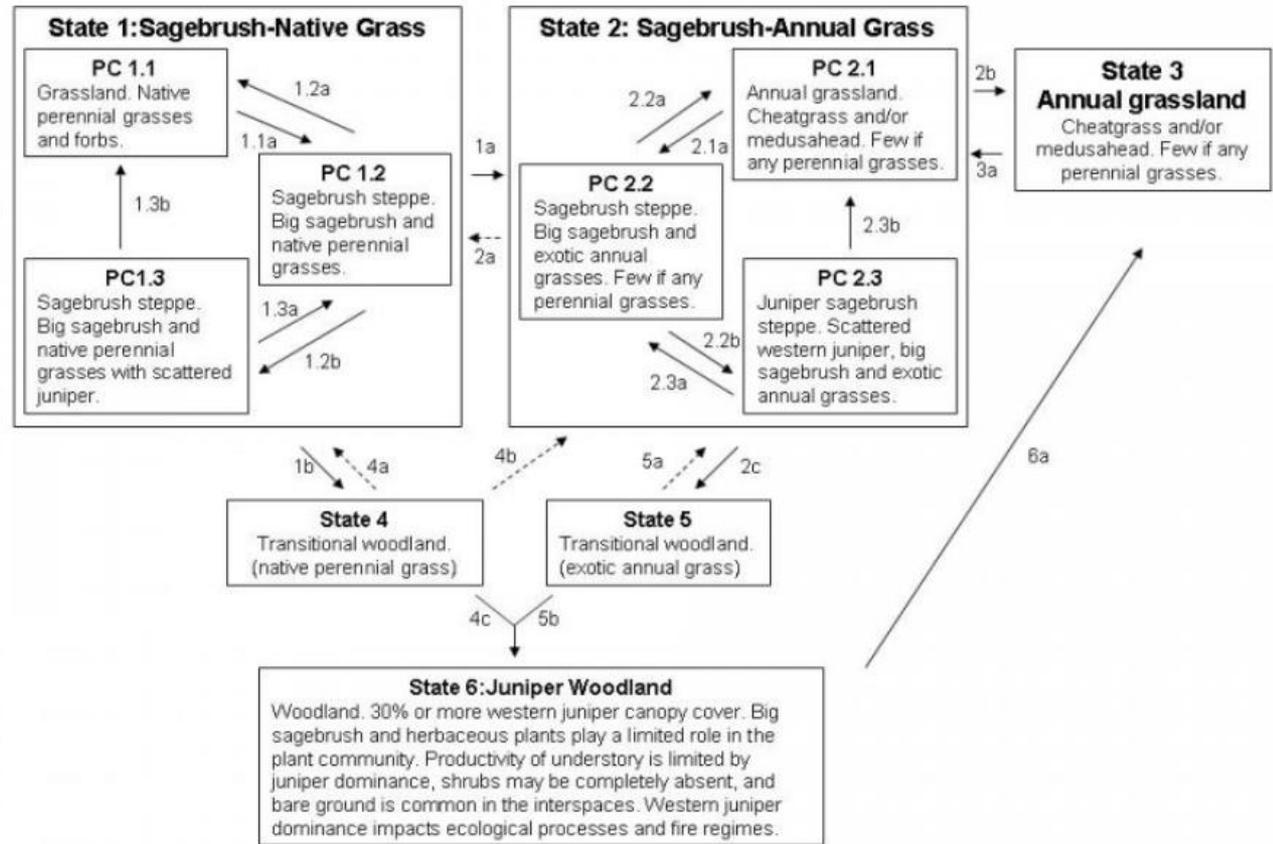
The historic natural plant community is dominated mountain big sagebrush (*Artemisia tridentata* ssp. *vasey*) and perennial grasses. The vegetation states for ecological site range from open grassland to sageb steppe with a few, scattered western junipers (*Junip occidentalis* ssp. *occidentalis*). The distribution of vegeta states is influenced by soils, topography, and fire his Grassland and sagebrush steppe patches occur togeth a mosaic. The reference state for this ecological sit similar to its pre-European state; however, expansio western juniper and invasion of exotic annual grasses forbs since the late 1800s has resulted in transitions to c states.

The shrub layer of this ecological site is typically domin by mountain big sagebrush intermixed with pere bunchgrasses, and often contains a rich variety of fo Antelope bitterbrush (*Purshia tridentata*) and occasio other shrubs such as a variety of ceanothus (*Ceano spp.*) and rabbitbrush (*Chrysothamnus spp*) may be pre Historically herbaceous vegetation and grassland pat were dominated by Idaho fescue (*Festuca idahoensis*) needlegrass (*Achnatherum spp.*) but grazing and curre disturbances hav

bluegrass (*Poa* Western Juniper Expansion

Prior to European settlement, western juniper was found primarily in places where fire was restricted - on rock outcrops, rocky ridges, and shallow, rocky or heavy clay soils with very low productivity. As a result of fire suppression and early grazing practices that began in the late 1800s, western juniper has been increasing in density and expanding its range into adjacent sagebrush steppe.

Conversion to western juniper woodland threatens to degrade sagebrush steppe ecosystems because it can reduce the quantity and quality of forage, accelerate soil



## Invasion by Exotic Grasses

An estimated 3 million acres in the Western United States have become dominated by invasive grasses such as cheatgrass (*Bromus tectorum*) or medusahead (*Taeniatherum caput-medusae*) (West, 1999). Unfortunately these grasses are capable of invading disturbed and undisturbed rangelands. Warmer and drier sites, sites at lower elevations (below 5000 ft) that have south-facing or west-facing aspects, have experienced disturbance such as fire or heavy grazing, or are in close proximity to roads may be more susceptible to invasion by exotic annual grasses.



***Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Association****Common Name:** Mountain Sagebrush / Blue Fescue**NVC Association Code:** CEGL001533, *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrub Grassland**Alliance:** *Artemisia tridentata* ssp. *vaseyana* Alliance**Association Concept**

The *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Association forms open to interm and herbaceous layers. The emergent tree layer is typically sparse to open. The association primarily from midslopes to ridge summits at all aspects. Soils are derived from a variety of: primarily general volcanic extrusives, andesite, or igneous, and textures are widely variable range from approximately 1292 to 2384 meters. *Artemisia tridentata* ssp. *vaseyana* is the cl shrub. Characteristic herbs include *Festuca idahoensis* and *Poa secunda*, and those often  $\{$  *Bromus tectorum* and *Elymus elymoides*.

**Diagnostic Criteria:** This association is characterized by an open to intermittent shrub layer *tridentata* ssp. *vaseyana* with an open to intermittent herbaceous layer of *Festuca idahoensis* shrub cover ranges from 8 to 49 percent.

**Vegetation Description**

**Vegetation Structure:** The Alliance forms a sparse to intermittent shrub layer, and the overall shrub cover ranges from 2 to 60 percent. The tree layer is typically sparse, and the herbaceous layer is sparse to intermittent.

**Vegetation Floristics:** *Artemisia tridentata* is the dominant and characteristic shrub. Stands sometimes have sparse, emergent *Juniperus occidentalis* in the tree Local Alliance Distribution *Bromus tectorum* and *Elymus elymoides*, and often incl

**Dynamics:** *Artemisia tridentata***Species of Interest:** *Astragalus agrestis*, *Balsamorhiza elegantulus*, *Lupinus nevadensis*, and *Polygala subspin***Local Alliance Distribution**

**Modoc Plateau:** Adin Mountains and Valleys (M261Gf), Bald Mountain - Dixie Valley (M261Gj), Crowder Flat (M261Gc), Devil's Garden (M261Gb), Eagle Lake - Observation Peak (M261Gm), Horsehead Mountain (M261Gk), Likely Mountain (M261Gi), Likely Tableland (M261Gh), Lower Klamath - Tule Lake Basins (M261Ga), Pit River Valley (M261Gg)

**Northwestern Basin and Range:** Medicine Lake Lava Flows (M261Dh)**Southern Cascades:** Medicine Lake Lava Flows (M261Dh)**Associations***Artemisia tridentata* Association*Artemisia tridentata* – (*Ericameria nauseosa*) / *Bromus tectorum* Association*Artemisia tridentata* – *Ephedra viridis* / *Pseudoroegneria spicata* Provisional Association*Artemisia tridentata* / *Distichlis spicata* Provisional Association**Reports*****Artemisia tridentata* – (*Ericameria nauseosa*) / *Bromus tectorum* Association****Common Name:** Big Sagebrush – (Rabbitbrush) / Cheatgrass**NVC Association Code:** CEGL002699, *Artemisia tridentata* - (*Ericameria nauseosa*) / *Bromus tectorum* Ruderal Shrubland**Alliance:** *Artemisia tridentata* Alliance**Association Concept**

The *Artemisia tridentata* – (*Ericameria nauseosa*) / *Bromus tectorum* Association forms an open to intermittent shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to intermittent. The association is found primarily on bottoms, slopes, and ridgetops at all aspects. Soils are derived from a variety of substrates but primarily basalt, general volcanic extrusives, or igneous and textures are widely variable. Elevations range from approximately 1225 to 1751 meters. Dominant and characteristic shrubs include *Artemisia tridentata* and *Ericameria nauseosa*. The dominant and characteristic herb is *Bromus tectorum*, and *Elymus elymoides* is often present.

**Diagnostic Criteria:** This association is characterized by an open to intermittent shrub layer of *Artemisia tridentata* and *Ericameria nauseosa*. The overall shrub cover ranges from 5 to 41 percent.



# Reference State

**Community Phase 1.1**  
Mountain sagebrush/Idaho fescue-Bluebunch wheatgrass

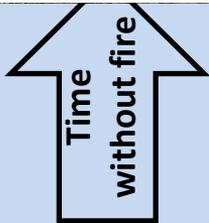
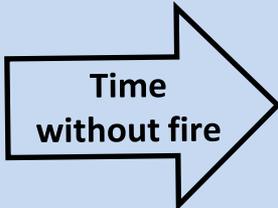


Artemisia tridentata ssp. vaseyana / Festuca idahoensis Association

**Community Phase 1.2**  
Mountain sagebrush/Idaho fescue-Bluebunch wheatgrass/western juniper



Artemisia tridentata ssp. vaseyana / Festuca idahoensis Association



**Community Phase 1.3**  
Idaho fescue-Bluebunch Wheatgrass

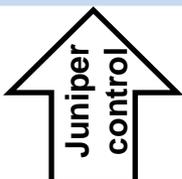
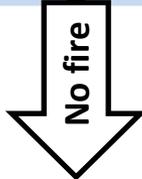


Festuca idahoensis-Pseudoroegneria spicata Association

**State 2**  
Community Phase 2.1



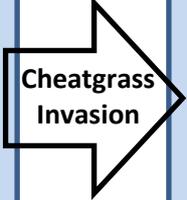
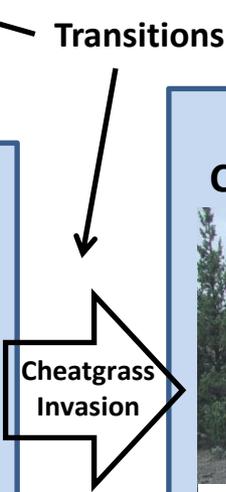
Juniperus occidentalis /Poa secunda – Festuca idahoensis – Pseudoroegneria spicata



**State 3**  
Community Phase 3.1



Juniperus occidentalis /Poa secunda-Festuca idahoensis- Pseudoroegneria spicata



## Reference State – Community Phase 1.1 and 1.2

(1) *Artemisia tridentata* ssp. *vaseyana* is strongly dominant to co-dominant in the shrub layer with *Purshia tridentata*, *Tetradymia canescens*, and/or *Chrysothamnus viscidiflorus*. Emergent *Pinus jeffreyi* and *Juniperus occidentalis* are often present although at low cover. *Festuca idahoensis* is dominant to co-dominant in the herb layer with *Poa secunda*, *Achnatherum thurberianum*, *Pseudoroegneria spicata* and/or *Achillea millefolium*.

*Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Association (n=33)

VegCAMP  
plot data  
informing  
association

## Alternative States – Community Phase 2.1

iv) *Juniperus occidentalis* stands with minimal shrub component (typically <4% absolute cover). Juniper cover is usually greater than 10% and trees are of mixed age classes. Herb layer is sparse to moderate, sometimes with significant cover of non-native grasses such as *Bromus tectorum*. However, native grasses including *Poa secunda*, *Pseudoroegneria spicata*, *Festuca idahoensis*, and/or *Achnatherum thurberianum* are characteristic in the herb layer. If shrubs are present, they are patchy and insignificant.

*Juniperus occidentalis* / (*Poa secunda* – *Festuca idahoensis* – *Pseudoroegneria spicata*)  
Association (n=30)



**INTERPRETING INDICATORS OF RANGELAND HEALTH, Version 5, REFERENCE SHEET**

Ecological site name: \_\_\_\_\_ Ecological site code: \_\_\_\_\_  
 Author(s)/participant(s): \_\_\_\_\_  
 Contact for lead author: \_\_\_\_\_  
 Date: \_\_\_\_\_ MLRA: \_\_\_\_\_ LRU: \_\_\_\_\_  
 Composition based on (check one):  Cover  Annual Production  
 Metadata storage location: \_\_\_\_\_

# Rangeland Health Reference Sheets and Matrices

**Indicators.** For each indicator, describe the potential for the site using the reference sheet checklist. Where possible, (1) use quantitative measurements; (2) include expected range of values for above- and below-average years and natural disturbance regimes for each community phase within the reference state; and (3) cite data sources used. Continue descriptions on separate sheet.

- 1. Rills:
- 2. Water flow patterns:
- 3. Pedestals and/or terracettes:
- 4. Bare ground:
- 5. Gullies:
- 6. Wind-scoured and/or depositional areas:
- 7. Litter movement:
- 8. Soil surface resistance to erosion:
- 9. Soil surface loss and degradation:
- 10. Effects of plant community composition and distribution on infiltration:
- 11. Compaction layer:

**12. Functional/structural groups:**

Dominance Category <sup>1</sup>	Relative Dominance of F/S Groups for Community Phases in the Reference State <i>Minimum expected number of species for dominant and subdominant groups is included in parentheses.</i>		
	Dominance based on <sup>1</sup> : Annual Production ___ or Foliar Cover ___		
	Phase 1. ___	Phase 1. ___	Phase 1. ___
Dominant			
Subdominant			
Minor			
Trace			

<sup>1</sup> Biological soil crust dominance is determined based on cover, rather than production. If biological soil crusts are an expected dominant or subdominant group, the number of expected life forms (e.g., lichen, moss) is listed, rather than number of individual species.

- 13. Dead or dying plants or plant parts:
- 14. Litter cover and depth:
- 15. Annual production:
- 16. Invasive plants:
- 17. Vigor with an emphasis on reproductive capability of perennial plants:



# Questions??

