USGS-NPS VEGETATION MAPPING PROGRAM

SEQUOIA AND KINGS CANYON NATIONAL PARKS PHOTO INTERPRETATION REPORT

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FOR

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I. INTRODUCTION

The National Park Service (NPS), in conjunction with the Biological Resources Division (BRD) of the U.S. Geological Survey (USGS), has implemented a vegetation mapping program to develop a uniform hierarchical vegetation methodology at a national level. The program also creates a geographic information system (GIS) database for the parks under its management. The purpose of the data is to document the state of vegetation within the NPS service area, thereby providing a baseline study for further analysis at the Regional or Service-wide level.

Several parks, representing different regions, environmental conditions, and vegetation types, were chosen by BRD to be part of the prototype phase of the program. The initial goal of the prototype phase was to "develop, test, refine, and finalize the standards and protocols" to be used during the production phase of the project. This included the development of a standardized vegetation classification system for each park and the establishment of photo interpretation (PI), field, and accuracy assessment (AA) procedures.

Sequoia and Kings Canyon National Park (SEKI, Park) was selected as a postprototype Inventory and Monitoring Program (IMP) mapping project. SEKI is part of the NPS Western Region and is located in the southern Sierra Nevada range of California. Sequoia National Park (SEQU) was established in September of 1890 and includes the Mineral King Valley and Mt. Whitney within the park boundaries. Kings Canyon National Park (KICA) was officially created in 1940. It absorbed the much smaller General Grant National Park created in 1890 to protect the Grant Grove of giant sequoias and includes backcountry wilderness and the South Fork of the Kings River.

While SEKI is technically composed of two separate national parks, they are managed as one entity. Together they total 865,256 acres. The Park elevations range from 1,300 feet in the Sierra foothills to 14,491 feet atop Mt. Whitney. The vegetation includes riverine woodlands, wetlands, chaparral, hardwood and coniferous forests, meadows, and above-timberline vegetation. The park ecosystems include the full range of montane, subalpine, and alpine environments, including permanent snowfields and glaciers.

Aerial Information Systems (AIS) was subcontracted by Environmental Systems Research Institute (ESRI), the prime contractor, to perform the vegetation photo interpretation and automation for the SEKI project. Staff ecologists at Sequoia and Kings Canyon National Park conducted the field sampling effort to support development of the National Vegetation Classification System (NVCS), to provide feedback for the photo interpreters, and to assess the accuracy of the cartographic map products.

II. TIMELINE OF THE MAPPING EFFORT AT SEKI

<u>2000</u>

July

Color infrared aerial photographs flown of SEKI and environs.

October

AIS received the CIR aerial photographs flown in 2000.

<u>2001</u>

February

AIS received plot data from SEKI:

- Natural Resource Inventory
- Stephenson Gradient Analysis
- Vegetation Mapping (2000)
- Fire Monitoring
- Vankat/Roy
- USGS/BRD reference stand data

April

AIS field reconnaissance trip 1

May

AIS field reconnaissance trip 2

Weislander maps scanned by ESRI and hard copies made for AIS to aid in the mapping process.

June

SEKI Preliminary Mapping Classification Short List created.

Summer

SEKI field crew collected data and answered photo interpreter's questions from preliminary photo interpretation delineations.

July

AIS field reconnaissance trip 3

July – August

Newly commissioned CIR aerial photos flown of SEKI (no environs).

August

AIS field reconnaissance trip 4

September

Received first shipment of July 2001 CIR aerial photos.

<u>2002</u>

June

Received last shipment of July 2001 CIR aerial photos.

Summer

SEKI field crew collected plot data and answered photo interpreter's questions from preliminary photo interpretation delineations.

October

Photo interpretation of the East Fork of the Kaweah (Mineral King) pilot project began.

Fall

SEKI field crew answered photo interpreter's mapping questions for the East Fork pilot area.

<u>2003</u>

January

Automation for the East Fork pilot completed by AIS.

February

Meeting held at AIS to discuss the East Fork pilot accuracy assessment results.

June

Photo interpretation began on SEQU.

Summer

Field crew collected data and answered photo interpreter's mapping questions for SEQU.

July

SEKI field crew conducted a "mini" field reconnaissance with the photo interpreters at SEQU.

SEKI delivered the White Pine Blister Rust report and coverage to AIS to aid in mapping.

September

Photo interpreters and field crew held a face-to-face meeting at AIS to summarize and wrap the 2003 field season.

October

The East Fork pilot was finalized with post AA changes and delivered to the Park.

<u>2004</u>

May

SEQU final coverage delivered to the Park.

Summer

Field crew collected data and answered photo interpreter's mapping questions for KICA.

July

Photo interpretation on KICA began.

September

Photo interpreters and field crew held a face-to-face meeting at AIS to summarize and wrap the 2004 field season.

November

AIS received plot data from SEKI that included:

- Selected plots from KICA that addressed specific questions from the photo interpreters
- SEQU AA plots
- Waypoints from SEQU and KICA

<u>2005</u>

March

AIS received "historical" plot data from SEKI (hand drawn field maps created by the SEKI field crews in the 1990s).

<u>2006</u>

June

Meeting between SEKI ecologist and photo interpreters held at AIS to discuss SEQU AA.

August

KICA final coverage delivered to the Park.

November

Meeting between SEKI ecologist and photo interpreters held at AIS to discuss KICA AA and overall AA for SEKI.

<u>2007</u>

January

The Park delivered the final AA results of SEKI to AIS. The SEKI final coverage delivered along with the AIS Photo Interpretation Report to the Park.

III. VEGETATION MAPPING

Background of the National Park Service Vegetation Mapping Program

One of the most important mandates of the Vegetation Mapping Program (Program) is the consistent capture and classification of vegetation types through mapping and field sampling methods. Mapping criteria and procedures developed in the prototype parks are still being tested and revised.

Two pilot projects mapped by AIS early in the program, Assateague Island National Seashore and Tuzigoot National Monument, used a vegetation layer mapping approach. Layer mapping consists of photo interpretation of multiple canopies of vegetation that are visible on the aerial photography. Canopies are normally defined by the structure of the vegetation (trees, shrubs, or herbaceous growth). Where possible, individual plant species are interpreted for each layer of vegetation. These data layers are then aggregated up into the appropriate alliance or community as defined in the NVCS.

The Program criteria and methodology has since evolved to the methods in use today. Mapping at subsequent parks, including the Scotts Bluff National Monument, Agate Fossil Beds National Monument, Fort Laramie National Historic Site, Rock Creek Park, Isle Royale National Park, Congaree Swamp National Monument, and Yosemite National Park (YOSE) involve mapping an initial photo signature type describing multiple vegetation canopies. These photo signature types are then translated into a NVCS association or alliance. Density and in some cases height and pattern are also assigned to each polygon. In some instances photo interpretive units depict floristic characteristics that may represent more detail than described associations and are retained as phases within a particular association. In other situations, aggregated mapping units are used to address vegetation where an alliance or association is not discernable on the aerial photography.

Photo Interpretation Mapping Criteria

The standard vegetation mapping criteria used for the SEKI project are described in this section.

From the onset of the NPS Vegetation Mapping Program, a standardized programwide mapping criterion (USGS, 2007) has been used. The mapping criterion contains a set of decision rules that are used to ensure accuracy and maintain consistency of vegetation attributes including type, height, and density. This criterion assists the user in understanding the characteristics, definition, and context for each vegetation community.

Minimum Mapping Unit

Established by the NPS Vegetation Mapping Program standard, the minimum mapping unit (mmu) is 1/2 hectare.

Aggregation

Aggregation of multiple vegetative classes is necessary when vegetation types present within a polygon fall below the resolution of the minimum mapping unit of 0.5 ha.

- Like life forms are aggregated together; tree dominated types are aggregated with other tree dominated types, shrub types with other shrub types and herbaceous types with other herbaceous vegetation types.
- If possible, wetland vegetation types generally should not be aggregated with upland types, even if they are in the same life form.
- If a unit that is below minimum mapping resolution is completely surrounded by another vegetation type, the unit is aggregated with the surrounding vegetation.

Density

Density, also referred to as vegetative cover, is a quantitative estimate of plant cover derived from viewing the aerial photography in stereo magnification. Photo interpreters assess the total density of vegetation associated with the life form of the alliance being assigned to that polygon. For example, if the polygon is defined as a jeffrey pine/greenleaf manzanita association, only the tree cover will be evaluated in calculating a density value. If the polygon is defined as a greenleaf manzanita alliance, only the shrub cover will be evaluated, not any emergent tree layer.

Photo interpreters use six categories to define density or vegetative cover:

1 = Greater than 60% 2 = 40-60% 3 = 25-40% 4 = 10-25% 5 = 2-10 % 6 = Trace amounts less than 2% (used for talus & scree)

It is important to note that photo interpreters can only accurately quantify the vegetation that is visible on the aerial photography. Using aerial photography at scales smaller than about 1:12000 (the SEKI aerial photography scale is approximately 1:15840), photo interpreters generally cannot see the amount of vegetation which is obscured by a higher canopy, regardless of its life form; therefore, total vegetative cover may differ from assessments done on the ground by field crews. Understory vegetation that is not visible on the aerial photograph cannot be quantified when assigning the total cover of vegetation for that polygon.

Density Mapping Criteria

- To determine the density or vegetative cover, photo interpreters assign percentages to the different life forms visible on the aerial photo, including non-vegetated areas. The total percent cover of trees, shrubs, herbaceous and non-vegetated should add up to 100%. The density percentages are then converted into the appropriate density category.
- Non-vegetated areas are not coded in the database unless they meet the minimum mapping resolution for the park and can be mapped as a standalone polygon. Otherwise, it is assumed that all vegetation polygons contain non-vegetated areas.
- The photo interpreters consider the coverage pattern of the life form before assigning a density code to the polygon. Estimating densities is more straightforward when plants occupying the same strata are evenly distributed throughout the polygon. However, when polygons contain populations of plants that are clumped or occurring only in portions of the polygon, the photo interpreter must also consider the area that is not occupied by plant cover when determining total density. To ensure consistency, it is helpful to count the plants in polygons with clumped and unevenly distributed vegetation and then compare them to similar sized polygons with an even distribution of plant cover.
- Vegetation stature and the scale of the aerial photography determine the visibility of individual plants. Trees are usually visible as individuals and with larger scale photography so are shrubs. However, grasses are rarely seen as individual plants, regardless of the scale of the photography.
- In the case of trees and shrubs, the percent cover at a density break is adjusted downward. If the percent cover is at about 25%, the polygon is assigned a density category of sparse (10-25%) instead of dispersed (25-40%).
- Dry grasses tend to be less dense than they appear on the aerial photography. To more accurately depict the densities, the percent cover for dry grasses is adjusted downward. For example, if the percent cover falls at the lower end of a density class, the polygon should be assigned the next density class down. For example, if the percent cover is 25%, the polygon should be assigned a density category of sparse (10-25%) instead of dispersed (25-40%).
- The date that the aerial photography is acquired also influences the density assigned to vegetation types, especially for herbaceous dominated vegetation types. Subsequent field verification and accuracy assessments must take into consideration the following factors that can cause apparent discrepancies between the densities evident on the photo and those visible in the field:

- Seasonality The density of most herbaceous plants is variable due to their annual growth cycle. Depending on the season the aerial photography was taken, a mapped unit could show a different density on the aerial photographs than is observed during an on-site visit at a different time of the year. Another effect of seasonality is leaf on/off conditions. Photos of forest or woodland areas with leaf on conditions obscure the understory. Photos of leaf off conditions would allow photo interpretation of the understory, but make it difficult to identify the overstory species since there is no foliage present.
- Annual variability The environmental conditions at the time of the photography (wet vs. drought years, flooding, etc.) may affect the densities seen during the on-site field visits.

Alliance/Association

The assignment of vegetation polygons to alliance and association is based on NVCS criteria. In the case of SEKI, AIS initially used the mapping classification developed for YOSE and modified it to fit conditions at SEKI. Using the plot data collected by the SEKI field sampling crews, a final vegetation classification containing an associated vegetation key, along with vegetation descriptions for each alliance and association will be developed for SEKI.

SEKI Specific Mapping Protocols and Criteria

The additional vegetation mapping criteria developed specifically for SEKI are described in this section

Most of the SEKI mapping protocols, criteria, and the initial vegetation classification were derived directly from the YOSE mapping effort completed by AIS in 2004. Due to the similar environmental conditions and close geographical relationship between YOSE and SEKI, a decision was reached between AIS and park ecologists to basically follow the same criteria in creating the vegetation map for SEKI.

SEKI staff had extensive communication with YOSE personnel regarding the potential to successfully crosswalk the YOSE mapping effort to SEKI. The Park determined that only slight modifications would be needed to the YOSE methods and classification. As a result, the field sampling protocols and methodologies between the two parks were essentially the same, allowing a consistency in mapping and vegetation interpretation. In addition, ongoing and continuous dialog between the photo interpreters and field ecologists aided in the correlation of photo signatures and potential mapping types during the mapping effort.

Mapping Classification

The YOSE mapping classification was used as the starting point for the SEKI vegetation mapping effort. Local expert knowledge was used to modify the YOSE mapping classification by extracting out vegetation classes that did not exist at SEKI (e.g. foothill and knobcone pine types) and adding in classes unique to SEKI (e.g. sycamore and foxtail pine). During the Mineral King pilot study at SEKI and throughout the mapping process, additional classes were added and deleted based on the observations of the photo interpreters and SEKI field sampling crew.

Floristic Classification

The mapping classification is being used as a baseline to further develop a comprehensive floristic classification for SEKI. SEKI field crews were responsible for gathering field plot data across two field seasons. The plot data will be used to further describe the floristic classes identified during the SEKI field sampling and analysis effort. For floristic descriptions of the types shared between YOSE and SEKI, the user is referred to the Yosemite National Park floristic classification (NatureServe, 2004).

Project Imagery

SEKI was unique in that two sets of color-infrared stereo-imagery were produced for the Park. The first set was acquired in late July 2000. Upon review, it was discovered that the imagery was significantly out-of-scale in many areas, with extremely variable tonal differences, and poor color balance. AIS and SEKI personnel determined that the product was unsuitable for the project. As a result, the project was delayed while the Park commissioned another aerial photo overflight.

The second overflight was performed in July 2001. The 2001 overflight did produce photography of acceptable quality but due to the variable climatic conditions, the entire study area was not captured within a single season. Approximately 5% of the study area was missing photo coverage. Most of the missing imagery was concentrated in the western edge of Kings Canyon National Park and in the vicinity south of Grants Grove. AIS and SEKI staff reviewed the July 2000 imagery for the missing areas and determined that portions of the imagery acquired in 2000 could be used to fill in for areas of missing photo coverage from the 2001 overflight.

Ancillary Data

The Park provided AIS with a number of hardcopy and digital files to assist in the photo interpretations. The information included historical vegetation data from the 1990s (polygons and points), Vankat-Roy plots, White Pine Blister Rust Data (polygons and points), Stephenson Gradient Analysis plot data, Natural Resource Inventory plot data, with both Holland types and preliminary vegetation types assigned by SEKI staff, and a digital coverage showing the location of existing giant sequoia groves (Giant Sequoia Groves shapefile 1979). Hard copies of the historic Weislander vegetation maps (Frost 1935) that covered the study area were also provided, and these were scanned by ESRI for AIS to use.

There were two sets of existing plot data that occurred only in the Mineral King pilot area that was given to AIS. The plots were called: Permanent Fuel Plots (PFP) and Fire History Plots (FH). The PFP plots only showed locations, but since there was no other information for these plots, they were not used for mapping purposes. The FH plots included a listing of the species found at the plot locations, therefore was employed in the pilot area mapping process.

In addition to the existing data, the Park also provided AIS with plot information gathered by the SEKI field teams over the course of the project. This included SEKI AA plots and waypoints obtained during the Mineral King pilot study (2000 – 2001), Rapid Assessment plots (established specifically to answer photo interpreter's questions about vegetation signatures seen on the aerial photography), SEKI AA plots from 2002 and 2003, and SEKI waypoints from 2002 and 2003.

Sequoia Groves

Of special interest to the Park was the accurate mapping of all known existing giant sequoia groves, in addition to any sequoia groves that were not captured on the existing digital sequoia grove map. To assist the photo interpreters, the Park provided AIS with a digital coverage showing previously mapped locations of giant sequoia groves. This information was used as a reference layer during the photo interpretation effort. During the mapping effort, photo interpreters identified several small groves not captured on the original digital sequoia grove map. Additionally the boundaries of some of the existing delineations of some groves throughout both SEQU and KICA were refined.

Dead Foxtail Pine Stands

Another area of interest to the Park was the location of stands of dead foxtail pine. The presence of dead foxtail pines is an indicator for changing climatic conditions. The Park provided AIS with a digital coverage identifying previously mapped dead foxtail pine areas for reference during the photo interpretation effort. A separate mapping class was added to the SEKI classification to capture standing dead and/or downed foxtail pine.

SEKI Field Plot Sampling

One of the beneficial aspects of the SEKI project was the close interaction between the AIS photo interpretation and SEKI field sampling teams. While there has always been a collaborative relationship between the photo interpreters and field sampling teams, the SEKI project was the first time the teams worked together to plan and perform the field sampling effort.

The sampling effort was performed over two field seasons. The first sampling effort was performed over the summer of 2003 for SEQU. The second sampling effort was performed in the summer of 2004 for KICA. A total of eight different field regions were sampled.

There were three responsibilities of the SEKI field crews, which are listed below:

- 1. Gather floristic data to further develop the floristic classification.
 - 2. Set aside accuracy assessment points (also known as "blind" points) for use during the AA task to be performed by the NPS at a later date.
 - 3. Assist the photo interpreters with signatures, which were difficult to classify that were identified during the photo interpretation process.

The mapping is then followed by a final field verification session designed to confirm that the vegetation units were mapped correctly. Any outstanding photo interpretation related questions are also addressed during the visit. The last task was used in lieu of a separate AIS field verification task. By using the crews already in the field, the Park was able to streamline the mapping process resulting in a more efficient project.

A typical SEKI field session began with the SEKI crew leader performing a rapid preliminary reconnaissance to identify areas of interest and to layout the groundwork for the full sampling effort. Upon completion of this task, the field team would identify their potential field routes and vegetation of interest and then forward this information to AIS.

The AIS photo interpreters would specifically review the areas of interest identified by the field team and generate questions for the field team to answer. The photo interpretation overlay with delineations was photocopied into a field template and then sent to the field team with the corresponding questions. Upon completion of each field sampling effort, the SEKI field crew would summarize the areas that were visited in documents called Area Descriptions, and then the AIS photo interpreters and SEKI field crew held a conference call to discuss the results.

Project Materials

The following materials were used for the SEKI mapping project.

Aerial Imagery (Hardcopy Stereo-pair Diapositives)

The aerial imagery was used as the base for the vegetation photo interpretations and attribute coding. Generalized flight line indexes were provided by the Park for both the July 2000 and July 2001 sets of imagery. These indexes were used for quick reference to photo locations and as a tool to display the status of mapping and automation tasks. These tasks are discussed later in this document in the Photo Interpretation Mapping Procedures and Data Conversion sections.

Pilot Area – East Fork Kaweah River (Mineral King)

- Color infrared photography
- Flight dates July 2000 and July 2001
- Nominal scale 1:15,840

Approximate photo size – 9" x 9"

SEKI:

- Color infrared photography
- Flight dates July 2000 and July 2001
- Nominal scale 1:15,840
- Approximate photo size 9" x 9"

Total Number of Photos: 1228

Digital Orthophoto Quarter Quad (DOQQ) Basemap

Digital orthophoto quarter quads (DOQQs) served as the base for the data rectification task. The data rectification task is discussed later in this document in the Data Conversion section. The Park did not have a full set of DOQQs that covered the study area, so two different sets of DOQQ imagery were used. The date range of the DOQQs was 1987 to 2003 and they were in either a CIR or Black and White format. For a complete list of the DOQQs used, refer to Appendix C in this report.

Total Number of DOQQs: 129

Total Number of DOQQ Full Module Equivalents (FME): 91

Ancillary Data

The ancillary data used by AIS during the SEKI project is listed below. Unless otherwise noted, the Park provided all material.

- Weislander Maps
- Historic Vegetation (Polygons)
- Historic Vegetation (Points)
- White Pine Blister Rust Data (Polygons and Points)
- Dead Foxtail Pines (Points)
- Sequoia Grove Coverage (Polygons)
- Chagoopa Fire History
- Limber Pine Accuracy Assessment
- Vankat-Roy Transects
- Stephenson Gradient Analysis plots
- Natural Resource Inventory Plots (with Holland codes and preliminary vegetation types coded by SEKI staff)
- Fire Effects Monitoring Plots (FMH)
- Fire History (FH) (pilot area only)
- Permanent Fuel Plots (PFP) (pilot area only)
- Area Descriptions of field trips taken during the 2004 field season
- SEKI Plots 2000-2001
- Rapid Assessment Plots
- SEKI Accuracy Assessment Plots 2002
- AA Waypoints

- AIS Waypoints (from AIS data collected during the "mini" field reconnaissance in July 2003)
- SEKI Waypoints 2003
- SEQU Accuracy Assessment Plots
- SEQU Waypoints

Photo Interpretation Mapping Procedures

There are six major tasks associated with the photo interpretation phase of a NPS vegetation mapping project:

- · Field reconnaissance
- Field plot sampling
- Photo interpretation of vegetation
- Data conversion (rectification of vegetation delineations)
- Field verification
- Accuracy assessment

The division of labor between the AIS photo interpreters and the NPS depends upon the specific requirements of the park unit being mapped. In general, both the photo interpreters and project ecologist perform the field reconnaissance and verification tasks as a team. The photo interpreters are solely responsible for the vegetation interpretations and data rectification, while NPS staff performs the plot sampling and accuracy assessments. A pilot study area is ordinarily selected to test the entire process. Pilot studies quickly show if the classification needs more development and whether the proposed mapping procedures need adjustment.

For the SEKI project, AIS conducted the field reconnaissance, photo interpretation, and data conversion efforts. Park staff performed the field plot sampling and accuracy assessment tasks. Unlike other parks, SEKI did not include a separate field verification survey. Instead the field verification was included as part of the SEKI field sampling effort performed by NPS ecologists.

Pilot Study Area - East Fork of the Kaweah River Watershed (Mineral King)

The major tasks involved with the mapping of SEKI that were performed by AIS are described in the remainder of this document.

The Park selected the East Fork of the Kaweah River Watershed (Mineral King) as the pilot study area to test the mapping criteria, classification, and mapping procedures. The pilot was performed over a six-month period in 2001. After entire mapping process for the pilot area, from field reconnaissance to accuracy assessment, was performed, the complete mapping process was reviewed and revised by the Park and AIS prior to mapping the rest of SEKI.

Field Reconnaissance

The field reconnaissance visit serves two major functions. First, it allows the photo interpreter to key the signature on the aerial photos to the vegetation on the ground at each site. Second, the photo interpreter becomes familiar with the flora, vegetation communities, and local ecology that occur in the study area. NPS and/or field biologists that are familiar with the local vegetation and ecology of the park are present to help the photo interpreter understand these elements and their relationship with the geography of the park. The field trips at SEKI involved driving, hiking, horseback riding, backpacking, and in one instance helicopter transport to view a variety of vegetation types.

Prior to the field reconnaissance trip, the AIS photo interpreter performs several inhouse tasks in order to facilitate a more organized trip. Field routes are planned to accommodate a variety of factors including: maximizing the number of vegetation communities and elevation zones visited, responding to any recommendations of park staff, addressing time constraint considerations, and accessibility. The 9 x 9 aerial prints along the selected routes are prepared with a frosted mylar field overlay. Location features such as trails and place names are drafted onto the overlays to aid in navigation.

Each photo is reviewed under a stereoscope to choose several things, including: representative signatures of different vegetation types; geographic variables (% slope, aspect, shape of the slope, elevation); and other abiotic variables noted on the photography. Field check sites and associated notations are drafted onto the field overlays. Multiple sites are chosen to provide alternatives if one or more sites prove inaccessible. The field photographs (CIR aerial photograph prints), overlays and associated topographic sheets are arranged in packets for the field team.

Field site numbers are annotated directly onto the photo field overlay, thereby correlating the field site to a specific location and photo signature. A field notebook is used to record pertinent information (canopy dominance, understory species present, abiotic features, disturbance history) for each site visited. Color ground photos (35mm) are taken at selected locations and are later compared to the aerial photographs and the field site notes. Additional field sites include areas encountered in transit between initially selected sites, areas of noteworthy or unusual significance, and other vegetation types the photo interpreter or ecologist deem important.

Photo Interpretation of Vegetation

Photo interpretation is the process of identifying map units based on their photo signature. All land cover features have a photo signature. These signatures are defined by the color, texture, tone and pattern they represent on the aerial photography. By observing the context and extent of the photo signatures associated with specific vegetation types, the photo interpreter is able to identify and delineate boundaries between plant communities or signature units. Environmental factors

such as elevation, slope, and aspect also play an important part of the photo interpretation decision-making process.

Each photo is prepared with a 9"x9" frosted mylar overlay for the photo signature delineations. Photo overlays are pin-registered to the photos and project labels are affixed to each overlay identifying the photo number, status of work, and photo interpreter responsible for that task. Study area boundaries are drafted onto each photo overlay, defining the area within the photograph to be interpreted. The study area boundaries are edge matched to adjacent photos to ensure complete coverage.

Additional collateral sources (existing vegetation maps, supplemental photography, soil data, plot data, etc.) can be of great utility to the photo interpreter. Prior to the PI effort on the photo, this ancillary data is added to the mylar overlay by the photo interpreter in order to document all locations and information within the study area on an aerial photograph. Understanding the relationship between the vegetation units and the environmental context in which they appear is useful in the interpretation process. Familiarity with regional differences also aids interpretation by establishing a context for a specific area.

Using a mirrored stereoscope with a 3X lens, photo signature units are delineated onto the mylar overlays. These initial photo delineations are based on a number of signature characteristics including color, tone, texture, relative height and density. Attribute codes (mapping classification types and density) are assigned to each polygon and annotated onto the mylar overlay. The map units and codes are edge matched to the adjoining photo overlays.

Land use activities within the park units are also identified during the mapping of the vegetation units.

Quality Control of the Photo Interpretations

A separate quality control step is performed for each photo upon completion of the photo interpretation. A senior photo interpreter reviews each photo for map unit delineation, PI signature code, and density code accuracy. Each photo overlay is checked for completeness, consistency, and adherence to the mapping criteria and guidelines

IV. DATA CONVERSION

The following section outlines the data automation procedures required to convert the hand-drafted vegetation map units to a digital format rectified to the Digital Orthophoto Quarter-Quad base. For a list of the digital orthophoto quadrangle names and abbreviations, see Appendix C.

Data Automation

Data automation is conducted using Mono Digitizing Stereo Digitizing (MDSD) software. The first step of the procedure involves the creation of control points. Control points are locational points identified both on the DOQQ imagery and the aerial photography that are identified and input into an ARC/INFO point coverage.

The MDSD software used to capture the vegetation linework automatically georeferences the data into real world coordinates. By using the control points generated in the previous step, each photo is registered to the DOQQ. Once each photo is georeferenced, the lines are then digitized. The digitized lines are stored in an MDSD outfile format that are then converted to a coverage using ARC/INFO.

Data Rectification

Coverage linework from each aerial photo is rectified to the corresponding DOQQ. The coverage, containing polygons and codes, is checked for open polygons, data registration, and any spatial edgematch problems between photos. Registration quality depends on the accuracy, quantity, and distribution of the control points. Spatial refinement is performed in ARCEDIT sessions using various user-defined tools. Lines depicting boundaries representing minimal ecotones (for example – land use interface, water bodies, life-form interface) are refined.

Polygon Attribute Assignment

During the data rectification step, label points are created and coded for each map unit. The vegetation mapping type, density and land use type codes are input for each polygon (see Appendix A for Mapping Classification). Automated quality control measures that AIS created, such as Codecheck and code frequency programs are run to check for code validity.

Code Verification and Edit Plot Quality Assurance

A hard copy edit plot of the converted spatial data is produced for each DOQQ and compared to the aerial photo overlays. Each plot is checked for cartographic quality of the arcs defining the polygon features and the accuracy of the label assignments. Line and code corrections are noted directly on the edit plot. All plots are edgematched to verify line and code accuracy across map sheets. Processors conduct interactive ARCEDIT sessions to make the necessary corrections to the coverages.

Final Quality Assurance of the Vegetation Map

The individual coverages created for each DOQQ are then joined into a single seamless vegetation coverage for the park unit. This final vegetation layer is examined by a senior photo interpreter. Final checks are conducted to test for invalid codes, missing or extra lines, edgematch problems, to verify the registration of linework to the DOQQ base, and to review the distribution of species mapped within the park.

Vegetation Mapping Classes in the Final Database

The final database contains two fields for vegetation mapping class: PI and PIORIGINAL.

During the AA task, each mapping class is evaluated for adherence to the AA mapping standards. Where the class does not meet the standard, the Park ecologist aggregates it into the appropriate vegetation class. This often results in a loss of mapping detail as classes are aggregated into superassociations, superalliances or alliances in order to meet the AA protocols. The PI field represents the vegetation classes that meet the accuracy assessment standards and is considered the "official" version of the vegetation dataset.

The PIORIGINAL field represents the pre-accuracy assessment vegetation map. The purpose of the PIORIGINAL field is to retain the original mapping information thereby providing additional detail for the post-AA aggregated types. The Park is interested in keeping this information for reference purposes. The PIORIGINAL codes do not represent the official version of the vegetation map.

For a complete list of fields in the final database, see Appendix D.

V. APPENDICES

APPENDIX A

NPS/USGS VEGETATION MAPPING PROGRAM SEQUOIA AND KINGS CANYON NATIONAL PARKS, CALIFORNIA FINAL MAPPING CLASSIFICATION February 28, 2007

0000) =	=	Spar	sely Vegetated/Miscellaneous Classes
0100) :	-	Aİpi	ne Talus Slope (assign density)
0200) :	-	Alpi	ne Scree Slope (assign density)
0300) :	=	Alpi	ne Snow Patch Communities (no density)
0400) :	-	Alpi	ne Fell-field (assign density)
0500) :	_	Mes	ic Bock Outcrop (no density)
0700) :	_	Bou	der Field (no density)
0900) :	=	Spar	selv Vegetated/Miscellaneous Classes (continued)
	0910		=	Conifer Reproduction (assign density)
	0920		=	Conifer Plantation (assign density)
	0940		=	Sparsely Vegetated Undifferentiated (no density)
	(0941	1	 Sparsely Vegetated Riverine Flat (no density)
	0950		=	Non-alpine Talus
	0960			 Bock Outcrop Undifferentiated
		0961	1	= Sparsely Vegetated to Non-vegetated Exposed Rock
	(0963	3	= Dome
	(0965	5	= Sparsely Vegetated Rocky Streambed
	0970		=	Albine Permanent Snowfield/Glacier
	0980		_	Water
	0990		_	Urban/Developed (assign Land Use code)
1000) :	_	Broa	dleaf Evergreen Trees
	, 1020		=	Canvon Live Oak Forest Alliance
		1021	1	Canvon Live Oak/Birchleaf Mountain Mahogany Forest Mapping Unit
		1022	2	= Canyon Live Oak/Whiteleaf Manzanita Forest Association
		1023	3	= Canyon Live Oak-(Ponderosa Pine-Incense-cedar) Forest Superassociation
		1024	1	= Canyon Live Oak-California Laurel Forest Superassociation
		1029		= Canyon Live Oak/Greenleaf Manzanita Forest Association
	1040		=	Interior Live Oak Woodland Alliance
		1043	3	= Interior Live Oak-Canvon Live Oak Woodland Association
		1044	1	= Interior Live Oak-California Buckeve/Birchleaf Mountain Mahogany-California Redbud
				Forest Association
2000) :	=	Broa	dleaf Deciduous Trees
	2010		=	Quaking Aspen Forest Alliance
	2	2013	3	= Quaking Aspen/Willow spp. Forest Mapping Unit
	2	2014	4	= Quaking Aspen/Willow spp. Talus Mapping Unit
	2	2016	6	= Quaking Aspen/Big Sagebrush Forest Superassociation
	2	2017	7	= Quaking Aspen/Meadow Mapping Unit
	2020		=	California Black Oak Forest Alliance (includes 2021 and 2026)
	1	2021	1	= California Black Oak/Greenleaf Manzanita Forest Association (see 2020)
	2	2025	5	= California Black Oak/(Bracken Fern) Forest Mapping Unit
	2	2026	6	= California Black Oak/Indian Manzanita-Mountain Misery Forest Association (see 2020)
	2030		=	Blue Oak Woodland Alliance
	2	2033	3	= Blue Oak/Brome sppAmerican Wild Carrot Woodland Association
	2	2034	4	= Blue Oak-Interior Live Oak/Brome sppAmerican Wild Carrot Woodland Association
	:	2038	3	= Blue Oak-California Buckeye-(Interior Live Oak) Woodland Mapping Unit
	2050		=	Black Cottonwood Temporarily Flooded Forest Alliance
	2	2053	3	= Black Cottonwood Forest Association
	2060		=	White Alder Temporarily Flooded Forest Alliance
	2	2061	1	= White Alder-Red Willow-California Sycamore Forest Association

2080 **Bigleaf Maple Forest Alliance** California Sycamore Temporarily Flooded Woodland Alliance 2100 = 2102 California Sycamore-(Canyon Live Oak-Interior Live Oak) Forest Mapping Unit -2110 **California Buckeye Woodland Alliance** = 2114 = California Buckeye-Canyon Live Oak Woodland Association 2500 Superalliances and Alliance-level Mapping Units = 2530 Montane Broadleaf Deciduous Trees Mapping Unit = 3000 Needleleaf Evergreen Pine Trees 3010 Sierra Lodgepole Pine-Quaking Aspen-(Jeffrey Pine) Forest Alliance Sierra Lodgepole Pine-Quaking Aspen/(Kentucky Bluegrass) Forest Mapping Unit 3012 Sierra Lodgepole Pine Forest Alliance 3020 = Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (see 3026) 3021 = 3022 Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit 3026 Sierra Lodgepole Pine Woodlands Superassociation (includes 3021, 3038 and 3042) = 3028 Sierra Lodgepole Pine-(Whitebark Pine)/(Ross Sedge-Shorthair Sedge) Forest = Superassociation (includes 3033, 3041, and 3043) 3030 = Sierra Lodgepole Pine Forest Alliance (continued) Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (see 3028) 3033 = Sierra Lodgepole Pine/Big Sagebrush Forest Association 3034 = 3038 Sierra Lodgepole Pine Woodland Association (see 3026) 3040 Sierra Lodgepole Pine Forest Alliance (continued) = 3041 Sierra Lodgepole Pine/Ross Sedge Forest Association (see 3028) = Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (see 3026) 3042 = 3043 Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (see 3028) = 3048 Sierra Lodgepole Pine Mesic Forest Superassociation = Sierra Lodgepole Pine Xeric Forest Superassociation 3049 Ponderosa Pine Woodland Alliance 3050 = Ponderosa Pine-California Black Oak/Whiteleaf Manzanita Woodland Association 3053 3060 Ponderosa Pine-Incense-cedar Forest Alliance 3061 Ponderosa Pine-Incense-cedar-Canyon Live Oak/Mountain Misery Forest Association Ponderosa Pine-Incense-cedar/Mountain Misery Forest Association 3062 = Ponderosa Pine-Incense-cedar-California Black Oak Forest Association 3063 3070 Jeffrey Pine Woodland Alliance (includes 3550) = 3072 Jeffrey Pine/Greenleaf Manzanita Woodland Association = Jeffrey Pine/Whitethorn Ceanothus Woodland Association 3073 3080 Jeffrey Pine Woodland Alliance (continued) 3083 Jeffrey Pine-White Fir/Roundleaf Snowberry/Squirreltail Woodland Association = 3084 = Jeffrey Pine-Canyon Live Oak/Whiteleaf Manzanita Woodland Association 3085 Jeffrey Pine-California Red Fir Woodland Association Singleleaf Pinyon Pine Woodland Alliance 3110 3114 Singleleaf Pinyon Pine-Canyon Live Oak/Whiteleaf Manzanita Woodland Association 3130 Western White Pine Woodland Alliance = Western White Pine-Sierra Lodgepole Pine Woodland Association (see 4540) 3132 = 3133 Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland **Mapping Unit** 3140 Whitebark Pine Woodland Alliance = 3142 Whitebark Pine/Davidson's Penstemon Woodland Association = 3144 Whitebark Pine/Shorthair Sedge Woodland Association = 3148 Whitebark Pine-Mountain Hemlock Woodland Association **Limber Pine Woodland Alliance** 3150 = Foxtail Pine Woodland Alliance 3200 = Foxtail Pine/Bush Chinquapin Woodland Association 3202 3203 **Foxtail Pine Woodland Superassociation** 3204 = Foxtail Pine-Western White Pine Woodland Superassociation **Dead Foxtail Pine Mapping Unit** 3205 -3500 Superalliances and Alliance-level Mapping Units 3520 (Foxtail Pine-Sierra Lodgepole Pine-Whitebark Pine) Krummholz Woodland Mapping = Ùnit 3530 Whitebark Pine-Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance = 3540 = Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance 3550 White Fir-Jeffrey Pine-(Sugar Pine) Woodland Mapping Unit (see 3070)

4000 Needleleaf Evergreen Conical-form 4020 **Giant Sequoia Forest Alliance** = 4021 Giant Sequoia-Sugar Pine/Pacific Dogwood Forest Association = 4023 Giant Sequoia-White Fir-California Red Fir Forest Association 4030 **Mountain Hemlock Forest Alliance** = 4033 Mountain Hemlock-Western White Pine Forest Association 4040 Mountain Hemlock Forest Alliance (continued) = 4041 Mountain Hemlock-Sierra Lodgepole Pine Forest Association 4042 Mountain Hemlock-Sierra Lodgepole Pine-Whitebark Pine Forest Mapping Unit = Mountain Hemlock-Sierra Lodgepole Pine-Western White Pine Forest Association 4043 California Red Fir Forest Alliance 4050 = 4051 California Red Fir Forest Association = California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus) 4054 Forest Mapping Unit (see 4064) California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (see 4055 _ 4540) 4057 California Red Fir-Western White Pine Forest Association 4060 California Red Fir Forest Alliance (continued) California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit 4063 = 4064 = California Red Fir-(Western White Pine)/(Pinemat Manzanita-Bush Chinquapin) Forest Mapping Unit (includes 4054 and 4065) 4065 California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest = Mapping Unit (see 4064) 4070 California Red Fir-White Fir Forest Alliance (includes 4071, 4072, and 4073) _ 4071 California Red Fir-White Fir Forest Association (see 4070) 4072 California Red Fir-White Fir-Jeffrey Pine Forest Association (see 4070) = 4073 California Red Fir-White Fir-Sugar Pine Forest Association (see 4070) 4080 White Fir-Sugar Pine Forest Alliance _ 4081 White Fir Forest Mapping Unit = 4082 White Fir Mature Even-age Stands Mapping Unit = 4084 White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf _ Manzanita) Forest Mapping Unit 4090 White Fir-Sugar Pine Forest Alliance (continued) = White Fir-Sugar Pine-Incense-cedar Forest Superassociation 4094 = White Fir-Sugar Pine/Greenleaf Manzanita-Whitethorn Ceanothus Forest Mapping Unit 4095 Sierra Juniper Woodland Alliance 4100 = 4107 Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association = 4108 = Sierra Juniper Woodland Association Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation 4109 = 4110 Incense-cedar Forest Alliance 4111 Incense-cedar-White Alder Forest Association 4500 Superalliance and Alliance-level Mapping Units Western White Pine-Sierra Lodgepole Pine-(California Red Fir) Woodland 4540 = Superassociation (includes 3132 and 4055) 5000 = Everareen Shrubs 5010 **Birchleaf Mountain Mahogany Shrubland Alliance** = Birchleaf Mountain Mahogany/California Redbud-California Flannelbush Shrubland 5011 = Association 5012 Birchleaf Mountain Mahogany/Whiteleaf Manzanita Shrubland Association 5020 Chamise Shrubland Alliance (includes 5021) = 5021 Chamise Shrubland Association (see 5020) = Chamise/Whiteleaf Manzanita Shrubland Association 5022 = 5023 **Chamise-Chaparral Yucca Shrubland Association** = 5025 Chamise-California Yerba Santa Shrubland Association = 5030 Chamise-Buckbrush Shrubland Alliance = 5031 **Chamise-Buckbrush Shrubland Association** 5050 **Buckbrush Shrubland Alliance** = **Chaparral Whitethorn Shrubland Alliance** 5060 = 5070 Whiteleaf Manzanita Shrubland Alliance = 5080 = Bush Chinquapin Shrubland Alliance (see 5590) 5090 **Greenleaf Manzanita Shrubland Alliance**

5110	=	Whitethorn Ceanothus Shrubland Alliance (see 5590)
5130	=	Mountain Misery Dwarf-shrubland Alliance
5140	=	Indian Manzanita Shrubland Alliance
5160	=	Big Sagebrush Shrubland Alliance
5200	=	Timberline Sagebrush Shrubland Alliance
5230	=	Curl-leaf Mountain Mahogany Woodland Alliance
5270	=	Chaparral Yucca Shrubland Alliance
5280	=	Pinemat Manzanita Dwarf-shrubland Alliance
5300	=	Water Birch Shrubland Alliance
5500	=	Superalliances and Alliance-level Mapping Units
55	10	= Mountain Big Sagebrush & Timberline Sagebrush & Oceanspray & Red
		Mountainheather Shrubland Superalliance
55	20	= Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit
		(see 5590)
55	30	= Bitter Cherry-Gooseberry spp(Mountain Maple) Shrubland Mapping Unit
55	50	= Red Mountainheather Dwarf-shrubland Alliance
55	90	= Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Superalliance
		(includes 5080, 5110 and 5520)
6000 =	De	eciduous Shrubs
6010	=	Deerbrush Shrubland Alliance
6020	=	Oregon White Oak Shrubland Alliance
60	22	= Oregon White Oak-Birchleaf Mountain Mahogany Shrubland Association
6030	=	California Grape Association
6110	=	Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance
6210	=	Oceanspray Shrubland Alliance
6300	=	Bitter Cherry Shrubland Alliance
6500-6	990	= Superalliances and Alliance-level Mapping Units
6500	=	Willow spp./Meadow Shrubland Mapping Unit
6600	=	Willow spp. Riparian Shrubland Mapping Unit
6700	=	Willow spp. Talus Shrubland Mapping Unit
7000 =	Up	bland Herbaceous
7120	=	Shorthair Sedge Herbaceous Alliance
7260	=	California Annual Grassland/Herbland Superalliance
7702	=	Mesic Post Fire Herbaceous Mapping Unit
7703	=	Post Fire Shrub/Herbaceous Mapping Unit
8000	=	Intermittently to Seasonally Flooded Meadow
9000	=	Semi-permanently to Permanently Flooded Meadow

APPENDIX B

NPS/USGS VEGETATION MAPPING PROGRAM SEQUOIA AND KINGS CANYON NATIONAL PARKS, CALIFORNIA PHOTO INTERPRETATION DESCRIPTIONS March 6, 2007

Note: The final database contains two fields for vegetation mapping class: PI and PIORIGINAL. During the AA task, each mapping class is evaluated for adherence to the AA mapping standards. Where the class does not meet the standard, the Park ecologist aggregates it into the appropriate vegetation class. This often results in a loss of mapping detail as classes are aggregated into superassociations, superalliances or alliances in order to meet the AA protocols. The PI field represents the vegetation classes that meet the accuracy assessment standards and is considered the "official" version of the vegetation dataset.

The PIORIGINAL field represents the pre-accuracy assessment vegetation map. The purpose of the PIORIGINAL field is to retain the original mapping information thereby providing additional detail for the post-AA aggregated types. The Park is interested in keeping this information for reference purposes. The PIORIGINAL codes do not represent the official version of the vegetation map.

For a complete list of fields in the final database, see Appendix D.

0100 - ALPINE TALUS SLOPE



MOBR_SE

DISTRIBUTION:



DESCRIPTION:

Alpine talus slopes are mapped on moderate to steep alpine slopes of varying aspect between 2546 -- 4375 m (8354 -- 14354 ft). Talus habitats are characterized by sloping, unsorted masses of medium to large unstable blocks of rock, which are usually found at the base of cliffs. Although usually sparsely vegetated, mesic sites can support surprisingly high richness of perennial alpine herbaceous species. Included in this category are rock glaciers, which are masses of poorly sorted, angular boulders cemented with interstitial ice.

PHOTO INTERPRETATION SIGNATURE:

The use of texture and color (reflectance) are the main guidelines in differentiating alpine talus (0100), alpine scree (0200), and boulder fields (0700). The photo signature may be influenced by a number of variables including soil/rock color, geologic rock type, rock size/shape, amount of vegetation, overall aspect, and proximity to edge of photo. Alpine talus has a moderately coarse texture, while the color signature varies greatly. Since vegetation densities range from extremely sparse (<2% cover) to discontinuous (~50% cover), the signature ranges from white or gray in a sparse area to pink in areas with a denser vegetative cover.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – variable Elevation – 2546 -- 4375 m (8354 -- 14354 ft) Shape – convex to concave Slope position – mid and low Steepness – fairly steep to moderate

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Scree Slope (0200) •
- Alpine Fell-field (0400) •
- Boulder Field (0700) ٠
- Non-alpine Talus (0950) •
- Sparsely Vegetated to Non-vegetated Exposed Rock (0961)
 Alpine Permanent Snowfield/Glacier (970)
- Mountain Big Sagebrush & Timberline Sagebrush & Oceanspray & Red Mountainheather • Shrubland Superalliance (5510)
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110) ٠

0200 - ALPINE SCREE SLOPE



MOBR_NE

DISTRIBUTION:



DESCRIPTION:

Alpine scree slopes are mapped on moderate to steep alpine slopes of varying aspect between 2428 -- 4316 m (7967 -- 14159 ft). Scree habitats consist of unstable rock fragments covering the exposed summits of mountains or accumulating on slopes below cliffs. Although sparsely vegetated, mesic sites can support surprisingly high richness of perennial alpine herbaceous species. Soils are poorly developed, often with areas of coarse decomposed granites or sands. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

The use of texture and color (reflectance) are the main guidelines in differentiating alpine talus (0100), alpine scree (0200), and boulder fields (0700). Scree slopes are mapped where the texture is smooth to the point that individual rocks generally cannot be observed. Photo signature may be influenced by a number of variables, including soil/rock color, geologic rock type, rock size/shape, amount of vegetation, overall aspect and proximity to edge of photo. Alpine scree has a fine texture, and the color signature varies from light gray or white to pink. The color signature depends on the density of vegetation present. A pink color indicates a denser vegetation cover than an area where the signature is light gray or white.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – variable Elevation – 2428 -- 4316 m (7967 -- 14159 ft) Shape – convex to concave Slope position – mid to low Steepness – fairly steep to moderate

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Talus Slope (0100) •
- •
- ٠
- •
- Alpine Talus Slope (0100) Alpine Fell-field (0400) Sparsely Vegetated to Non-vegetated Exposed Rock (0961) Alpine Permanent Snowfield/Glacier (970) Mountain Big Sagebrush & Timberline Sagebrush & Oceanspray & Red Mountainheather Shrubland Superalliance (5510) •
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110) •

0300 - ALPINE SNOW PATCH COMMUNITIES



MOWI_SW

DISTRIBUTION:



DESCRIPTION:

Alpine snow patches are mapped adjacent to areas of late lying snow on moderately steep, northerly facing slopes between 3230 -- 3771 m (10598 -- 12371 ft). Fed by melting snow, these habitats remain saturated well into the growing season and support a generally sparse mixture of mesic high alpine species such as *Caltha leptosepala ssp. howellii* and *Ranunculus eschscholtzii var. oxynotus*. Soils are typically poorly developed sands, and the sites are seasonally saturated.

PHOTO INTERPRETATION SIGNATURE:

The photo signature of the alpine snow patch community is very similar to the permanent snowfields/glaciers (0970) class. The USGS 7.5 minute topographic quadrangles are used to differentiate alpine snow patch communities from the snowfields/glaciers. Alpine snow patch polygons also include saturated conditions downslope from the snow that are visible on the color infrared aerial photography, often in the form of small linear rivulets that trail below the snow patch itself. Vegetation densities are not assigned to these polygons.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 3230 -- 3771 m (10598 -- 12371 ft) Shape – convex Slope position – mid and lower Steepness – moderately steep slopes





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:•Intermittently to Seasonally Flooded Meadow (8000)•Semi-permanently to Permanently Flooded Meadow (9000)

0400 – ALPINE FELL-FIELD



MOBR_SE

DISTRIBUTION:


DESCRIPTION:

Alpine fell-fields are mapped on gentle to moderate sloping, exposed alpine flats of varying aspect between 2811 -- 4413 m (9222 -- 14478 ft). These communities are found on rocky flats or plateaus that are often exposed to winter winds. Fell-field vegetation is composed of scattered perennial herbs or dwarf shrubs less than 0.5 m tall, which can form a low turf on favorable sites but more often is scattered among the broken rocks, exposed outcrops and gravel which are typical of these sites (Holland 1986). Frequently encountered species include *Erigeron spp., Draba spp., Eriogonum incanum, Eriogonum ovalifolium ssp. nivale, Koeleria macrantha, Festuca brachyphylla, Juncus parryi, Lupinus breweri,* and Oreonana clementis. Some examples of mapped fell-fields are the areas of or around Table Mountain, Boreal Plateau, Diamond Mesa, and Martha Lake.

PHOTO INTERPRETATION SIGNATURE:

The alpine fell field photo signature is dependent on several variables including the vegetative cover and density, rock composition, slope and aspect. The color evident on the color infrared imagery ranges from white to gray to light brown.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – seasonally mesic (during snowmelt) to xeric Elevation – 2811 -- 4413 m (9222 -- 14478 ft) Shape – variable Slope position – variable Steepness – gentle to moderate

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Talus Slope (0100)
- Alpine Scree Slope (0200) Mesic Rock Outcrop (0500) ٠
- ٠
- Sparsely Vegetated to Non-vegetated Exposed Rock (0961)
 Upland Herbaceous (7000)
 Shorthair Sedge Herbaceous Alliance (7120)

0500 - MESIC ROCK OUTCROP



MOBR_SE

DISTRIBUTION:



DESCRIPTION:

Mesic rock outcrops are mapped on primarily north and east facing, moderate to steep rock outcrops between 2364 -- 3983 m (7756 -- 13067 ft). These sparsely vegetated habitats are dominated by rock and support less than 10% absolute vegetative cover. Species composition varies according to elevation and local site conditions, but may include relatively mesic species in small, protected pockets of soil. Sites are characterized by upland hydrology and little to no soil development.

PHOTO INTERPRETATION SIGNATURE:

Mesic rock outcrops generally contain less than 10% absolute vegetative cover. These map units are usually northerly trending, but may be southerly where the vegetation appears clearly mesic or wet (brighter pink to red signature) on the aerial photography. Mesic rock outcrops are usually found on rock where there are numerous breaks and cracks, which tend to accumulate small amounts of soil and pool water. Steep cliffs generally don't allow for extensive mappable mesic vegetation; most mesic rocks are mapped on gentle to moderate slopes. Outcroppings that usually trend south and that contain a vegetation signature that tends to be brown or tan (possibly *Holodiscus* or *Dasiphora floribunda*) are lumped into the more general sparsely vegetated to non-vegetated exposed rock (0961) type. Vegetation densities are not assigned to mesic rock outcrop polygons.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – variable Elevation – 2364 -- 3983 m (7756 -- 13067 ft) Shape – neutral Slope position – variable Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Fell-field (0400)
- •
- Sparsely Vegetated to Non-vegetated Exposed Rock (0961) Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110) ٠
- Upland Herbaceous (7000) ٠
- Shorthair Sedge Herbaceous Alliance (7120) ٠
- Intermittently to Seasonally Flooded Meadow (8000) •



Aerial Information Systems, Inc.

DISTRIBUTION:

8,245 Acres

DESCRIPTION:

Boulder fields are mapped in flat to moderately sloping areas of varying aspect between 1286 -- 4016 m (4218 -- 13177 ft). The habitat is characterized by large coarse rock fragments averaging 1-2 m in size or greater. Vegetation is extremely sparse and varies according to elevation and local site conditions. Sites are characterized by upland hydrology and little to no soil development.

PHOTO INTERPRETATION SIGNATURE:

Boulder fields are mapped when the rock size averages 1-2 meters or greater. The use of photo signature texture and color (reflectance) are the main variables used in differentiating boulder fields from alpine talus (0100) and alpine scree (0200). A boulder field photo signature has an extremely coarse texture and dark gray color, and may include areas of snow that are not identified on the topographic map as permanent snowfield/glacier.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1286 -- 4016 m (4218 -- 13177 ft) Shape – variable Slope position – middle to lower slopes Steepness – flat to moderate





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Talus Slope (0100)
 Non-alpine Talus (0950)

DISTRIBUTION:



Aerial Information Systems, Inc.



0910 - CONIFER REPRODUCTION

USGS-NPS Vegetation Mapping Program Sequoia and Kings Canyon National Parks Photo Interpretation Report

DESCRIPTION:

The post avalanche, fire, flood, and/or mass movement conifer reproduction is mapped on gentle to steep slopes of varying aspect between 1454 -- 3714 m (4770 -- 12184 ft). These stands are characterized by post-disturbance (avalanche, fire, flood or mass movement) conifer reproduction, where the trees are too young to identify to species based on photosignature.

PHOTO INTERPRETATION SIGNATURE:

Young conifers yield a stipple-like signature due to the narrow crowns of the individual plants. Stand continuity depends on density throughout the mapped polygon; signatures generally remain constant throughout where density change is minimal. Color and tones vary little between conifer species and depend more on age, health and overall density of the stand.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – variable Elevation – 1454 -- 3714 m (4770 -- 12184 ft) Shape – variable Slope position – variable Steepness – variable

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Conifer Plantation (0920) •

- Contrer Plantation (0920)
 Quaking Aspen Forest Alliance (2010)
 Giant Sequoia Forest Alliance (4020)
 White Fir Mature Even-age Stands Mapping Unit (4082)
 White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)

DISTRIBUTION:





0920 - CONIFER PLANTATION

USGS-NPS Vegetation Mapping Program Sequoia and Kings Canyon National Parks Photo Interpretation Report

DESCRIPTION:

Plantations are mapped on gentle to moderate slopes of varying aspect between 1950 -- 2068 m (6397 -- 6784 ft). These monospecific stands are composed of a group of planted trees, often either *Pinus jeffreyi* or *Pinus ponderosa*. A pattern of evenly spaced rows may be evident, and access roads are often visible in the vicinity. Sites have well-developed soils and upland hydrology.

PHOTO INTERPRETATION SIGNATURE:

Conifer plantations show up on the color infrared imagery as small red trees arranged in a pattern of evenly spaced rows. Access roads are usually present in the vicinity.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic to xeric Elevation – 1950 -- 2068 m (6397 -- 6784 ft) Shape – variable Slope position – variable Steepness – gentle to moderate

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• Conifer Reproduction (0910)

0940 - SPARSELY VEGETATED UNDIFFERENTIATED



MOWH_SW

DISTRIBUTION:



DESCRIPTION:

The sparsely vegetated undifferentiated category is mapped in naturally sparse to barren areas of varying slope and aspect between 1389 -- 3781 m (4558 -- 12405 ft). Vegetative cover is less than 2%, with species composition varying according to local site conditions.

PHOTO INTERPRETATION SIGNATURE:

The photo signature for sparsely vegetated undifferentiated areas typically appears white on the color infrared aerial photos.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – variable Elevation – 1389 -- 3781 m (4558 -- 12405 ft) Shape – variable Slope position – variable Steepness – variable

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES: Sparsely Vegetated Riverine Flat (0941) Sparsely Vegetated to Non-vegetated Exposed Rock (0961) Upland Herbaceous (7000)

DISTRIBUTION:

CHFA_SE



Aerial Information Systems, Inc.

0941 – SPARSELY VEGETATED RIVERINE FLAT

USGS-NPS Vegetation Mapping Program Sequoia and Kings Canyon National Parks Photo Interpretation Report

DESCRIPTION:

The sparsely vegetated riverine flat category is mapped in naturally sparse to barren areas along the margins of rivers and streams between 566 -- 3209 m (1857 -- 10527 ft). Vegetative cover is generally less than 2%, with species composition varying according to elevation and local site conditions.

PHOTO INTERPRETATION SIGNATURE:

The sparsely vegetated riverine flats appear white on the color infrared photos and have less than 2% vegetation cover.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – wetland or riparian Elevation – 566 -- 3209 m (1857 -- 10527 ft) Shape – neutral Slope position – valley and canyon bottoms Steepness – gentle to moderate

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES: • Sparsely Vegetated Undifferentiated (0940)

0950 - NON-ALPINE TALUS



MOSI_SW

DISTRIBUTION:



DESCRIPTION:

The non-alpine talus category is mapped on moderate to steep slopes of varying aspect between 993 -- 3460 m (3258 -- 11353 ft). Talus fields are characterized by sloping, unsorted masses of medium to large, unstable blocks of rock, which are usually found at the base of cliffs or steep slopes. Non-alpine talus is applied in areas below treeline. Although sparsely vegetated (less than 2% cover), mesic sites can support relatively high species richness.

PHOTO INTERPRETATION SIGNATURE:

The signature for non-alpine talus ranges from white to gray. In the alpine zone (generally above 10,000'), talus areas are mapped using the alpine type classes (see codes 0100 through 0400). For rocks that average 1-2 meters in size or greater, the boulder field (700) code is used.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – variable Elevation – 993 -- 3460 m (3258 -- 11353 ft) Soil – variable Shape – variable Slope position – variable Steepness – variable

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Talus Slope (0100)
- ٠
- ٠
- Boulder Field (0700) Sparsely Vegetated to Non-vegetated Exposed Rock (0961) Mountain Big Sagebrush & Timberline Sagebrush & Oceanspray & Red Mountainheather Shrubland Superalliance (5510) •



0961 – SPARSELY VEGETATED TO NON-VEGETATED EXPOSED ROCK

MOSI_SW

DISTRIBUTION:



DESCRIPTION:

The sparsely vegetated to non-vegetated exposed rock category is applied to rock outcrops and cliffs across a wide range of slope positions and steepness between 421 -- 4412 m (1381 -- 14474 ft). These sites are naturally sparsely vegetated or barren, with less than 5% absolute vegetative cover on a substrate of exposed rock.

PHOTO INTERPRETATION SIGNATURE:

The photo signature for sparsely vegetated to non-vegetated exposed rock varies from white to dark gray. Exposed rock outcrops displaying a visibly bright infrared signature are mapped as mesic rock outcrops (0500).

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – variable Elevation – 421 -- 4412 m (1381 -- 14474 ft) Shape – variable Slope position – variable Steepness – variable

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Talus Slope (0100)
- Alpine Scree Slope (0200)
- Alpine Fell-field (0400)
- Mesic Rock Outcrop (0500)
- Sparsely Vegetated Undifferentiated (0940)
- Non-alpine Talus (0950)
- Dome (0963)
- Sparsely Vegetated Rocky Streambed (0965)
- Alpine Permanent Snowfield/Glacier (970)
- Sierra Juniper Woodland Alliance (4100)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)
- Chaparral Yucca Shrubland Alliance (5270)
- Mountain Big Sagebrush & Timberline Sagebrush & Oceanspray & Red Mountainheather Shrubland Superalliance (5510)
- Oceanspray Shrubland Alliance (6210)
- Upland Herbaceous (7000)
- Shorthair Sedge Herbaceous Alliance (7120)

0963 – DOME



LODG_SE Sugarbowl Dome

DISTRIBUTION:



DESCRIPTION:

The dome category is applied to smooth rounded rock features that by definition generally slope in all directions from a central point. These classic topographic features are mapped between 1907 -- 3549 m (6258 -- 11644 ft), and are sparsely vegetated to barren (less than 2% absolute cover). Notable examples include Tehipite Dome, Moro Rock and Homer's Nose.

PHOTO INTERPRETATION SIGNATURE:

The signature for a dome is typically white to light gray.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1907 -- 3549 m (6258 -- 11644 ft) Shape – variable Slope position – variable Steepness – steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• Sparsely Vegetated to Non-vegetated Exposed Rock (0961)



SHMO_NE

DISTRIBUTION:



DESCRIPTION:

The sparsely vegetated rocky streambed category is applied to streambeds occurring on rock outcrops where there is little or no unconsolidated material within the stream channel. Often characterized by steep waterfalls and a lack of vegetation, this type is mapped on moderate to steep slopes of varying aspect between 606 -- 3595 m (1987 -- 11795 ft).

PHOTO INTERPRETATION SIGNATURE:

The photo signature for sparsely vegetated rocky streambeds is light gray or white.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – variable Elevation – 606 -- 3595 m (1987 -- 11795 ft) Shape – variable Slope position – variable Steepness – variable

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• Sparsely Vegetated to Non-vegetated Exposed Rock (0961)





MOBR_NE

DISTRIBUTION:



DESCRIPTION:

The alpine permanent snowfield/glacier category is applied to permanent snow and ice fields on steep, generally north facing alpine slopes between 3136 -- 4289 m (10290 -- 14072 ft). Locations of snowfields and glaciers are mapped from the USGS 1:24,000 scale topographic sheets (1983-1994). Polygon boundaries are then rectified to the aerial photography. Finally, polygons are readjusted to the digital orthophoto quarter quads (DOQQ's) (1987-2003) to ensure that no portion of a polygon extends beyond the most recent snow line as depicted on the DOQQ image.

PHOTO INTERPRETATION SIGNATURE:

The permanent snowfield/glacier class is mapped using the snowfield and glacier map units found on the USGS 7.5 minute topographic quadrangles. Polygon boundaries are rectified to the color infrared photography and then readjusted to the DOQQ's to ensure that no portion of the polygon goes beyond the most recent snow line as depicted on the DOQQ image. In order to maintain consistency, the following two rules are applied to 0970 polygons in the database. One, if the permanent snowfield/glacier is less extensive on the DOQQ, then the polygon is shrunk to match the DOQQ. Two, if the permanent snowfield/glacier is more extensive on the DOQQ, then the polygon is drawn as originally interpreted on the color infrared imagery.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 3136 -- 4289 m (10290 -- 14072 ft) Shape – variable Slope position – variable Steepness – variable

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Talus Slope (0100)
 Alpine Scree Slope (0200)
 Sparsely Vegetated to Non-vegetated Exposed Rock (0961)

11,659 Acres



0980 – WATER

USGS-NPS Vegetation Mapping Program Sequoia and Kings Canyon National Parks Photo Interpretation Report
DESCRIPTION:

The water category includes all water bodies, including lakes, ponds, streams, and rivers, and is mapped across a wide range of slope steepness and aspects between 401 -- 3966 m (1315 -- 13012 ft).

PHOTO INTERPRETATION SIGNATURE:

Water bodies and rivers typically have a dark blue to black signature on the aerial photography. Portions of the rivers may appear dry (white to gray signature) due to the midsummer dry conditions of the aerial photography.

ENVIRONMENTAL CHARACTERISTICS:

Elevation - 401 -- 3966 m (1315 -- 13012 ft)

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• Semi-permanently to Permanently Flooded Meadow (9000)

0990 – URBAN/DEVELOPED



LODG_NW Lodgepole

DISTRIBUTION:



DESCRIPTION:

All urban/developed or human-disturbed areas with less than 2% absolute vegetative cover are mapped in this class. Vacant areas created by human activity, such as road cuts and cleared areas, are included here. Refer to the following list of land use codes or see the land use layer for more detailed land use designations of built-up features. *Note: This is a complete list of land use codes, but not all of these land use types are mapped at SEKI.*

100 = Urban/Built Up (Outside of the Park and Private In-Holdings)

- 110 = Residential
- 120 = Commercial
- 130 = Industrial
- 140 = Transportation/Utility/Communication
- 150 = Recreation
- 200 = Agriculture (Outside of the Park and Private In-Holdings)
 - 210 = Plantations
 - 220 = Other Agricultural Land
- 300 = Mining (Outside of the Park and Private In-Holdings)
- 400 = National Park Facilities (Within the Park Except Private In-Holdings)
 - 410 = Residential
 - 420 = Commercial
 - 421 = Hotels/Lodges
 - 422 = Commercial/Concessions (including shops, restaurants, visitor center)
 - 430 = Administration/Offices
 - 431 = Administrative Offices/Research Facilities/Other Services
 - 432 = Park Entrance
 - 433 = Restoration
 - 434 = Museum
 - 440 = Industrial
 - 441 = Maintenance Shops
 - 450 = Transportation/Utility/Communication
 - 451 = Sewage Treatment Facilities
 - 452 = Water Storage Facilities
 - 453 = Water Treatment Facilities
 - 454 = Electrical Power Facilities
 - 455 = Communication Facilities
 - 456 = Major Day Use Parking Areas
 - 457 = Dams
 - 460 = Recreation
 - 461 = Ski Areas
 - 462 = Picnic Areas and Associated Parking
 - 463 = Campgrounds (non-primitive) and Associated Parking
 - 464 = Tent Cabins and Associated Parking
 - 465 = Golf Course
 - 466 = View Point Area and Associated Parking
 - 467 = Stables and Associated Facilities
 - 468 = Ice Rink and Associated Parking
 - 469 = Firing Range
 - 470 = Mining/Borrow Pits
- 800 = Open Water
- 900 = Vacant

PHOTO INTERPRETATION SIGNATURE:

Unnatural non-vegetated areas or stands of unnatural altered vegetation, usually as a result of human disturbance, generally identifies the photo interpretation signature for the Urban/Developed mapping unit. The boundaries for this type are usually straight.

ASPECT:

Aerial Information Systems, Inc.

PI 990 N 360 NW 315 NE 45 W_ 270 Е 90 1 • SW 225 SE 135 ۰. S 180

CANYON LIVE OAK FOREST ALLIANCE



SEKI.215_222

Canyon Live Oak-California Laurel Forest





LODG_NW

DISTRIBUTION:



DESCRIPTION:

The Quercus chrysolepis forest alliance is mapped on gentle to steep slopes of varying aspect between 600--2800 m (1970 -- 9236 ft). At lower elevations, stands are often found on north- to northeast-facing slopes, while at higher elevations they are found on south- to southwest-facing slopes. Soils are generally shallow and well drained. Stands occurring on low slopes are often characterized by large talus blocks. Although not a riparian type, stands of canyon live oak are frequently found immediately adjacent to riparian corridors. The hydrology ranges from upland settings to drier fringes of riparian areas. The overstory is dominated by Quercus chrysolepis but also may include Umbellularia californica (frequently as a co-dominant), Acer macrophyllum, Torreya californica, Pinus monophylla, or Juniperus occidentalis var. australis. Emergent conifers may include Calocedrus decurrens, Abies concolor, Pinus lambertiana, Pinus ponderosa or Pinus jeffreyi. The shrub layer is characteristically sparse but may include Arctostaphylos viscida, A. mewukka, A. patula, Cercocarpus montanus var. glaber, Garrya flavescens, Keckiella breviflora, or Rhamnus tomentella. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The Quercus chrysolepis photo signature appears pink or red. The crowns of the trees are broad and round while the texture varies from smooth to slightly uneven. Juniperus occidentalis var. australis is only occasionally noted as a minor component in the highest stands in rocky areas adjacent to J. occidentalis var. australis types.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 600--2800 m (1970 -- 9236 ft) Shape – flat to concave or convex Slope position – canyon bottoms and slopes Steepness – gentle to very steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak-California Laurel Forest Superassociation (1024)
- Interior Live Oak Woodland Alliance (1040)
- Interior Live Oak Canyon Live Oak Woodland Association (1043)
- California Black Oak Forest Alliance (2020)
- Singleleaf Pinyon Pine-Canyon Live Oak/Whiteleaf Manzanita Woodland Association (3114)

1021 – CANYON LIVE OAK/BIRCHLEAF MOUNTAIN MAHOGANY FOREST MAPPING UNIT

Quercus chrysolepis/Cercocarpus montanus var. glaber Forest Mapping Unit



LODG_SW DISTRIBUTION:



DESCRIPTION:

The Quercus chrysolepis/ Cercocarpus montanus var. glaber mapping unit is mapped on gentle to steep southeast to southwest trending slopes between 601 -- 2100 m (1971 -- 6891 ft). Quercus chrysolepis dominates the overstory of these sparse to moderately dense stands. The shrub layer is characterized by Cercocarpus montanus var. glaber (C.betuloides sensu Hickman 1993), with Arctostaphylos viscida or A. mewukka also often present. Stands of the Quercus chrysolepis/ Cercocarpus montanus var. glaber mapping unit are generally found at slightly higher elevations than the Quercus chrysolepis / Arctostaphylos viscida mapping unit, and in rockier and steeper settings than the Quercus chrysolepis / Arctostaphylos mapping unit.

PHOTO INTERPRETATION SIGNATURE:

The *Quercus chrysolepis* signature appears pink or red with smooth, extensive round crowns while the *Cercocarpus montanus var. glaber* signature looks coarse in texture and tan or brown in color. There are openings in the *Quercus chrysolepis* canopy that contain sparse to dense *C. montanus var. glaber* understory.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 601 -- 2100 m (1971 -- 6891 ft) Shape – neutral to convex Slope position – generally southeast to southwest trending Steepness – generally steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak/Whiteleaf Manzanita Forest Association (1022)
- Interior Live Oak-California Buckeye/Birchleaf Mountain Mahogany California Redbud Forest Association (1044)
- Birchleaf Mountain Mahogany Shrubland Alliance (5010)
- Birchleaf Mountain Mahogany /California Redbud-California Flannelbush Shrubland Association (5011)
- Birchleaf Mountain Mahogany/Whiteleaf Manzanita Shrubland Association (5012)
- Chaparral Yucca Shrubland Alliance (5270)
- Oregon White Oak-Birchleaf Mountain Mahogany Shrubland Association (6022)



1022 - CANYON LIVE OAK/WHITELEAF MANZANITA FOREST ASSOCIATION Quercus chrysolepis/Arctostaphylos viscida Forest Association



DISTRIBUTION:



DESCRIPTION:

The Quercus chrysolepis/Arctostaphylos viscida forest association is mapped on moderate to steep southwest facing slopes at elevations between 853 and 2030 m (2800 -- 6661 ft). Characterized by open stands of Quercus chrysolepis at a minimum of 5-10% as an emergent to Arctostaphylos viscida or A. mewukka, which have proven indistinguishable through photo interpretation. Emergent conifers may also include Abies concolor, Calocedrus decurrens, Pinus lambertiana, or Pinus ponderosa. The shrub layer may also include Ceanothus integerrimus or Chamaebatia foliolosa. Soils are poorly developed to rocky, often on coarse decomposed granite. The hydrology for this mapping unit is upland.

PHOTO INTERPRETATION SIGNATURE:

The *Quercus chrysolepis* signature appears pink or red with smooth, broad, round crowns while the understory of the coarse whiteleaf manzanita (*Arctostaphylos viscida* or *A. mewukka*) looks light brown. There are openings in the *Quercus chrysolepis* that contain sparse to dense whiteleaf manzanita. Photo interpreters generally do not note significant conifer presence in this association.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 853 and 2030 m (2800 -- 6661 ft) Shape – convex Slope position – middle and upper Steepness – fairly steep slopes and shallower slopes with exposed bedrock

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak/Birchleaf Mountain Mahogany Forest Mapping Unit (1021) ٠
- Canyon Live Oak-California Laurel Forest Superassociation (1024) •
- ٠
- •
- Canyon Live Oak/Greenleaf Manzanita Forest Association (1024) California Black Oak/Greenleaf Manzanita Forest Association (2021) California Black Oak/Indian Manzanita Mountain Misery Forest Association (2026) •

1023 – CANYON LIVE OAK (PONDEROSA PINE -INCENSE-CEDAR) FOREST SUPERASSOCIATION *Quercus chrysolepis (Pinus ponderosa-Calocedrus decurrens)* Forest Superassociation



LODG_SW DISTRIBUTION:



DESCRIPTION:

The Quercus chrysolepis-(Pinus ponderosa-Calocedrus decurrens) forest superassociation is mapped on gentle to steep slopes of variable aspect between 704 -- 2064 m (2309 -- 6773 ft). Stands are characterized by a dense (>75% crown cover) canopy of Quercus chrysolepis with emergent Pinus ponderosa or Calocedrus decurrens contributing at least 3-5% relative cover. The two associations making up this superassociation appear to be transitional between the Quercus chrysolepis forest alliance, Pinus ponderosa woodland alliance, and the Calocedrus decurrens forest alliance. The tree layer is dominated by Quercus chrysolepis and Pinus ponderosa or Calocedrus decurrens although Quercus kelloggii, Abies concolor and Pinus lambertiana may also be important. Although not usually discernible on the aerial photography, the shrub layer is generally open with Chamaebatia foliolosa and Toxicodendron diversilobum most frequently encountered. The sparse herb layer is characterized primarily by the presence of Galium bolanderi and Asarum hartwegii; however, a variety of other understory species may contribute minor cover. Soils are moderately to well drained loamy sands and the hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

The dense stands of broad, round-crowned *Quercus chrysolepis* in mesic settings generally yield a dark red signature. The narrow crowned, bright red *Calocedrus decurrens* is often difficult to see in this stand. Sparse emergent *Pinus ponderosa* with rounded crowns appear taller and lighter in color than the *Q. chrysolepis*. The overall texture of the stand is smooth to slightly uneven with tall emergent trees interspersed throughout. Photo interpreters generally do not detect the presence of *Chamaebatia foliolosa* as an understory component of this class.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - mesic

Elevation – 704 -- 2064 m (2309 -- 6773 ft) Shape – concave when adjacent to riparian environments and convex on side slopes Slope position – canyon bottoms; low to midslopes Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak-California Laurel Forest Superassociation (1024)
- Ponderosa Pine-Incense-cedar-Canyon Live Oak/Mountain Misery Forest Association (3061)
- Ponderosa Pine-Incense-cedar-California Black Oak Forest Association (3063)



1024 – CANYON LIVE OAK-CALIFORNIA LAUREL FOREST SUPERASSOCIATION Quercus chrysolepis-Umbellularia californica Forest Association



DISTRIBUTION:



DESCRIPTION:

The Quercus chrysolepis-Umbellularia californica forest superassociation is mapped on moderate to steep slopes of varying aspects between 611 -- 2236 m (2005 -- 7337 ft). At lower elevations stands are often found on north- to northeast-facing slopes, while at higher elevations they can be found on south- to southwest-facing slopes. The tree canopy is closed, with >75% crown cover of Quercus chrysolepis and a minimum of 1-5% cover of Umbellularia californica. Aesculus californica, Quercus wislizeni var. wislizeni, Q. kelloggii, Calocedrus decurrens and/or Torreya californica may also be present. The shrub layer is characteristically sparse, and may include Toxicodendron diversilobum, Symphoricarpos mollis, or Rhamnus ilicifolia. The herbaceous layer is characteristically sparse to absent. Soils are moderately well drained sandy to silty loams. The hydrology for this superassociation is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The photo signature of the large, round crowns of the *Quercus chrysolepis* appears dark red. *Umbellularia californica* can be a very minor component in the canopy and is indiscernible on the aerial photos. The stand is usually dense and the crown texture is generally smooth with some variability throughout. Photo interpreters generally do not detect presence of *Arctostaphylos viscida* in mapped stands.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 611 -- 2236 m (2005 -- 7337 ft) Shape – flat to concave or convex Slope position – variable; low to midslope Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak Forest Alliance (1020) •
- Canyon Live Oak Forest Allance (1020)
 Canyon Live Oak/Whiteleaf Manzanita Forest Association (1022)
 Canyon Live Oak-(Ponderosa Pine-Incense-cedar) Forest Superassociation (1023)
 Interior Live Oak Canyon Live Oak Woodland Association (1043)
 California Black Oak Forest Alliance (2020)



1029 – CANYON LIVE OAK/GREENLEAF MANZANITA FOREST ASSOCIATION Quercus chrysolepis/Arctostaphylos patula Forest Association

LODG_SW

DISTRIBUTION:



DESCRIPTION:

Stands of *Quercus chrysolepis/Arctostaphylos patula* forest association are generally found at midelevations 1415 -- 2815 m (4641 -- 9236 ft) on the mid to upper portions of linear to convex-shaped slopes. These sites tend to be on moderate to steep south- to southwest-facing slopes. Soils are well drained sandy loams of granitic parent material and the hydrology is upland. These are open stands of 10-40% canyon live oak over a sparse to dense understory of *Arctostaphylos patula*, shrubby *Quercus chrysolepis*, and *Chamaebatia foliolosa. Quercus kelloggii, Calocedrus decurrens, Pinus ponderosa,* and *Ceanothus* species can also be present. The herbaceous layer is characteristically sparse. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

The photo signature of the *Quercus chrysolepis* looks red or pink, with expansive round crowns. The *Arctostaphylos patula* appears orange or orange-brown with a coarse crown. The *Quercus chrysolepis* forms a moderately open canopy with a sparse to dense understory of *Arctostaphylos patula*. Other montane chaparral species may be present.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – subxeric Elevation – 1415 -- 2815 m (4641 -- 9236 ft) Shape – convex Slope position – low, middle to upper Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak/Whiteleaf Manzanita Forest Association (1022) •
- California Black Oak/Greenleaf Manzanita Forest Association (2021)
 California Black Oak/Indian Manzanita Mountain Misery Forest Association (2026)

INTERIOR LIVE OAK WOODLAND ALLIANCE



SEKI-AA.0042_659

Interior Live Oak-California Buckeye / Birchleaf Mountain Mahogany-California Redbud Forest



1040 – INTERIOR LIVE OAK WOODLAND ALLIANCE Quercus wislizeni var. wislizeni Woodland Alliance

SHMO_NE

DISTRIBUTION:



DESCRIPTION:

The Quercus wislizeni var. wislizeni woodland alliance is mapped on gentle to steep slopes of varying aspect between 389 -- 1901 m (1275 -- 6238 ft). Soils are generally shallow and well drained sandy loams. The hydrology is upland. This alliance is characterized by *Quercus wislizeni var. wislizeni* as the sole or co-dominant tree in the canopy. Other trees may include *Aesculus californica, Quercus chrysolepis,* or *Umbellularia californica.* Shrubs may be either infrequent or common and may include a diverse mixture of *Adenostoma fasciculatum, Arctostaphylos viscida, Cercis canadensis var. texensis, Cercocarpus montanus var. glaber,* or *Toxicodendron diversilobum.* The herbaceous layer is often sparse, but may include exotic annual species such as *Bromus diandrus* or *Hypochaeris glabra*; moister sites often support a diverse herbaceous layer. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Quercus wislizeni var. wislizeni* varies from dark to dull red with a smooth texture and a small rounded crown.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – variable Elevation – 389 -- 1901 m (1275 -- 6238 ft) Shape – concave to convex Slope position – low to midslope Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak Forest Alliance (1020)
- Canyon Live Oak-California Laurel Forest Superassociation (1024)
- Interior Live Oak Canyon Live Oak Woodland Association (1043)
- Interior Live Oak California Buckeye/Birchleaf Mountain Mahogany California Redbud Forest Association (1044)
- California Black Oak Forest Alliance (2020)
- Blue Oak-Interior Live Oak/Brome spp-American Wild Carrot Woodland Association (2034)



1043 – INTERIOR LIVE OAK-CANYON LIVE OAK WOODLAND ASSOCIATION Quercus wislizeni var. wislizeni-Quercus chrysolepis Woodland Association



DISTRIBUTION:



DESCRIPTION:

The Quercus wislizeni var. wislizeni-Quercus chrysolepis woodland association is mapped on gentle to steep slopes of varying aspect between 591 -- 1608 m (1939 -- 5277 ft). The open to closed stands are dominated by an even mix of Quercus wislizeni var. wislizeni and Q. chrysolepis over an understory of scattered shrubs and patches of annual grasses and herbs. Total tree canopy cover generally ranges from 30-60%. Other tree species may include Umbellularia californica, Aesculus californica, and Pinus ponderosa. When present, the shrub layer may include Adenostoma fasciculatum, Arctostaphylos viscida, Cercocarpus montanus var. glaber Rhamnus tomentella or Toxicodendron diversilobum. This upland association is often found adjacent to riparian corridors. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

Generally the *Quercus chrysolepis* yields a redder signature and has a slightly larger round crown than the *Q. wislizeni var. wislizeni*. The stand texture appears smooth with some jaggedness throughout.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 591 -- 1608 m (1939 -- 5277 ft) Shape – concave to convex Slope position – low slopes Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak Forest Alliance (1020)
- Canyon Live Oak-California Laurel Forest Superassociation (1024)
- Interior Live Oak Woodland Alliance (1040)
- Interior Live Oak California Buckeye/Birchleaf Mountain Mahogany (California Redbud) mapping unit (1044)
- California Black Oak Forest Álliance (2020)

1044 - INTERIOR LIVE OAK-CALIFORNIA BUCKEYE/BIRCHLEAF MOUNTAIN MAHOGANY-CALIFORNIA REDBUD FOREST ASSOCIATION Quercus wislizeni var. wislizeni-Aesculus californica/Cercocarpus montanus var.

glaber-Cercis canadensis var. texensis Forest Association





DISTRIBUTION:



DESCRIPTION:

The Quercus wislizeni var. wislizeni-Aesculus californica/Cercocarpus montanus var. glaber-(Cercis canadensis var. texensis) mapping unit is mapped on gentle to steep slopes of varying aspects between 389 -- 1523 m (1275 -- 4997 ft). Stands of this moderately open to closed canopy type occur on low to midslopes of the Kaweah River drainages, where it often forms extensive patches. The tree canopy is dominated by Quercus wislizeni var. wislizeni and Aesculus californica, with Quercus chrysolepis and Umbellularia californica often present. The shrub layer is characterized by Cercocarpus montanus var. glaber (C. betuloides sensu Hickman 1993) and Cercis canadensis var. texensis (C. occidentalis sensu Hickman 1993), but often includes varying amounts of Fraxinus dipetala, Fremontodendron californicum, and Toxicodendron diversilobum. Soils are moderately to well drained sandy loams. The hydrology of this vegetation type is upland.

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Quercus wislizeni var. wislizeni* is red with small round crowns. The *Aesculus californica* looks yellow with small or medium irregularly shaped crowns and the *Cercocarpus montanus var. glaber* appears dark brown and coarse. The *Cercis canadensis var. texensis* is not distinct on the aerial photography. The stand has a rough pattern with *C. montanus var. glaber* occurring as the shrub understory to the *Q. wislizeni var. wislizeni* and *Aesculus californica* tree canopy. *Adenostoma fasciculatum* generally is not found in significant amounts in mapped polygons, although adjacent stands may be mapped to that type.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 389 -- 1523 m (1275 -- 4997 ft) Shape – concave to convex Slope position – low to midslope Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak/Birchleaf Mountain Mahogany Forest Mapping Unit (1021)
- Interior Live Oak Woodland Alliance (1040)
- Interior Live Oak Canyon Live Oak Woodland Association (1043)
- Birchleaf Mountain Mahogany/California Redbud-California Flannelbush Shrubland Association (5011)

QUAKING ASPEN FOREST ALLIANCE



SEKI.0353_372

Quaking Aspen / Big Sagebrush Forest

2010 – QUAKING ASPEN FOREST ALLIANCE Populus tremuloides Forest Alliance



MOKA_NW

DISTRIBUTION:


DESCRIPTION:

The *Populus tremuloides* forest alliance is mapped on gentle to very steep slopes of varying aspect between 1818 -- 3391 m (5963 --11126 ft). Stands of this type are restricted to areas of relatively high moisture availability, including steep talus slopes at the upper limits of its elevational range. The overstory is dominated by *Populus tremuloides* in either tree or tall shrub form, with *Abies concolor, Calocedrus decurrens, Pinus contorta, or Pinus jeffreyi* frequently contributing low cover. The shrub layer is often made up of *Artemisia tridentata Chrysolepis sempervirens,* or *Salix sp.* The understory can be sparse or dense depending on moisture availability; more mesic sites often support a rich layer of mesophytic herbs. Areas dominated by the associations making up this alliance are usually subject to disturbance, such as avalanche or rock fall. Although substrate may be either metamorphic or igneous in origin, stands of *Populus tremuloides* appear to frequently occur on metamorphic parent material. Soils are moderately to well drained sands and sandy loams. The hydrology is upland. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

Populus tremuloides often yields a very bright orange to red signature and a texture that is consistent throughout the stand. Salix is often mapped as a co-dominant in wetter stands with Artemisia tridentate, which is a common component in drier stands. Photo interpreters often note montane chaparral species such as Chrysolepsis sempervirens adjacent to stands of *P. tremuloides*; however mixing does not frequently occur except towards the margins of the stand.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 1818 -- 3391 m (5963 --11126 ft) Shape – flat to concave to convex Slope position – canyon bottom to high slope Steepness – gentle to very steep

ASPECT:



- Conifer Reproduction (0910)
- Quaking Aspen/Willow spp. Forest Mapping Unit (2013)
- Quaking Aspen/Willow spp. Talus Mapping Unit (2014)
- Quaking Aspen/Big Sagebrush Forest Superassociation (2016)
- Quaking Aspen/Meadow Mapping Unit (2017)
- Black Cottonwood Temporarily Flooded Forest Alliance (2050)
- Bitter Cherry Shrubland Alliance (6300)
- Water Birch Shrubland Alliance (5300)
- Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland mapping unit (5530)
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110)
- Willow spp./Meadow Shrubland Mapping Unit (6500)
- Willow spp. Riparian Shrubland Mapping Unit (6600)

- 2013 QUAKING ASPEN/WILLOW SPP. FOREST MAPPING UNIT Populus tremuloides/Salix spp. Forest Mapping Unit

TDPE_SE

DISTRIBUTION:



DESCRIPTION:

The *Populus tremuloides/Salix spp.* forest mapping unit is mapped on gentle to moderately steep slopes of varying aspect between 2148 -- 3297 m (7046 -- 10817 ft). Frequently found adjacent to meadows and riparian corridors, stands of this mapping unit are characterized by at least 30% cover of *Populus tremuloides* emergent over dense, localized patches of at least 30% cover of *Salix spp. Populus balsamifera* is often present in the tree layer. The understory is composed of a diverse mix of mesic herbaceous species, often including *Pteridium aquilinum* or *Epilobium angustifolium*. Stands are temporarily to seasonally flooded. Soils are usually well-developed alluvium.

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Populus tremuloides* has a smooth, even texture and brown or dark red color that typically occurs as a shrub while the willow species appears smooth with a lighter red signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 2148 -- 3297 m (7046 -- 10817 ft) Shape – flat to concave Slope position – canyon bottoms and low slopes Steepness – gentle to moderately steep





- Quaking Aspen Forest Alliance (2010) ٠
- Quaking Aspen/Willow spp. Talus mapping unit (2014) •
- Quaking Aspen/Meadow Mapping Unit (2017) ٠
- Sierra Lodgepole Pine-Quaking Aspen/(Kentucky Bluegrass) Forest Mapping Unit (3012) Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland Mapping Unit (5530) •
- •
- Bitter Cherry Shrubland Alliance (6300) •
- Willow spp./Meadow Shrubland Mapping Unit (6500) •
- Willow spp. Riparian Shrubland Mapping Unit (6600) •

MOSI SW

2014 – QUAKING ASPEN/WILLOW SPP. TALUS MAPPING UNIT Populus tremuloides/Salix spp. Talus Mapping Unit

DISTRIBUTION:



DESCRIPTION:

The *Populus tremuloides/Salix spp.* talus mapping unit is mapped on moderate to very steep talus slopes of varying aspect between 2181 -- 3370 m (7154 -- 11058 ft). These sparse to moderately dense stands support at least 5% cover of shrubby *Populus tremuloides* and at least 5% cover of *Salix spp.* emerging from broken talus. *Chrysolepis sempervirens* and *Artemisia tridentata* may also be present in the shrub layer. The understory of mesic herbaceous species often includes *Veratrum californicum, Pteridium aquilinum,* and *Castilleja miniata.* This type is frequently associated with avalanche courses and rock falls. Sites may be temporarily to seasonally flooded and have minimal soil development.

PHOTO INTERPRETATION SIGNATURE:

The signature of *Populus tremuloides* varies from red to brown in color while smooth in texture and usually occurs in shrub form. The signature of the *Salix* is frequently lighter red in color than the *Populus tremuloides* and also has a smooth texture.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 2181 -- 3370 m (7154 -- 11058 ft) Shape –convex to concave Slope position – low to high slope Steepness – moderate to very steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen Forest Alliance (2010) •
- •
- Quaking Aspen/Willow spp. Forest Mapping Unit (2013) Quaking Aspen/Big Sagebrush Forest Superassociation (2016) Willow spp./Meadow Shrubland Mapping Unit (6500) ٠
- •
- Willow spp. Talus Shrubland Mapping Unit (6700)



2016 – QUAKING ASPEN/BIG SAGEBRUSH FOREST SUPERASSOCIATION Populus tremuloides/Artemisia tridentata Forest Superassociation

MOKA_NE

DISTRIBUTION:



DESCRIPTION:

The Populus tremuloides/Artemisia tridentata forest superassociation is mapped on gentle to steep slopes of varying aspect between 2010 -- 3391 m (6596 -- 11126 ft). This superassociation includes the most xeric of the Populus tremuloides types, which form sparse to nearly closed stands of Populus tremuloides (at least 5% cover) over a shrub layer of at least 5% cover of Artemisia tridentata. P. tremuloides frequently assumes a shrubby form in these stands. Pinus contorta, P. jeffreyi, and/or Abies magnifica may be emergent in the tree canopy. Other shrubs present may include Ribes cereum, Symphoricarpos rotundifolius, and/or Holodiscus microphyllus. Characteristic herbs may include Monardella odoratissima, Apocynum androsaemifolium, Carex filifolia, or Gayophytum diffusum. Sites are characterized by upland hydrology. Soils are well drained sandy loams. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

The signature of *Populus tremuloides* in this type is pink or light red in color with a small round crown that appears smooth and is usually in shrub form. *Artemisia tridentata* has a uniform gray or brown signature and usually dominates the shrub layer.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – subxeric Elevation – 2010 -- 3391 m (6596 -- 11126 ft) Shape – concave to convex Slope position – flats and lower slopes Steepness – gentle to steep

ASPECT:



- Quaking Aspen Forest Alliance (2010)
- Quaking Aspen/Willow spp. Talus Mapping Unit (2014)
- Big Sagebrush Shrubland Alliance (5160)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Superalliance (5590)
- Willow spp. Talus Shrubland Mapping Unit (6700)

- 2017– QUAKING ASPEN/MEADOW MAPPING UNIT Populus tremuloides/Meadow Mapping Unit

DISTRIBUTION:



DESCRIPTION:

The *Populus tremuloides*/meadow mapping unit is mapped on gentle to very steep mesic slopes of varying aspect between 2284 -- 2907 m (7494 -- 9539 ft). The overstory of these open to closed stands is dominated by at least 5% cover of *Populus tremuloides* over a dense herbaceous layer of *Juncus spp, Poa spp., Carex spp.* and *Elymus spp.* Soils are well developed and are often temporarily flooded.

PHOTO INTERPRETATION SIGNATURE:

Populus tremuloides has a characteristic pattern and texture that appears consistent throughout the stands – crown size does vary but the textures between varying stand sizes are similar. Through field reconnaissance and the mapping of similar stands throughout the eastern Sierras, photo interpreters observe that colors vary from pink/orange to deeper reds depending on plant health and how mesic the stand is. This type is mesic and often adjacent to meadows, which have a very smooth texture.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 2284 -- 2907 m (7494 -- 9539 ft) Shape – neutral Slope position – lower Steepness – flat to gently sloping





- Quaking Aspen Forest Alliance (2010) •

- Quaking Aspen/Willow spp. Forest Mapping Unit (2013)
 Black Cottonwood Temporarily Flooded Forest Alliance (2050)
 Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland Mapping Unit (5530)
 Willow spp. Riparian Shrubland Mapping Unit (6600)

CALIFORNIA BLACK OAK FOREST ALLIANCE



SEKI.0238_291

California Black Oak Forest

2020 – CALIFORNIA BLACK OAK FOREST ALLIANCE Quercus kelloggii Forest Alliance



GIFO_NW

DISTRIBUTION:



DESCRIPTION:

The Quercus kelloggii forest alliance is mapped on gentle to very steep slopes of varying aspect between 893 -- 2641 m (2929 -- 8664 ft). The overstory of these open to closed stands is dominated by Quercus kelloggii, with Pinus ponderosa, Calocedrus decurrens, Pinus lambertiana and/or Quercus chrysolepis often present. When present the shrub layer may include Arctostaphylos patula, A. viscida, A. mewukka, Ceanothus spp., or Ribes roezlii. Stands often have an understory of Chamaebatia foliolosa and a dense carpet of leaf litter, and are often found in late-seral post fire environments. Soils are moderately well drained sandy clay loams, loams, and sandy loams. The hydrology is upland. (NatureServe October 2006) In the aggregated database, the Quercus kelloggii forest alliance includes the Quercus kelloggii/Arctostaphylos patula forest association (2021) and the Quercus kelloggii/Arctostaphylos mewukka-Chamaebatia foliolosa forest association (2026).

PHOTO INTERPRETATION SIGNATURE:

The photo signature for *Quercus kelloggii* is bright red with widespread irregular round crowns and a smooth texture. The texture of *Q. kelloggii* stands vary from smooth to slightly mottled depending on conifer component, stand age, and structural diversity.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic to subxeric Elevation – 893 -- 2641 m (2929 -- 8664 ft) Shape – variable; generally convex Slope position – variable; low to high slope Steepness – gentle to very steep

ASPECT:



- Canyon Live Oak Forest Alliance (1020)
- Canyon Live Oak-California Laurel Forest Superassociation (1024)
- Interior Live Oak Woodland Alliance (1040)
- Interior Live Oak Canyon Live Oak Woodland Association (1043)
- Blue Oak Woodland Alliance (2030)
- Oregon White Oak Shrubland Alliance (6020)

2021 – CALIFORNIA BLACK OAK/GREENLEAF MANZANITA FOREST ASSOCIATION

Quercus kelloggii/Arctostaphylos patula Forest Association



LODG_NE

DISTRIBUTION:



DESCRIPTION:

The Quercus kelloggii/Arctostaphylos patula forest association is mapped on moderate to steep south to southwest facing slopes between 1455 -- 2641 m (4774 -- 8664 ft). These moderately open stands of *Quercus kelloggii* have an open to closed shrub layer dominated by Arctostaphylos patula. Pinus ponderosa may occur as a canopy emergent. Ceanothus integerrimus frequently occurs in the shrub layer, and Chamaebatia foliolosa is often an important understory component. Other montane chaparral shrub species, such as Chrysolepis sempervirens and Ceanothus cordulatus may also be present. The hydrology is upland, and the soils are moderately well developed sandy loams. (NatureServe October 2006) In the aggregated database, the Quercus kelloggii/Arctostaphylos patula forest association is aggregated into the Quercus kelloggii forest alliance (2020).

PHOTO INTERPRETATION SIGNATURE:

The photo signature for *Quercus kelloggii* is bright red with widespread irregular round crowns and a smooth texture. The signature for *Arctostaphylos patula* is an orange or orange-brown color with a coarse texture. The *Arctostaphylos patula* occurs as a sparse to dense understory to the *Quercus kelloggii*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1455 -- 2641 m (4774 -- 8664 ft) Shape – convex Slope position – low to midslope Steepness – moderate to steeply sloping

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak/Whiteleaf Manzanita Forest Association (1022) ٠
- Canyon Live Oak/Greenleaf Manzanita Forest Association (1022)
 Canyon Live Oak/Greenleaf Manzanita Forest Association (1029)
 California Black Oak/Indian Manzanita Mountain Misery Forest Association (2026)
 Oregon White Oak-Birchleaf Mountain Mahogany Shrubland Association (6022)



2025 – CALIFORNIA BLACK OAK/(BRACKEN FERN) FOREST MAPPING UNIT Quercus kelloggii/(Pteridium aquilinum) Forest Mapping Unit

SHMO_NE

DISTRIBUTION:



DESCRIPTION:

The Quercus kelloggii/(Pteridium aquilinum) forest mapping unit is mapped on moderately steep southeast to southwest facing slopes between 1035 -- 2091 m (3397 -- 6860 ft). Stands are dominated by an open canopy of Quercus kelloggii over a dense herbaceous layer of grasses and herbaceous annuals, including Bromus spp. and Torilis arvensis; Pteridium aquilinum is often important. Shrubs generally contribute low cover to this type, but Ceanothus integerrimus, Arctostaphylos viscida, and Cercocarpus montanus var. glaber are frequently present. The hydrology is upland, but this type may occur on fringes of drier meadows; soils are moderately well drained silty clay loams and loams.

PHOTO INTERPRETATION SIGNATURE:

The signature for the large *Quercus kelloggii* trees that typically occur in this association is dark red with broad, uneven rounded crowns that grow over an understory of annual grasses and herbs that appears gray or tan.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – subxeric Elevation – 1035 -- 2091 m (3397 -- 6860 ft) Shape – convex Slope position – low slope Steepness – moderately steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• Blue Oak/Brome spp.-American Wild Carrot Woodland Association (2033)

2026 - CALIFORNIA BLACK OAK/INDIAN MANZANITA-MOUNTAIN MISERY

FOREST ASSOCIATION Quercus kelloggii/Arctostaphylos mewukka-Chamaebatia foliolosa Forest Association



SHMO_NE

DISTRIBUTION:



DESCRIPTION:

The Quercus kelloggii/Arctostaphylos mewukka-Chamaebatia foliolosa forest association is mapped on moderate to steep south to southwest facing slopes between 1140 -- 2117 m (3740 -- 6944 ft). These moderately open stands of Quercus kelloggii have an open to closed shrub layer dominated by Arctostaphylos mewukka, with a dense layer of Chamaebatia foliolosa characterizing the understory. Arctostaphylos patula and/or Ceanothus integerrimus may also be present in the shrub layer. The herbaceous layer is generally sparse, but may include a diverse array of xeric species such as Galium sparsiflorum, Chlorogalum pomeridianum, or Elymus glaucus. This type is often mapped in post-fire settings. The hydrology is upland, and the soils are moderately well drained sandy clay loams. (NatureServe October 2006) In the aggregated database, the Quercus kelloggii forest alliance (2020).

PHOTO INTERPRETATION SIGNATURE:

The Quercus kelloggii signature is dark red with broad asymmetrical rounded crowns. The signature for Arctostaphylos mewukka is smooth and orange or tan in color. The signature for Chamaebatia foliolosa Mountain Misery is pink or red with a very smooth texture. The Chamaebatia foliolosa and Arctostaphylos mewukka typically grow in post fire areas and can either occur together or alone as a sparse to dense understory beneath the Quercus kelloggii canopy.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1140 -- 2117 m (3740 -- 6944 ft) Shape – convex Slope position – low slope Steepness – moderate to steep

ASPECT:



- Canyon Live Oak/Whiteleaf manzanita Forest Association (1022)
- Canyon Live Oak/Greenleaf Manzanita Forest Association (1029)
- California Black Oak/Greenleaf Manzanita Forest Association (2021)
- Oregon White Oak-Birchleaf Mountain Mahogany Shrubland Association (6022)

BLUE OAK WOODLAND ALLIANCE



SEKI.0211_178

Blue Oak-California Buckeye-Interior Live Oak Woodland





DISTRIBUTION:



DESCRIPTION:

The Quercus douglasii woodland alliance is mapped on gentle to moderately steep south to southwest or west-facing slopes between 394 -- 1462 m (1293 -- 4796 ft). Woodland associations in this alliance form the characteristic oak savannahs of the western foothills. Typical stands contain *Quercus douglasii* as an important or dominant species in the tree canopy, which may be two-tiered. Other trees may include *Quercus wislizeni var wislizeni*, *Aesculus californica, Quercus kelloggii*, and *Fraxinus dipetala*. Although shrub cover is usually low (less than 20% absolute cover) species present may include *Arctostaphylos viscida, Cercocarpus montanus var. glaber, Cercis canadensis var. texensis, Keckiella breviflora, Rhamnus ilicifolia, Ceanothus cuneatus, Eriodictyon californicum, Rhus trilobata, and <i>Toxicodendron diversilobum*. The understory is made up of a diverse assemblage of annual grasses and herbaceous species, which is typically dominated by a mixture of *Bromus diandrus* or *B. hordeaceous, Avena fatua* or *A. barbata*. The hydrology is upland, and the soils are moderately well drained sandy clay loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature of *Quercus douglasii* is fairly consistent with a diffused open round crown that ranges in color from orange to brown.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - xeric Elevation – 394 -- 1462 m (1293 -- 4796 ft) Shape – concave to convex Slope position – low slope Steepness – gentle to moderate; occasionally steep

ASPECT:



- California Black Oak Forest Alliance (2020)
- Blue Oak/Brome spp.-American Wild Carrot Woodland Association (2033)
- Blue Oak-Interior Live Oak/Brome spp.-American Wild Carrot Woodland Association
 (2034)
- Blue Oak-California Buckeye-(Interior Live Oak) Woodland Mapping Unit (2038)

2033 – BLUE OAK/BROME SPP.-AMERICAN WILD CARROT WOODLAND ASSOCIATION

Quercus douglasii/Bromus spp.-Daucus pusillus Woodland Association





DISTRIBUTION:



DESCRIPTION:

The Quercus douglasii/ Bromus spp.- Daucus pusillus woodland association is mapped on gentle to moderate south to southwest facing slopes between 419 -- 1341 m (1375 -- 4398 ft). The tree canopy is open, with up to 50% absolute cover of Quercus douglasii. Aesculus californica and Quercuswislezeni may also contribute low amounts of cover. The sparse shrub layer (<10% absolute cover) may include Arctostaphylos viscida, Eriodictyon californicum, and Ceanothus cuneatus. The continuous herbaceous layer is dominated by Bromus diandrus, B. hordeaceous, and/or Avena barbata, with Madia elegans, Holocarpha heermanii, and Lupinus bicolor contributing significant cover during different times of the year. The hydrology is upland. Soils are moderately well drained sandy clay loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature of *Quercus douglasii* is fairly consistent with a diffused open round crown that ranges in color from orange to brown over a smooth dense understory of non-native annual grasses and forbs.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – subxeric to xeric Elevation – 419 -- 1341 m (1375 -- 4398 ft) Shape – convex, undulating Slope position – low to middle slope Steepness – gentle to moderately sloping; occasionally steep

ASPECT:



- California Black Oak/(Bracken Fern) Forest Mapping Unit (2025)
- Blue Oak Woodland Alliance (2030)
- Blue Oak-Interior Live Oak/Brome spp.-American Wild Carrot Woodland Association (2034)

2034 - BLUE OAK-INTERIOR LIVE OAK/BROME SPP.-AMERICAN WILD CARROT

WOODLAND ASSOCIATION Quercus douglasii-Quercus wislizeni var. wislizeni/Bromus spp.-Daucus pusillus Woodland Association



GIFO_SE DISTRIBUTION:



DESCRIPTION:

The Quercus douglasii-Quercus wislizeni var. wislizeni/Bromus spp.-Daucus pusillus woodland association is mapped on moderate to moderately steep slopes of south, southwest or west facing aspect between 394 -- 1236 m (1293 -- 4056 ft). These open-canopied woodlands are co-dominated by Quercus douglasii and Quercus wislizeni var wislizeni in the tree layer, with Aesculus californica frequently contributing low cover and Fraxinus dipetala occasional in the subcanopy. The sparse shrub layer (<10% absolute cover) may include Arctostaphylos viscida, Eriodictyon californicum, Ceanothus cuneatus, and Toxicodendron diversilobum. Bromus diandrus, B. hordeaceous, Avena barbata, Madia elegans, Torilis nodosa and Holocarpha heermanii dominate the generally continuous and diverse herb layer. The hydrology is upland. Soils are moderately well developed sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature for *Quercus douglasii* is orange or brown with a diffused, open crown. The *Q. wislizeni var. wislizeni* varies from dull to dark red in color with a small, round crown. Stands are generally open with a dense understory of annuals and grasses that appear gray or tan.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 394 -- 1236 m (1293 -- 4056 ft) Shape – convex to undulating Slope position – low to mid slope Steepness –moderate to moderately steep

ASPECT:


TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:Interior Live Oak Woodland Alliance (1040)

- Blue Oak Woodland Alliance (2030)
 Blue Oak/Brome spp.-American Wild Carrot Woodland Association (2033)

2038 – BLUE OAK-CALIFORNIA BUCKEYE-(INTERIOR LIVE OAK) WOODLAND MAPPING UNIT *Quercus douglasii-Aesculus californica-(Quercus wislizeni var. wislizeni)* Woodland Mapping Unit



SHMO_SE

DISTRIBUTION:



DESCRIPTION:

The Quercus douglasii-Aesculus californica-(Quercus wislizeni var. wislizeni) woodland mapping unit is mapped on moderately sloping predominantly south to southwest facing hillsides between 404 -- 1462 m (1324 -- 4796 ft). The tree canopy is dominated by a mixture of *Quercus douglasii*, *Aesculus californica*, and *Q. wislizeni var. wislizeni* in two distinct expressions. One expression is characterized by open woodlands of *Quercus douglasii* and *Aesculus californica* occurring over a rich understory of primarily non-native annual grasses. In the other expression, the tree canopy is generally more closed and is dominated by a mixture of *Quercus douglasii*, *Aesculus californica* and *Q. wislizeni var. wislizeni*. Scattered understory shrubs can include *Rhamnus ilicifolia, Ceanothus cuneatus, Toxicodendron diversilobum, Cercocarpus montanus var. glaber*, and *Cercis canadensis var. texensis. Avena barbata, Bromus diandrus, B. hordeaceous, Holocarpha heermanii, Madia elegans*, and *Torilis nodosa* dominate the generally continuous and diverse herb layer. The hydrology is upland. Soils are moderately to well drained sandy clay loams.

PHOTO INTERPRETATION SIGNATURE:

The signature of *Quercus douglasii* varies from an orange to brown color with short, irregular or round crowns. The signature of *Aesculus californica* has a small or medium asymmetrical shaped yellow crown, and the signature of *Q. wislizeni var. wislizeni* varies from dull to dark red in color with a small,round crown. Stands are generally open with a dense understory of annual grasslands that appear gray or tan. Overall stand signature varies depending on relative abundance of the canopy trees.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic to subxeric Elevation – 404 -- 1462 m (1324 -- 4796 ft) Shape – convex to concave Slope position – low slope Steepness – gentle to moderately steep; usually moderately sloping

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Blue Oak Woodland Alliance (2030)
- California Buckeye Woodland Alliance (2110)
- California Buckeye Canyon Live Oak Woodland Association (2114)

BLACK COTTONWOOD TEMPORARILY FLOODED FOREST ALLIANCE



SEKI.0277_0402

Black Cottonwood Forest



2050 – BLACK COTTONWOOD TEMPORARILY FLOODED FOREST ALLIANCE Populus balsamifera ssp. trichocarpa Temporarily Flooded Forest Alliance

CHFA_NE

DISTRIBUTION:



DESCRIPTION:

The *Populus balsamifera ssp. trichocarpa* temporarily flooded forest alliance is mapped on gentle to moderate slopes of varying aspect between 1203 --2709 m (3948 -- 8888 ft). These riparian stands can occupy alluvial terraces along streams and rivers, or form narrow stringers adjacent to streams with a much steeper slope. The tree layer is characteristically open to moderately dense and is dominated by *Populus balsamifera ssp. trichocarpa*. Other tree associates may include *Pinus ponderosa, Abies concolor, Alnus rhombifolia, Calocedrus decurrens, Pinus contorta* and occasionally *Quercus chrysolepis*, reflecting the drier associations frequently found in adjacent upland types. A shrub layer is usually present and may be dominated by *Ribes cereum, Salix spp.*, or *Cornus sericea*. Common species in the relatively sparse herbaceous layer include *Pteridium aquilinum, Artemisia douglasiana,* and *Equisetum hyemale*. Soils are well drained sands, sandy loams, and sandy clay loams. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

The signature for Black Cottonwood ranges from a bright pink to dark red color with a large, irregular crown that exhibits a billowy texture. Photo interpreters often map stands containing *Populus tremuloides* adjacent to or as a component of cottonwood stands. Stands of *Quercus chrysolepsis* occasionally are adjacent to cottonwood but are generally not noted by photo interpreters in stands containing *Populus balsamifera*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – temporarily flooded during growing season Elevation – 1203 --2709 m (3948 -- 8888 ft) Shape – flat to undulating Slope position – canyon bottoms and low slopes Steepness – level to gently sloping

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen Forest Alliance (2010) •
- Quaking Aspen/Meadow Mapping Unit (2017) Black Cottonwood Forest Association (2053) •
- ٠
- White Alder Temporarily Flooded Forest Alliance (2060) Water Birch Shrubland Alliance (5300) •
- •
- Willow spp./Meadow Shrubland Mapping Unit (6500) •
- Willow spp. Riparian Shrubland Mapping Unit (6600) •



2053 – BLACK COTTONWOOD FOREST ASSOCIATION Populus balsamifera ssp. trichocarpa Forest Association

MOKA_SE

DISTRIBUTION:



DESCRIPTION:

The Populus balsamifera ssp. trichocarpa forest association is mapped on gentle to steep slopes of varying aspects between 1349 -- 2500 m (4425 -- 8201 ft). These riparian stands can occupy alluvial terraces along streams and rivers, or form narrow stringers adjacent to streams with a much steeper slope. The overstory is dominated by *Populus balsamifera ssp. trichocarpa* with *Abies concolor* frequently occurring as a co-dominant. As mapped, *Pinus contorta* and *Populus tremuloides* may also contribute significant cover to the tree layer. *Alnus incana ssp. tenuifolia, Salix exigua,* and *Cornus sericea* are frequently found in the well-developed shrub layer, especially in mesic areas adjacent to the water's edge. A well-developed forb layer often includes *Artemisia douglasiana, Equisetum arvense,* and *Lupinus latifolius.* Sites are characterized by riparian hydrology, and soils are typically sandy loams. This association is closely related to the black cottonwood association described by Potter (2005).

PHOTO INTERPRETATION SIGNATURE:

The signature for *Populus balsamifera ssp. trichocarpa* ranges from a bright pink to dark red color with a large, irregular crown that exhibits a billowy texture. The photo signature for *Abies concolor* is red with a narrow, conical crown that also has a billowy texture.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – temporarily to seasonally flooded Elevation – 1349 -- 2500 m (4425 -- 8201 ft) Shape – neutral Slope position – lower Steepness – flat

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Black Cottonwood Temporarily Flooded Forest Alliance (2050)
- White Alder Temporarily Flooded Forest Alliance (2060)
- White Fir Forest Mapping Unit (4081)
- Incense-Cedar-White Alder Forest Association (4111)
- Willow spp./Meadow Shrubland Mapping Unit (6500)
- Willow spp. Riparian Shrubland Mapping Unit (6600)

WHITE ALDER TEMPORARILY FLOODED FOREST ALLIANCE



SEKI-AA.0152_702

White Alder Temporarily Flooded Forest



2060 – WHITE ALDER TEMPORARILY FLOODED FOREST ALLIANCE Alnus rhombifolia Temporarily Flooded Forest Alliance

GIFO_NW

DISTRIBUTION:



DESCRIPTION:

The Alnus rhombifolia temporarily flooded forest alliance is mapped along gentle to steeply sloping low to mid-elevation watercourses of varying aspect between 671 -- 2073 m (2201 -- 6802 ft). The tree canopy is dominated by Alnus rhombifolia, with Platanus racemosa, Populus balsamifera, Quercus chrysolepis, or Acer macrophyllum often co-dominating. Calocedrus decurrens frequently contributes low cover to the tree canopy. The shrub layer is usually dense and diverse and is frequently multi-layered, with Pteridium aquilinum, Cornus sericea, Salix spp, Rubus leucodermis, Calycanthus occidentalis, and/or Toxicodendron diversilobum contributing significant cover. The herbaceous layer can be either sparse or diverse, with species composition dependent on elevation, degree of canopy closure, and the composition of the surrounding vegetation. Stands are characterized by riverine hydrology and are temporarily/seasonally flooded. Soils are well drained loamy sands and sandy loams. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

Alnus rhombifolia appears bright pink or red with a small, rounded crown on the aerial photos and is usually found forming dense stands in riparian environments. *Alnus rhombifolia* is also found in narrow canyons containing perennial streams in a variety of slope conditions.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 671 -- 2073 m (2201 -- 6802 ft) Shape – generally flat Slope position – canyon bottoms and low slopes Steepness – gentle to moderately sloping

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Black Cottonwood Temporarily Flooded Forest Alliance (2050) •
- Black Cottonwood Forest Association (2053) •
- Bigleaf Maple Forest Alliance (2080) ٠
- California Sycamore Temporarily Flooded Woodland Alliance (2100) Incense-Cedar-White Alder Forest Association (4111) ٠
- •
- Water Birch Shrubland Alliance (5300) •

2061 – WHITE ALDER-RED WILLOW-CALIFORNIA SYCAMORE FOREST ASSOCIATION

Alnus rhombifolia-Salix laevigata-Platanus racemosa Forest Association



SHMO_SE

DISTRIBUTION:



DESCRIPTION:

The Alnus rhombifolia-Salix laevigata-Platanus racemosa forest association is mapped along gentle to moderately steep low elevation streams between 523 -- 1063 m (1716 -- 3488 ft). The tree layer of these riparian stands is characterized by *Platanus racemosa* mixed with varying amounts of *Alnus rhombifolia* and *Salix laevigata*. Frequently encountered shrubs include *Baccharis salicifolia*, *Salix lasiolepis, Toxicodendron diversilobum,* and *Vitis californica*. The understory is generally well developed, and most often is characterized by the presence of *Artemisia douglasiana, Carex nudata, Mimulus guttatus, Rumex crispus,* and *Torilis arvense*. Stands are characterized by temporarily flooded riparian hydrology. The soils are rocky sands and gravels. (Potter 2005).

PHOTO INTERPRETATION SIGNATURE:

The signature of *Platanus racemosa* is pink or red with an irregularly shaped expansive open crown. The signature of the *Alnus rhombifolia* is a brighter pink color with a small, rounded crown. The *Platanus racemosa* is usually larger in stature than the *Alnus rhombifolia* and they occur together in dense patches in riparian areas where they display a billowy texture.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 523 -- 1063 m (1716 -- 3488 ft) Shape – neutral Slope position – drainage bottoms Steepness – moderately sloping

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

California Sycamore – (Canyon Live Oak-Interior Live Oak) Forest Mapping Unit (2102)

BIGLEAF MAPLE FOREST ALLIANCE



SEKI.0332_435

Bigleaf Maple Forest

2080 – BIGLEAF MAPLE FOREST ALLIANCE Acer macrophyllum Forest Alliance



GIFO_SE

DISTRIBUTION:



DESCRIPTION:

The Acer macrophyllum forest alliance is mapped on mesic moderate to steep north-facing slopes between 1077 -- 2270 m (3535 -- 7448 ft). Acer macrophyllum dominates the tree canopy, although Calocedrus decurrens, Quercus chrysolepis, and Torreya californica may contribute minor amounts of cover. The herbaceous layer is generally sparse but may include Dryopteris arguta, Toxicodendron diversilobum, and other mesic lower montane/upper foothill species. Sites have upland or riparian hydrology and well drained rocky soils.

PHOTO INTERPRETATION SIGNATURE:

The signature of *Acer macrophyllum* is a pink color with an expansive round crown. It is typically found in a dense patch along steep, rocky riparian environments and appears smooth in texture.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 1077 -- 2270 m (3535 -- 7448 ft) Shape – concave Slope position – low slopes and valley bottoms Steepness – moderately sloping to steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• White Alder Temporarily Flooded Forest Alliance (2060)

CALIFORNIA SYCAMORE TEMPORARILY FLOODED WOODLAND ALLIANCE



SEKI.0400_445

California Sycamore-Canyon Live Oak Forest

2100 – CALIFORNIA SYCAMORE TEMPORARILY FLOODED WOODLAND ALLIANCE

Platanus racemosa Temporarily Flooded Woodland Alliance



GIFO_SW

DISTRIBUTION:



DESCRIPTION:

The *Platanus racemosa* temporarily flooded woodland alliance is mapped along gentle to moderately steep low elevation streams between 388 -- 1383 m (1274 -- 4536 ft). These communities are characterized by the dominance of *Platanus racemosa*, with *Quercus wislizeni var. wislizeni, Quercus chrysolepis,* or *Umbellularia californica* also important. *Alnus rhombifolia* may also contribute low cover. The shrub cover is generally sparse, but may include *Calycanthus occidentalis, Toxicodendron diversilobum, Cercis canadensis var. texensis* and/or *Salix spp.* The herbaceous layer is also relatively sparse but may include a variety of mesic foothill species. Stands are characterized by temporarily flooded riparian hydrology. Soils are rocky sands and gravels. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature of *Platanus racemosa* is pink with a broad, irregular, open crown and a smooth overall texture. *Quercus chrysolepis* is often present mixing along the drier edges of this alliance, especially along steep rocky interfaces.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 388 -- 1383 m (1274 -- 4536 ft Shape – neutral Slope position – drainage bottoms Steepness – gentle to moderate slopes





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• White Alder Temporarily Flooded Forest Alliance (2060)

2102 - CALIFORNIA SYCAMORE-(CANYON LIVE OAK-INTERIOR LIVE OAK) FOREST MAPPING UNIT Platanus racemosa/(Quercus chrysolepis-Quercus wislizeni var. wislizeni) Forest

Mapping Unit





DISTRIBUTION:



DESCRIPTION:

The Platanus racemosa – (Quercus chrysolepis – Quercus wislizeni var. wislizeni) forest mapping unit is mapped on gentle to moderate slopes adjacent to foothill rivers and streams between 417 --1383 m (1368 -- 4536 ft). The tree layer of these closed riparian forest stands is co-dominated by Platanus racemosa and Quercus chrysolepis, with Calocedrus decurrens and Umbellularia californica occasionally contributing lower amounts of cover. Toxicodendron diversilobum, Rhamnus tomentella, and Calycanthus occidentalis are frequently found in the shrub layer. The herbaceous layer includes typical upland herbs such as Galium spp., Trifolium spp., Bromus spp., Hypochaeris glabra, Pentagramma triangularis, Madia elegans, and Claytonia spp., along with more typically riparian species such as Artemisia douglasiana. Sites are characterized by temporarily flooded, riparian hydrology and soils of moderately well drained sandy loam. This type is very similar to the California sycamore/poison oak association (Potter 2005) with the exception of the presence of Quercus chrysolepis in SEKI stands.

PHOTO INTERPRETATION SIGNATURE:

The signature of *Platanus racemosa* is pink or red with a broad, irregularly shaped open crown. The photo signature of *Quercus chrysolepis* appears pink or red with a large round crown. The texture of this dense riparian vegetation is smooth and uniform.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 417 --1383 m (1368 -- 4536 ft) Shape – neutral Slope position – drainage bottoms Steepness – moderate

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• White Alder Temporarily Flooded Forest Alliance (2060)

CALIFORNIA BUCKEYE WOODLAND ALLIANCE



California Buckeye-Birchleaf Mountain Mahogany-Canyon Live Oak-Black Oak Woodland

- 2110 CALIFORNIA BUCKEYE WOODLAND ALLIANCE Aesculus californica Woodland Alliance



DEPE_NE

DISTRIBUTION:



DESCRIPTION:

The Aesculus californica woodland alliance is mapped on generally steep north to east-facing low slopes between 451 -- 1700 m (1481 -- 5579 ft). These small open stands are dominated by Aesculus californica and usually have Quercus chrysolepis or Q. wislizeni var. wislizeni contributing low cover. The sparse shrub layer is characterized by Cercocarpus montanus var. glaber and can also include Fremontodendron californicum. The understory is characterized by herbaceous plants typical of the foothill annual grassland. The hydrology is upland. Soils are moderately well drained sandy clay loams and silty clay loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Aesculus californica* appears yellow with small to medium irregularly shaped crowns. The pure stands of *Aesculus californica* are usually small and dense with a billowy texture.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 451 -- 1700 m (1481 -- 5579 ft) Shape – concave to convex Slope position – low slope Steepness – steep





- TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:
 Blue Oak-California Buckeye-(Interior Live Oak) Woodland Mapping Unit (2038)
 Birchleaf Mountain Mahogany Shrubland Alliance (5010)



2114 – CALIFORNIA BUCKEYE-CANYON LIVE OAK WOODLAND ASSOCIATION Aesculus californica-Quercus chrysolepis Woodland Association



DISTRIBUTION:



DESCRIPTION:

The Aesculus californica-Quercus chrysolepis woodland association [provisional] is mapped on gentle to very steep slopes of varying aspect between 666 -- 1700 m (2186 -- 5579 ft). A moderately dense to closed tree canopy is co-dominated by Aesculus californica and Quercus chrysolepis on low to mid slope settings. Stands of this type are mapped at the upper end of the elevation range of Aesculus californica. Due to a lack of plot data for this often steep and inaccessible type, little is known about the understory composition. It is retained in the mapping classification based on field reconnaissance and input from the photo interpreters, who express confidence in its distribution in the Kaweah River drainage. Plot data is required to further describe this type.

PHOTO INTERPRETATION SIGNATURE:

In this woodland, the photo signature of *Aesculus californica* appears yellow with small to medium irregularly shaped crowns. The signature of *Quercus chrysolepis* is pink or red with a broad round crown. The texture of this woodland is variable: smooth where the *Quercus chrysolepis* dominates and rough or uneven where the *Aesculus californica* dominates.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 666 -- 1700 m (2186 -- 5579 ft) Shape – neutral to concave Slope position – mid to low Steepness – gentle to very steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• Blue Oak-California Buckeye-(Interior Live Oak) Woodland Mapping Unit (2038)
2530 – MONTANE BROADLEAF DECIDUOUS TREES MAPPING UNIT Montane Broadleaf Deciduous Trees Mapping Unit

DISTRIBUTION:



DESCRIPTION:

The montane broadleaf deciduous trees mapping unit represents a formation level class that is mapped in only a few instances in Sequoia National Park. It is mapped on gentle to moderately steep north trending slopes between 1643 -- 1883 m (5391 -- 6177 ft). These patches of tall shrub to short tree vegetation in coniferous forest openings are dominated by such deciduous species as *Cornus nuttallii* and *Corylus cornuta*, which proved difficult to distinguish on the aerial photography.

PHOTO INTERPRETATION SIGNATURE:

This mapping unit is a back-off category for small openings in forest canopy. The signature is highly variable.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - submesic

Elevation - 1643 -- 1883 m (5391 -- 6177 ft).

ASPECT:



SIERRA LODGEPOLE PINE-QUAKING ASPEN FOREST ALLIANCE



SEKI.0250_340

Sierra Lodgepole Pine-Quaking Aspen Forest



3010 – SIERRA LODGEPOLE PINE-QUAKING ASPEN FOREST ALLIANCE Pinus contorta var. murrayana-Populus tremuloides Forest Alliance



DISTRIBUTION:



DESCRIPTION:

The Pinus contorta var. murrayana-Populus tremuloides alliance is mapped on gentle to moderate slopes of varying aspect between 2149 -- 3235 m (7049 -- 10613 ft). These types are often adjacent to or in close proximity to meadows. The relatively open tree canopy (20-70% absolute cover) is dominated by a mixture of Pinus contorta var. murrayana and Populus tremuloides, with Abies concolor, A. magnifica, and/or Juniperus occidentalis var. australis contributing lower amounts of cover. The shrub layer is generally sparse (<30% absolute cover) and can contain Arctostaphylos patula, Artemisia tridentata, Ledum glandulosum, and/or Salix spp. The herbaceous layer can be either sparse or dense depending on site conditions and is often characterized by Poa pratensis, Elymus glaucus, Monardella sp., Epilobium angustatum, and/or Heracleum lanatum.

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Pinus contorta var. murrayana* ranges from dark red to dark brown in color and a narrow, rounded shaped crown. *Populus tremuloides* conveys a brighter red to orange signature and often forms small patches among the conifers.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2149 -- 3235 m (7049 -- 10613 ft) Shape – flat to concave or undulating Slope position – canyon bottom, low slope, midslope Steepness – gentle to moderate





- TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

 •
 Sierra Lodgepole Pine-Quaking Aspen/(Kentucky Bluegrass) Forest Mapping Unit (3012)
 - Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022) Sierra Lodgepole Pine Mesic Forest Superassociation (3048) ٠
 - •

3012 – SIERRA LODGEPOLE PINE-QUAKING ASPEN/(KENTUCKY BLUEGRASS)

FOREST MAPPING UNIT Pinus contorta var. murrayana-Populus tremuloides/(Poa pratensis) Forest Mapping Unit



MOKA NW

DISTRIBUTION:



DESCRIPTION:

The *Pinus contorta var. murrayana-Populus tremuloides/(Poa pratensis)* forest mapping unit is mapped on canyon bottoms and gentle slopes of various aspects between 2322 -- 3005 m (7619 -- 9859 ft) along the edges of moist meadows. The tree canopy may be either open or closed and is dominated by a mixture of *Pinus contorta var. murrayana* and *Populus tremuloides*, with *Populus tremuloides* often occupying a subcanopy position. The shrub layer is sparse to absent. The herbaceous layer is made up of drier meadow species including *Juncus balticus, Poa pratensis*, and *Carex spp.* Soils are moderately well drained sandy clay loams on temporarily flooded sites.

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Pinus contorta var. murrayana* ranges from dark red to dark brown in color with a narrow, rounded crown. *Populus tremuloides* has a brighter red to orange signature, and often occurs in small patches among the conifers. This is a particularly mesic type interlaced with the smooth signature of small meadows within and adjacent to the stand.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 2322 -- 3005 m (7619 -- 9859 ft) Shape – flat Slope position – canyon bottoms and low slopes Steepness – gentle slopes





- Quaking Aspen/Willow spp. Forest Mapping Unit (2013) ٠
- Sierra Lodgepole Pine-Quaking Aspen-(Jeffrey Pine) Forest Alliance (3010) •
- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022) •
- •
- Willow spp./Meadow Shrubland Mapping Unit (6500) Willow spp. Riparian Shrubland Mapping Unit (6600) •
- Upland Herbaceous (7000) •
- Intermittently to Seasonally Flooded Meadow (8000) •
- Semi-permanently to Permanently Flooded Meadow (9000) •

SIERRA LODGEPOLE PINE FOREST ALLIANCE



SEKI.0256_361

Lodgepole Pine / Arrowleaf Butterweed Forest

- 3020 SIERRA LODGEPOLE PINE FOREST ALLIANCE Pinus contorta var. murrayana Forest Alliance

TDPE_SE

DISTRIBUTION:



DESCRIPTION:

The *Pinus contorta var. murrayana* forest alliance is mapped on a wide range of sites from gentle canyon bottoms to steep high slopes and ridges between 2028 -- 3523 m (6655 -- 11557 ft). Forests and woodlands included in this alliance are characterized by a closed to moderately open tree canopy that is dominated by *Pinus contorta var. murrayana*. *P. contorta ssp. murrayana* occupies a broad array of habitats in the Sierra Nevada, and this is reflected in the diverse range of associations it characterizes. Stands may be even- or multi-aged depending on geographic location, edaphic characteristics, and local fire history. Shrub and herbaceous layers may be present or absent depending on tree canopy characteristics and local site conditions. Stands are characterized by upland, palustrine, and seasonally flooded hydrology. Soils are well drained sands, loams, and sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Pinus contorta var. murrayana trees have a highly variable signature due to the extremes of environments in which they are found from extremely xeric to wetland settings. Generally, the crown size is small to medium; colors range in the deep reds that are typical of other pine species. Adjacent to Abies spp. and Tsuga mertensiana, crowns of *P. contorta ssp. murrayana* appear lighter in color and are more rounded. In stands with *Pinus albicaulis*, the crowns of *Pinus contorta var. murrayana* are usually narrower.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – subxeric to mesic Elevation – 2028 -- 3523 m (6655 -- 11557 ft) Shape – concave to convex or undulating Slope position – canyon bottoms to high slopes Steepness – gentle to steep

ASPECT:



- Sierra Lodgepole Pine Woodland Association (3038)
- Sierra Lodgepole Pine Xeric Forest Superassociation (3049)

3021 – SIERRA LODGEPOLE PINE SPARSE/OUTCROP WOODLAND SUPERASSOCIATION

Pinus contorta var. murrayana Sparse/Outcrop Superassociation



MOSI_SE DISTRIBUTION:



DESCRIPTION:

The *Pinus contorta var. murrayana* sparse/outcrop mapping unit is mapped on gentle to steep rock outcrops between 2526 -- 3410 m (8289 -- 11188 ft). The tree canopy of these open subalpine woodlands is characterized by extremely sparse *Pinus contorta var. murrayana* (usually below 5% absolute crown cover) on broad expanses of exposed slabs of granitic bedrock. *Abies magnifica*, *P. jeffreyi*, *P. balfouriana*, or *P. monticola* can also contribute low cover. The shrub layer is poorly developed, although scattered patches of *Chrysolepis sempervirens* and/or *Arctostaphylos patula* may be present. The herbaceous layer is also sparse, with scattered herbs (including *Penstemon newberryi*, *Streptanthus tortuosus*, *Carex exserta*, and *Juncus parryi*) growing out of rock fissures and in pockets of decomposed granitic interspersed among surface rock. In the aggregated database, the *Pinus contorta var. murrayana* woodlands superassociation mapping unit (3026).

PHOTO INTERPRETATION SIGNATURE:

The signature for *Pinus contorta var. murrayana* appears as irregularly shaped crowns that range in color from dark red to dark brown. The trees are generally small in stature and typically occur in an open, sparse pattern, surrounded by vast areas of rock that contain tiny seeps where patchy shrubs may occur.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - xeric

Elevation – 2526 -- 3410 m (8289 -- 11188 ft) Shape – convex to undulating Slope position – low to middle slopes and broad flat uplands Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Sierra Lodgepole Pine Woodlands Superassociation (3026)
- Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (3033)
- Sierra Lodgepole Pine Woodland Association (3038)
- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (3043)
- Sierra Lodgepole Pine-Xeric Forest Superassociation (3049)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

3022 – SIERRA LODGEPOLE PINE/(BOG BLUEBERRY) FOREST MAPPING UNIT Pinus contorta var. murrayana/(Vaccinium uliginosum ssp. occidentale) Forest Mapping Unit



MOSI_SW

DISTRIBUTION:



DESCRIPTION:

The Pinus contorta var. murrayana/(Vaccinium uliginosum ssp. occidentale) meadow edge mapping unit is mapped along small streams and on the edges of meadows on gentle to moderate slopes of variable aspects between 2028 -- 3388 m (6655 -- 11117 ft). The tree canopy is dominated almost entirely by Pinus contorta, which may appear stunted in size. Scattered individuals of Abies spp. or Tsuga mertensiana can also be present. The shrub layer is well developed and is typically characterized by Vaccinium uliginosum, Ledum glandulosum, and Phyllodoce breweri. On moister sites Senecio triangularis, Carex utriculata, Thalictrum sparsiflorum, and Calamagrostis canadensis are common dominants of a dense herbaceous understory. Soils are somewhat poorly to poorly drained silty loams. The hydrology is palustrine. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Pinus contorta var. murrayana* in this vegetation type is dark red or dark brown in color with narrowly rounded conical crowns. The herbaceous meadow understory often looks bright pink or red. *Pinus contorta var. murrayana* is variable in stand density and crown size but generally occurs in a dispersed stands with numerous openings to the herbaceous understory.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic to hydric Elevation – 2028 -- 3388 m (6655 -- 11117 ft) Shape – flat to concave Slope position – drainage bottoms and meadow edges Steepness – flat to gently sloping

ASPECT:



- Sierra Lodgepole Pine-Quaking Aspen (Jeffrey Pine) Forest Alliance (3010)
- Sierra Lodgepole Pine-Quaking Aspen/(Kentucky Bluegrass) Forest Mapping Unit (3012)
- Sierra Lodgepole Pine Woodlands Superassociation (3026)
- Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (3042)
- Sierra Lodgepole Pine Mesic Forest Superassociation (3048)
- California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit (4063)
- Willow spp./Meadow Shrubland Mapping Unit (6500)
- Upland Herbaceous (7000)
- Intermittently to Seasonally Flooded Meadow (8000)
- Semi-permanently to Permanently Flooded Meadow (9000)

3026 - SIERRA LODGEPOLE PINE WOODLANDS SUPERASSOCIATION *Pinus contorta ssp. murrayana* Woodlands Superassociation

DISTRIBUTION:



DESCRIPTION:

The Pinus contorta var. murrayana woodlands superassociation is an aggregation of the Pinus contorta var. murrayana sparse/outcrop mapping unit (3021), the Pinus contorta var. murrayana woodland association (3038), and the Pinus contorta var. murrayana/Carex exserta woodland association (3042). The aggregated mapping unit is mapped on open, rocky gentle to steep slopes of varying aspect between 2230 - 3454 m (7316 - 11333 ft). The open tree canopy of these subalpine woodlands is dominated by Pinus contorta var. murrayana (less than 30% cover), although Abies magnifica, Juniperus occidentalis var. australis, Pinus albicaulis, P. balfouriana ssp. austrina, P. jeffreyi, or P. monticola may contribute low amounts of cover. The sparse shrub layer may contain Arctostaphylos patula, A. nevadensis. Artemisia tridentata. Chrysolepis sempervirens. Holodiscus microphyllus, or Phyllodoce breweri. The herbaceous layer may be sparse or well developed, and may be characterized by dense patches of Carex exserta (C. filifolia var. erostrata sensu Hickman 1993) and/or Juncus parryi as well as lesser amounts of Arenaria congesta, Calyptridium umbellatum, Penstemon newberryi, or Streptanthus tortuosus. In the aggregated database, the Pinus contorta var. murrayana woodlands superassociation includes the Pinus contorta var. murrayana sparse/outcrop mapping unit (3021), the Pinus contorta var. murrayana woodland association (3038) and the Pinus contorta var. murrayana/Carex exserta woodland association (3042).

PHOTO INTERPRETATION SIGNATURE:

This superassociation is aggregated from three similar *Pinus contorta var. murrayana* types that tend to occur on rocky, exposed sites. *P. contorta var. murrayana* has an irregularly shaped crown that ranges in color from dark red to dark brown. The *P. contorta var. murrayana* trees are typically small in stature, open and sparse and surrounded by vast areas of rock that contain tiny seeps where patchy shrubs may occur. When present, the dense herbaceous layer yields little or no infrared reflectance late in the growing season so its signature appears white or cream colored. *Abies magnifica*, which can be a canopy component, contrasts as a pinker color against the more common *P. contorta var. murrayana*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2230 – 3454 m (7316 – 11333 ft) Shape – convex, concave, flat, undulating Slope position – canyon bottom, lowslope, midslope Steepness – gentle to steep

ASPECT:



- Sierra Lodgepole Pine Forest Alliance (3020)
- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022)
- Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (3033)
- Sierra Lodgepole Pine Woodland Association (3038)
- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (3042)
- Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (3043)
- Sierra Lodgepole Pine Mesic Forest Superassociation (3048)
- Sierra Lodgepole Pine Xeric Forest Superassociation (3049)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142)
- Whitebark Pine/Shorthair Sedge Woodland Association (3144)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)
- California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit (4063)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

3028 - SIERRA LODGEPOLE PINE-(WHITEBARK PINE)/(ROSS SEDGE-

SHORTHAIR SEDGE) FOREST SUPERASSOCIATION Pinus contorta var. murrayana-(Pinus albicaulis)/(Carex rossii-Carex exserta) Forest Association

DISTRIBUTION:



DESCRIPTION:

The Pinus contorta var. murrayana - (Pinus albicaulis) / (Carex rossii-Carex exserta) forest association is an aggregation of the Pinus contorta var. murrayana - Pinus albicaulis / Carex rossii forest association (3033), the Pinus contorta var. murrayana/Carex rossii forest association (3041), and the Pinus contorta var. murrayana-Pinus albicaulis/Carex exserta forest association (3043). The aggregated mapping unit is mapped on gentle to steep slopes of varying aspect between 2468 -- 3523 m (8197 -- 11557 ft). The open tree canopy can be characterized by either pure stands of Pinus contorta var. murrayana, or at higher elevations, Pinus contorta var. murrayana in mixture with P. albicaulis. Lower elevation stands may have minor amounts of Abies magnifica or P. monticola. The sparse shrub layer may include Chrysolepis sempervirens, Holodiscus microphyllus, Phyllodoce breweri, or Salix spp. The herbaceous layer may be sparse or dense, with Carex rossii and Juncus parryi frequently encountered. On rockier sites, dense patches of Carex exserta often form in shallow soil depressions.

PHOTO INTERPRETATION SIGNATURE:

This superassociation is a high elevation aggregation composed of broader-crowned upright *Pinus albicaulis* trees that are generally lighter red than the associated *P. contorta var. murrayana* trees. The understory signature is pale to dark brown and generally not white except in rocky settings where *Carex exserta* often forms in pockets yielding a cream-colored signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to subxeric Elevation – 2468 -- 3523 m (8197 -- 11557 ft) Shape – flat, concave, convex, undulating Slope position – canyon bottom, lowslope, midslope, highslope Steepness – gentle to steep

ASPECT:



- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (3033)
- Sierra Lodgepole Pine/Big Sagebrush Forest Association (3034)
- Sierra Lodgepole Pine Woodland Association (3038)
- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (3042)
- Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (3043)
- Sierra Lodgepole Pine Xeric Forest Superassociation (3049)
- Whitebark Pine Woodland Alliance (3140)
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142)
- Whitebark Pine/Shorthair Sedge Woodland Association (3144)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superassociation (3540)
- Mountain Hemlock-Sierra Lodgepole Pine Forest Association (4041)

3033 – SIERRA LODGEPOLE PINE-WHITEBARK PINE/ROSS SEDGE FOREST ASSOCIATION

Pinus contorta var. murrayana-Pinus albicaulis/Carex rossii Forest Association



DISTRIBUTION:



DESCRIPTION:

The Pinus contorta var. murrayana - Pinus albicaulis / Carex rossii forest association is mapped on gentle to steep slopes of varying aspect between 2602 -- 3441 m (8536 -- 11288 ft). The moderately open to closed tree canopy is dominated by a mixture of Pinus contorta and P. albicaulis, with each species contributing at least 10% relative cover. The generally sparse shrub layer may contain Holodiscus microphyllus, Ledum glandulosum, Phyllodoce breweri, Chrysolepis sempervirens, Arctostaphylos nevadensis, or Vaccinium caespitosum. The herbaceous layer is also generally sparse, and is characterized by the presence of Carex rossii. Other frequently encountered herbs include Juncus parryi, Penstemon newberryi, and Arabis platysperma. The hydrology is upland and soils are moderately to well drained sandy loams. (NatureServe October 2006) In the aggregated database, the Pinus contorta var. murrayana - (Pinus albicaulis) / (Carex rossii-Carex exserta) forest association (3028).

PHOTO INTERPRETATION SIGNATURE:

Pinus albicaulis usually displays a slightly lighter photo signature and has a more irregular crown than the dark red or dark brown *P. contorta var. murrayana*. The canopy density varies from fairly dense to sparse with an herbaceous understory that also has a variable density. *Carex rossii* is indiscernible on the aerial photos, but is referenced as an indicator species. The transitions between the *Pinus contorta var. murrayana - Pinus albicaulis / Carex rossii* forest association (3033) and the *Pinus contorta var. murrayana - Carex rossii* forest association (3041) often contain a significant *P. albicaulis* component in the understory tree layer that is not visible on the aerial photography.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2602 -- 3441 m (8536 -- 11288 ft) Shape – convex to undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine-(Whitebark Pine)/(Ross Sedge-Shorthair Sedge) Forest (3028)
- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (3042)
- Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (3043)
- Whitebark Pine Woodland Alliance (3140)
- Whitebark Pine/Davidson's Pentemon Woodland Association (3142)
- Whitebark Pine/Shorthair Sedge Woodland Association (3144)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)



3034 – SIERRA LODGEPOLE PINE/BIG SAGEBRUSH FOREST ASSOCIATION Pinus contorta var. murrayana/Artemisia tridentata Forest Association

MOKA_NE

DISTRIBUTION:



DESCRIPTION:

The Pinus contorta var. murrayana/Artemisia tridentata forest association is mapped on gentle to moderately steep slopes of varying aspect between 2468 -- 3198 m (8098 -- 10492 ft). The tree canopy of these relatively open, xeric stands is dominated by *Pinus contorta var.* murrayana, although Juniperus occidentalis var. australis, *P. jeffreyi, P. monticola*, and/or *Abies magnifica* may be present and sometimes important. The shrub layer ranges in cover from 10-70% and is dominated by *Artemisia tridentata*, with *Holodiscus microphyllus*, *Chrysolepis sempervirens*, and *Arctostaphylos patula* also contributing significant cover. The herbaceous layer may be sparse to dense and is characterized by such dryland species as *Carex exserta*, *C. rossii, Monardella odoratissima*, and *Achnatherum sp.* The hydrology is upland and soils are well drained sands and sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

In this environment, *Pinus contorta var. murrayana* trees exhibit a typical dark red to brown signature and generally smaller stature in comparison with the gray-trending *Artemisia tridentata*. Bare ground is an extensive component of the signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2468 -- 3198 m (8098 -- 10492 ft) Shape – flat to concave, convex Slope position – canyon bottom, low slope, midslope Steepness – gentle to moderately steep





- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041) •
- Sierra Lodgepole Pine Xeric Forest Superassociation (3049) •
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109) Big Sagebrush Shrubland Alliance (5160) ٠
- •

3038 – SIERRA LODGEPOLE PINE WOODLAND ASSOCIATION *Pinus contorta var. murrayana* Woodland Association



MOSI_SW

DISTRIBUTION:



DESCRIPTION:

The *Pinus contorta var. murrayana* woodland association is mapped on gentle to steep slopes of varying aspect between 2230 -- 3434 m (7316 -- 11267 ft). The open tree canopy is dominated by *Pinus contorta var. murrayana*, although *Abies magnifica* may also be important and *P. monticola* and *P. balfouriana* may also be present. The sparse shrub layer may contain *Holodiscus microphyllus*, *Chrysolepis sempervirens*, *Arctostaphylos nevadensis*, *Arctostaphylos patula*, or *Artemisia tridentata*. The herbaceous layer is also sparse, but may include *Carex exserta*, *Arenaria congesta*, *Juncus parryi*, or *Calyptridium umbellatum* among other xeric species. The hydrology is upland. (NatureServe October 2006). In the aggregated database, the *Pinus contorta var. murrayana* woodland association (3026).

PHOTO INTERPRETATION SIGNATURE:

The signature of *Pinus contorta var. murrayana* is typically narrow, rounded brown crowns in an open setting over a sparse herbaceous understory with little or no shrub component. Glacial rubble is considered a more indicative environment than consolidated rock for this type. *Abies magnifica*, which can be a component of these stands, contrasts as a pinker color against the more common *P. contorta var. murrayana*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2230 -- 3434 m (7316 -- 11267 ft) Shape – flat, concave, convex, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



- Sierra Lodgepole Pine Forest Alliance (3020)
- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine Woodlands Superassociation (3026)
- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Sierra Lodgepole Pine Xeric Forest Superassociation (3049)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit (4063)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)



3041 – SIERRA LODGEPOLE PINE/ROSS SEDGE FOREST ASSOCIATION *Pinus contorta var. murrayana/Carex rossii* Forest Association

MOKA_NW

DISTRIBUTION:



DESCRIPTION:

The Pinus contorta var. murrayana/Carex rossii forest association is mapped on xeric, gentle to steep slopes of varying aspect between 2468 -- 3485 m (8197 -- 11434 ft). The open to closed tree canopy is dominated by Pinus contorta var. murrayana, with small amounts of cover (<5%) contributed by P. monticola, Abies magnifica, or P. albicaulis. The shrub layer is sparse to absent but may contain significant amounts of Phyllodoce breweri or Ribes spp. The sparse, dry herbaceous layer is characterized by the presence of Carex rossii, and may also include Carex exserta, Achnatherum occidentale, Elymus elymoides, Juncus parryi, and/or Lupinus breweri along with other xeric species. The hydrology is upland. (NatureServe October 2006). In the aggregated database, the Pinus contorta var. murrayana - (Pinus albicaulis) / (Carex rossii-Carex exserta) forest association (3028).

PHOTO INTERPRETATION SIGNATURE:

The photo signature of the xerix-trending stands of *Pinus contorta var. murrayana* is dark red or dark brown with narrow, irregularly shaped crowns. These stands often occur as dense woodlands in somewhat xeric settings. *Carex rossii* is not discernible on the aerial photos but is referenced as an indicator species. Transitional areas between *Pinus contorta var. murrayana -Pinus albicaulis/Carex rossii* (3033) and *Pinus contorta var. murrayana /Carex rossii* (3041) often contain a significant *P. albicaulis* component in the understory tree layer that is not visible on the aerial photography.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2468 -- 3485 m (8197 -- 11434 ft) Shape – flat, concave, convex, undulating Slope position – canyon bottom, low slope, midslope Steepness – gentle to steep

ASPECT:


- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine-(Whitebark Pine)/(Ross Sedge-Shorthair Sedge) Forest (3028)
- Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (3033)
- Sierra Lodgepole Pine/Big Sagebrush Forest Association (3034)
- Sierra Lodgepole Pine Woodland Association (3038)
- Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (3042)
- Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (3043)
- Sierra Lodgepole Pine Xeric Forest Superassociation (3049)
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142)
- Whitebark Pine/Shorthair Sedge Woodland Association (3144)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)
- Mountain Hemlock-Sierra Lodgepole Pine Forest Association (4041)

3042 – SIERRA LODGEPOLE PINE/SHORTHAIR SEDGE WOODLAND ASSOCIATION

Pinus contorta var. murrayana/Carex exserta Woodland Association



MOBR_SE DISTRIBUTION:



DESCRIPTION:

The *Pinus contorta var. murrayana/Carex exserta* woodland association is mapped on gentle to moderately steep slopes of varying aspect between 2478 -- 3454 m (8131 -- 11333 ft). The open tree canopy is dominated by *Pinus contorta var. murrayana*, although *P. albicaulis*, *P. balfouriana*, or *Abies magnifica* may contribute low amounts of cover. The shrub layer is sparse to absent; when present, it may include *Arctostaphylos patula*, *Chrysolepis sempervirens*, *Holodiscus microphyllus*, or *Phyllodoce breweri*. The herbaceous layer is characterized by dense patches of *Carex exserta* (*C. filifolia var. erostrata sensu* Hickman 1993), but may also include significant cover of *Juncus parryi*. The hydrology is upland. Soils are moderately well drained sandy loams. (NatureServe October 2006). In the aggregated database, the *Pinus contorta var. murrayana/Carex exserta* woodland association is aggregated into the *Pinus contorta var. murrayana* woodlands superassociation (3026).

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Pinus contorta var. murrayana* in this mesic type is dark brown or red with a narrow, rounded crown. Generally open, the dense *Carex exserta* layer yields little or no infrared reflectance late in the growing season so its signature appears white or cream colored. Stands of *P. contorta var. murrayana* in *C. exserta* settings are less rocky than mixed *P. contorta var. murrayana* and *P. albicaulis* stands in similar settings.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - xeric

Elevation – 2478 -- 3454 m (8131 -- 11333 ft) Shape – convex, concave, flat, undulating Slope position – canyon bottom, low slope, midslope Steepness – gentle to moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022)
- Sierra Lodgepole Pine Woodlands Superassociation (3026)
- Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (3033)
- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (3043)
- Sierra Lodgepole Pine Mesic Forest Superassociation (3048)
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142)
- Whitebark Pine/Shorthair Sedge Woodland Association (3144)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)

3043 – SIERRA LODGEPOLE-WHITEBARK PINE/SHORTHAIR SEDGE FOREST ASSOCIATION

Pinus contorta var. murrayana-Pinus albicaulis/Carex exserta Forest Association



MOBR_SE DISTRIBUTION:



DESCRIPTION:

The Pinus contorta var. murrayana-Pinus albicaulis/Carex exserta forest association is mapped on gentle to steep slopes of varying aspect between 2858 -- 3523 m (9375 -- 11557 ft). The open tree canopy is dominated by a mixture of Pinus contorta and P. albicaulis. The sparse shrub layer may include Chrysolepis sempervirens, Holodiscus microphyllus, Phyllodoce breweri, or Salix orestera. The herbaceous layer may be sparse or moderately dense and is characterized by patches of Carex filifolia. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006). In the aggregated database, the Pinus contorta var. murrayana-Pinus albicaulis/Carex filifolia association is aggregated into the Pinus contorta var. murrayana - (Pinus albicaulis) / (Carex rossii-Carex exserta) forest association (3028).

PHOTO INTERPRETATION SIGNATURE:

The *Pinus contorta var. murrayana* looks dark red or brown on the aerial photos in this association. *P. contorta var. murrayana* is smaller in stature with a more compact crown than the larger *P. albicaulis*, which looks slightly lighter in color but has broad, multiple branching crowns. Canopy density is variable and is often patchy within the stand. There is generally a moderate to dense smooth herbaceous layer of *Carex exserta* except when interrupted by rocky outcroppings.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2858 -- 3523 m (9375 -- 11557 ft) Shape – convex, flat, undulating Slope position – low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine-(Whitebark Pine)/(Ross Sedge-Shorthair Sedge) Forest (3028)
- Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (3033)
- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (3042)
- Whitebark Pine Woodland Alliance (3140)
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142)
- Whitebark Pine/Shorthair Sedge Woodland Association (3144)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)



3048 – SIERRA LODGEPOLE PINE MESIC FOREST SUPERASSOCIATION *Pinus contorta var. murrayana* Mesic Forest Superassociation

MOKA_NE

DISTRIBUTION:



DESCRIPTION:

The *Pinus contorta var. murrayana* mesic forest superassociation is mapped on gentle to moderately steep slopes of varying aspect between 2153 -- 3430 m (7064 -- 11254 ft). This superassociation represents a combination of several mesic types, which are dominated by *Pinus contorta var. murrayana* in the tree canopy and support an understory of mesic shrubs and herbs. The shrub layer can be sparse to dense, and often includes *Ledum glandulosum, Phyllodoce breweri, Ribes spp., Salix spp., Vaccinium caespitosum,* and/or *Vaccinium uliginosum ssp. occidentale.* The herbaceous layer can also be sparse or dense, and is often characterized by such mesic herbs as *Allium validum, Aster alpigenus var. andersonii, Carex spp., Dodecatheon spp., Senecio triangularis,* and/or *Veratrum californicum var. californicum.* Sites are characterized by palustrine, seasonally saturated hydrology. Soils are moderately to poorly drained sandy clay loams and silty loams.

PHOTO INTERPRETATION SIGNATURE:

In this mesic mapping unit, the *Pinus contorta var. murrayana* signature typically yields a dark red or dark brown small rounded crown. The *Pinus contorta var. murrayana* trees usually occur in a uniform compact pattern with small openings in the canopy that show a mesic herbaceous signature that looks pink in the photo. Although less common, these stands can also occur in a more open woodland setting, revealing a mesic dense pink herbaceous understory.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic

Elevation – 2153 -- 3430 m (7064 -- 11254 ft) Shape – concave, convex, flat, undulating Slope position – canyon bottom, low slope, midslope Steepness – gentle to moderately steep

ASPECT:



- Sierra Lodgepole Pine-Quaking Aspen-(Jeffrey Pine) Forest Alliance (3010) ٠
- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022) ٠
- ٠
- •
- Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (3042) Sierra Lodgepole Pine Xeric Forest Superassociation (3049) California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit • (4063)



3049 – SIERRA LODGEPOLE PINE XERIC FOREST SUPERASSOCIATION *Pinus contorta var. murrayana* Xeric Forest Superassociation

MOSI_SW

DISTRIBUTION:



DESCRIPTION:

The Pinus contorta var. murrayana xeric forest superassociation is mapped on gentle to steep slopes of varying aspect between 2114 -- 3204 m (6936 -- 10511 ft). This superassociation represents a combination of several xeric types that are dominated by *Pinus contorta var. murrayana* in the tree canopy and support a sparse understory of shrubs and herbs. The tree canopy may also include lesser amounts of *Abies concolor, A. magnifica, Juniperus occidentalis var. australis, P. balfouriana ssp. austrina, P. jeffreyi or P. monticola.* The shrub layer is absent to sparse; but when present, it may contain *Arctostaphylos patula, Artemisia tridentata, Ceanothus cordulatus, Chrysolepis sempervirens, or Holodiscus microphyllus.* The herbaceous layer is generally sparse and may include *Achnatherum spp., Carex filifolia, Carex rossii, Elymus elymoides Gayophytum spp.,* and/or *Juncus parryi.* The hydrology is upland. Soils are well drained sands and sandy loams.

PHOTO INTERPRETATION SIGNATURE:

The *Pinus contorta var. murrayana* type is assigned where association level mapping is not feasible, such as in lower than normal elevations where understory openings appear light on the photography or in recent post disturbance settings. It is also assigned where other conifer species are a significant component (5-10%) yet don't fit described associations (such as Pinus jeffreyi).

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2114 -- 3204 m (6936 -- 10511 ft) Shape – convex, undulating Slope position – low slope, midslope, ridgetop Steepness – gentle to steep

ASPECT:



- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021) ٠
- Sierra Lodgepole Pine/Big Sagebrush Forest Association (3034) •
- ٠
- •
- •
- Sierra Lodgepole Pine/Big Sagebrush Polest Association (3034) Sierra Lodgepole Pine/Ross Sedge Forest Association (3041) Sierra Lodgepole Pine Mesic Forest Superassociation (3048) Western White Pine-Sierra Lodgepole Pine Woodland Association (3132) •

PONDEROSA PINE WOODLAND ALLIANCE



Ponderosa Pine Forest

3050 – PONDEROSA PINE WOODLAND ALLIANCE Pinus ponderosa Woodland Alliance



GIFO_SE

DISTRIBUTION:



DESCRIPTION:

The *Pinus ponderosa* woodland alliance is mapped on gentle to steep primarily south to southwest-facing slopes between 1165 -- 2125 m (3821 -- 6971 ft). The open tree canopy is often dominated by *Pinus ponderosa*, with *Abies concolor*, *P. lambertiana*, *Quercus chrysolepis*, and *Q. kelloggii* often occurring as co-dominants and *Calocedrus decurrens* sometimes contributing low cover. The shrub layer can be sparse or dense and may contain *Arctostaphylos patula*, *A. viscida*, *Ceanothus cordulatus*, *C. integerrimus var. californicus*, *Chamaebatia foliolosa*, and/or *Chrysolepis sempervirens* as important species. The herbaceous layer is characteristically sparse. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Pinus ponderosa generally has a very rounded crown ranging in size from medium to large when occurring in open non-rocky stands. Separation from *P. jeffreyi* is next to impossible, although in ideal situations, *P. ponderosa* tend to be a bit brighter red. Overlap in the range of these two species eclipses this comparison in most cases, however.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1165 -- 2125 m (3821 -- 6971 ft) Shape – concave, convex Slope position – canyon bottom, low slope, midslope Steepness – gentle to steep

ASPECT:



- Ponderosa Pine-California Black Oak/Whiteleaf Manzanita Woodland Association (3053)
- Ponderosa Pine-Incense-cedar Forest Alliance (3060) Jeffrey Pine Woodland Alliance (3070) ٠
- •

3053 – PONDEROSA PINE-CALIFORNIA BLACK OAK/WHITELEAF MANZANITA WOODLAND ASSOCIATION Pinus ponderosa-Quercus kelloggii/Arctostaphylos viscida Woodland Association



GIFO_SE

DISTRIBUTION:



DESCRIPTION:

The *Pinus ponderosa-Quercus kelloggii/Arctostaphylos viscida* woodland is mapped on moderately steep to steep south to southwest facing slopes between 1165 -- 2125 m (3821 -- 6971 ft). The open tree canopy is dominated by a mixture of *Pinus ponderosa* and *Quercus kelloggii*, with *Q. chrysolepis* occasionally contributing low cover. The shrub layer may be sparse or dense and is dominated by *Arctostaphylos viscida*. The herbaceous layer is characteristically sparse. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature of *Pinus ponderosa* is pink or light red in color and individual trees have a moderately sized rounded crown. *Quercus kelloggii* appears as a bright red medium sized tree with a broad uneven rounded crown. *Arctostaphylos viscida* looks coarse in texture and is a light orange or light brown color. *P. ponderosa* occurs as a sparse overstory to the minor component of *Q. kelloggii* and the understory of *A. viscida*, which can be variable but is usually sparse.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1165 -- 2125 m (3821 -- 6971 ft) Shape – convex Slope position – midslope Steepness – moderately steep to steep





- Ponderosa Pine Woodland Alliance (3050)
- Ponderosa Pine-Incense-cedar-Canyon Live Oak/Mountain Misery Forest Association (3061)
- Ponderosa Pine-Incense-cedar/Mountain Misery Forest Association (3062)
- Ponderosa Pine-Incense-cedar/Mountain Misery Forest Association (3084)

PONDEROSA PINE-INCENSE-CEDAR FOREST ALLIANCE



SEKI.0229_292

Ponderosa Pine-Incense-Cedar-California Black Oak Forest



3060 – PONDEROSA PINE-INCENSE-CEDAR FOREST ALLIANCE Pinus ponderosa-Calocedrus decurrens Forest Alliance



DISTRIBUTION:



DESCRIPTION:

The Pinus ponderosa-Calocedrus decurrens forest alliance is mapped on gentle to steep slopes of varying aspect (although primarily south to southwest or west facing) between 927 - 2367 m (3041 -- 7765 ft). The open to closed tree canopy is dominated by a mixture of *Pinus ponderosa* and *Calocedrus decurrens*, with *Abies concolor*, *P. lambertiana*, *Quercus chrysolepis*, and/or *Q. kelloggii* frequently important. When mapped along water courses and on river terraces, *Calocedrus decurrens* may dominate the canopy, with *Alnus rhombifolia*, *A. concolor*, *Acer macrophyllum*, and/or *Torreya californica* also present. The shrub layer may be sparse or dense, with *Arctostaphylos mewukka*, *Arctostaphylos patula*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *C. integerrimus*, *Cornus sericea*, *Corylus cornuta var. californica*, *Chamaebatia foliolosa* and/or *Rubus parviflorus* contributing the highest amount of cover. The herbaceous layer is characteristically sparse, but may include dense patches of annual grasses or *Pteridium aquilinum*. The hydrology is upland or riverine. Soils are moderately well drained to well drained sandy loams or sandy clay loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Calocedrus decurrens is generally not distinguishable on the imagery due to its low cover and general sub-canopy nature. When visible in small patches, it tends to yield a brighter red signature than the adjacent pines and has a narrower crown. Most stands have dense canopy cover.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic to xeric Elevation – 927 -- 2367 m (3041 -- 7765 ft) Shape – primarily convex; concave, undulating, flat Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



- Ponderosa Pine Woodland Alliance (3050)
- Ponderosa Pine-Incense-cedar-Canyon Live Oak/Mountain Misery Forest Association
 (3061)
- Ponderosa Pine-Incense-cedar/Mountain Misery Forest Association (3062)
- Ponderosa Pine-Incense-cedar-California Black Oak Forest Association (3063)

3061 - PONDEROSA PINE-INCENSE-CEDAR-CANYON LIVE OAK/MOUNTAIN

MISERY FOREST ASSOCIATION Pinus ponderosa – Calocedrus decurrens – Quercus chrysolepsis/Chamaebatia foliolosa Forest Association



LODG_SW

DISTRIBUTION:



DESCRIPTION:

The Pinus ponderosa-Calocedrus decurrens-Quercus chrysolepis/Chamaebatia foliolosa forest association is mapped on gentle to moderately steep slopes of varying aspect between 1360 -- 2367 m (4462 -- 7765 ft). The open tree canopy is dominated by a mixture of 10 - 60% cover of Pinus ponderosa and Calocedrus decurrens, and at least 5% cover of Quercus chrysolepis. Abies concolor, P. lambertiana, and Q. kelloggii may also be present in the tree canopy. The shrub layer may be sparse or dense and is often characterized by the presence of Chamaebatia foliolosa; Arctostaphylos viscida or Arctostaphylos patula may also be present. The herbaceous layer is characteristically sparse. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The *Pinus ponderosa-Calocedrus decurrens-Quercus chrysolepis/Chamaebatia foliolosa* forest association is a difficult type to map as it occurs in steep settings with rocky ravines where *Quercus chrysolepis* often takes hold. *Q. kelloggii* is often visible in the canopy adjacent to the rocky ravines. Conifer density is often highly variable within the canopy. *Chamaebatia foliolosa* is noted in the openings as a smooth bright orange to red signature but can be obscured by shadows of the adjacent canopy.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1360 -- 2367 m (4462 -- 7765 ft) Shape – convex, concave Slope position – low slope, midslope Steepness – gentle to moderately steep

ASPECT:



- Canyon Live Oak-(Ponderosa Pine-Incense-cedar) Forest Superassociation (1023) ٠
- Ponderosa Pine-California Black Oak/Whiteleaf Manzanita Woodland Association (3053) •
- ٠
- Ponderosa Pine-Incense-cedar Forest Alliance (3060) Ponderosa Pine-Incense-cedar/Mountain Misery Forest Association (3062) ٠
- Ponderosa Pine-Incense-cedar-California Black Oak Forest Association (3063) •

3062 – PONDEROSA PINE-INCENSE-CEDAR/MOUNTAIN MISERY FOREST ASSOCIATION

Pinus ponderosa-Calocedrus decurrens/Chamaebatia foliolosa Forest Association



SHMO_NE

DISTRIBUTION:



DESCRIPTION:

The Pinus ponderosa-Calocedrus decurrens/Chamaebatia foliolosa forest association is mapped on moderately steep south to southeast or southwest facing slopes between 1245 -- 2297 m (4086 -- 7535 ft). The open to closed tree canopy is dominated by a mixture of Pinus ponderosa and Calocedrus decurrens, with Abies concolor, P. lambertiana and Quercus kelloggii frequently present. Q. chrysolepis is notably absent from this association. The shrub layer is sparse to well developed and is characterized by Chamaebatia foliolosa; it may also contain Arctostaphylos patula, A. viscida, Ceanothus cordulatus, or C. integerrimus var. californicus. The herbaceous layer is characteristically sparse. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The *Pinus ponderosa-Calocedrus decurrens/Chamaebatia foliolosa* forest association is very similar to *Pinus ponderosa-Calocedrus decurrens-Quercus kelloggii* forest association (3063). It is mapped only where *Chamaebatia foliolosa* is visible in the understory openings. Openings to the canopy appear bright orange to red, yielding a very smooth signature; however these openings can be quite small and local in the stand. *Quercus kelloggii* has a more irregular shaped and larger crown than *P. ponderosa* and is often noted as a subcanopy component of the tree layer.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 1245 -- 2297 m (4086 -- 7535 ft) Shape – convex Slope position – low slope, midslope Steepness – moderately steep

ASPECT:



- Ponderosa Pine-California Black Oak/Whiteleaf Manzanita Woodland Association (3053)
- Ponderosa Pine-Incense-cedar Forest Alliance (3060)
- Ponderosa Pine-Incense-cedar-Canyon Live Oak/Mountain Misery Forest Association (3061)
- Ponderosa Pine-Incense-cedar-California Black Oak Forest Association (3063)

3063 – PONDEROSA PINE-INCENSE-CEDAR-CALIFORNIA BLACK OAK FOREST ASSOCIATION

Pinus ponderosa-Calocedrus decurrens-Quercus kelloggii Forest Association



GIFO_NW

DISTRIBUTION:



DESCRIPTION:

The *Pinus ponderosa-Calocedrus decurrens-Quercus kelloggii* forest association is mapped on gentle to steep southerly trending slopes between 1109 -- 2199 m (3640 -- 7216 ft). The closed tree canopy is dominated by a mixture of *Pinus ponderosa* and *Calocedrus decurrens*, with *Quercus kelloggii* often, but not always, a significant component. *Abies concolor, Pinus lambertiana*, and/or *Quercus chrysolepis* may also be important. The shrub layer may be sparse to well developed; when present it may contain *Arctostaphylos mewukka*, *A. patula*, *A. viscida, Ceanothus integerrimus*, and/or *Chamaebatia foliolosa*. The herbaceous layer is characteristically sparse. The hydrology is upland. Soils are moderately well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Pinus ponderosa is not as bright red as *Quercus kelloggii*, and when the two species cooccur the signature difference is noticeable when they are both in the overstory. Understory oaks in the subcanopy tree layer are generally not detectable on the imagery since most stands are in forest-like settings.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic to mesic Elevation – 1109 -- 2199 m (3640 -- 7216 ft) Shape – concave, convex, flat, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to steep





- Canyon Live Oak-(Ponderosa Pine-Incense-cedar) Forest Superassociation 1023)
- Ponderosa Pine-Incense-cedar Forest Alliance (3060)
- Ponderosa Pine-Incense-cedar-Canyon Live Oak/Mountain Misery Forest Association (3061)
- Ponderosa Pine-Incense-cedar/Mountain Misery Forest Association (3062)
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094)

JEFFREY PINE WOODLAND ALLIANCE



SEKI.0004_02

Jeffrey Pine / Greenleaf Manzanita Woodland

3070 – JEFFREY PINE WOODLAND ALLIANCE Pinus jeffreyi Woodland Alliance



0031_300

DISTRIBUTION:



DESCRIPTION:

The Pinus jeffreyi woodland alliance is mapped on gentle to very steep slopes of varying aspect between 1600 -- 3085 m (5248 -- 10120 ft). The open tree canopy is dominated by Pinus jeffreyi, with Abies concolor, A. magnifica, Calocedrus decurrens, Juniperus occidentalis var. australis, Pinus contorta var. murrayana, P. lambertiana, and/or Quercus kelloggii also frequently present. The shrub layer may be sparse or well developed and may contain Arctostaphylos nevadensis, A. patula, Artemisia tridentata, Ceanothus cordulatus, Chamaebatia foliolosa, Chrysolepis sempervirens, Eriogonum wrightii, Prunus emarginata, Ribes cereum, or Ribes roezlii var. roezlii. The herbaceous layer is characteristically sparse, with Apocynum androsaemifolium, Elymus elymoides, Erigeron breweri, Eriogonum nudum, Gayophytum sp., and Pteridium aquilinum frequently encountered. The hydrology is upland. Soils are well drained sandy loams and loamy sands. (NatureServe October 2006). In the aggregated database, the Pinus jeffreyi woodland alliance includes the Pinus jeffreyi-Abies concolor woodland & Abies concolor-Pinus lambertiana-Pinus jeffreyi forest superalliance (3550).

PHOTO INTERPRETATION SIGNATURE:

Pinus jeffreyi generally have very large rounded crowns, especially in open woodlands. Although their signature is less variable than most pines, the overall signature of this type is highly dependent on associated conifer species such as *Abies concolor* or *Juniperus occidentalis var. australis.*

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to sub mesic Elevation – 1600 -- 3085 m (5248 -- 10120 ft). Shape – concave, convex, flat, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to very steep

ASPECT:


- Ponderosa Pine Woodland Alliance (3050)
- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Jeffrey Pine/Whitethorn Ceanothus Woodland Association (3073)
- Western White Pine Woodland Alliance (3130)
- White Fir-Jeffrey Pine-(Sugar Pine) Woodland Mapping Unit (3550)
- Sierra Juniper Woodland Alliance (4100)
- Greenleaf Manzanita Shrubland Alliance (5090)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit (5520)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Superalliance (5590)



3072 – JEFFREY PINE/GREENLEAF MANZANITA WOODLAND ASSOCIATION *Pinus jeffreyi/Arctostaphylos patula* Woodland Association

MUGR_SE

DISTRIBUTION:



DESCRIPTION:

The *Pinus jeffreyi/Arctostaphylos patula* woodland association is mapped on gentle to very steep slopes of primarily south to southwest facing aspect between 1707 -- 3085 m (5602 -- 10120 ft). The tree canopy is dominated by open stands of *Pinus jeffreyi* emergent to a sparse to dense shrub layer. Although dominated by *Arctostaphylos patula*, the shrub layer may also contain significant amounts of *Artemisia tridentata, Ceanothus cordulatus*, and/or *Chrysolepis sempervirens*. The herbaceous layer is sparse to absent. The hydrology is upland. Soils are well drained sandy loams. (Potter 1994, NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature for *Pinus jeffreyi* is pink or light red with a large, full round crown. The canopy is open where a sparse to dense understory of *Arctostaphylos patula* appears coarse and orange or orange-brown in color. Other shrubs may be present in the understory. Photo interpreters map this type in extremely sparse to slightly sparse conifer settings that are almost always rocky.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1707 -- 3085 m (5602 -- 10120 ft) Shape – convex, concave, undulating Slope position – low slope, midslope, high slope Steepness – gentle to very steep

ASPECT:



- Jeffrey Pine Woodland Alliance (3070)
- Jeffrey Pine/Whitethorn Ceanothus Woodland Association (3073)
- Ponderosa Pine-Incense-cedar/Mountain Misery Forest Association (3084)
- Jeffrey Pine-California Red Fir Woodland Association (3085)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- White Fir-Jeffrey Pine-(Sugar Pine) Woodland Mapping Unit (3550)
- California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest Mapping Unit (4065)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)
- Sierra Juniper Woodland Association (4108)



3073 – JEFFREY PINE/WHITETHORN CEANOTHUS WOODLAND ASSOCIATION *Pinus jeffreyi/Ceanothus cordulatus* Woodland Association

LODG_NW

DISTRIBUTION:



DESCRIPTION:

The *Pinus jeffreyi/Ceanothus cordulatus* woodland association is mapped on gentle to steep south to southwest facing slopes between 1807 -- 2938 m (5927 -- 9639 ft). The open tree canopy is dominated by *Pinus jeffreyi*, with *Abies concolor* also often important. The shrub layer is dominated by patches of *Ceanothus cordulatus*, with *Arctostaphylos patula* and *Chrysolepis sempervirens* frequently mixed in. The herbaceous layer is characteristically sparse but often includes *Elymus elymoides* as well as other scattered perennial herbs and grasses. The hydrology is upland. Soils are moderately well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Due to this being a post disturbance vegetation type, the photo signature for *Pinus jeffreyi* in these stands is variable. They can appear as large red or pink trees with a broad, round crown or they can have smaller crowns from younger trees returning in late seral conditions. The density of the *P. jeffreyi* is usually sparse with a dense understory of *Ceanothus cordulatus* chaparral that appears as a smooth textured, pink colored shrub.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1807 -- 2938 m (5927 -- 9639 ft) Shape – convex, undulating Slope position – low slope, midslope Steepness – gentle to steep

ASPECT:



- Jeffrey Pine Woodland Alliance (3070)
- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Ponderosa Pine-Incense-cedar/Mountain Misery Forest Association (3084)
- Jeffrey Pine-California Red Fir Woodland Association (3085)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- White Fir-Jeffrey Pine-(Sugar Pine) Woodland Mapping Unit (3550)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)
- White Fir-Sugar Pine/Greenleaf Manzanita-Whitehorn Ceanothus Forest Mapping Unit (4095)

3083 – JEFFREY PINE-WHITE FIR/ROUNDLEAF SNOWBERRY/SQUIRRELTAIL WOODLAND ASSOCIATION

Pinus jeffreyi-Abies concolor/Symphoricarpos rotundifolius/Elymus elymoides Association





DISTRIBUTION:



DESCRIPTION:

The *Pinus jeffreyi-Abies concolor/Elymus elymoides* association is mapped on gentle to moderate slopes of varying aspect between 1769 -- 2919 m (5805 -- 9576 ft). The open tree canopy is dominated by a mixture of *Pinus jeffreyi* and *Abies concolor*, with *P. contorta* also sometimes important. The shrub layer is generally sparse but may contain *Ceanothus cordulatus* and/or *Chrysolepis sempervirens*. The herbaceous layer is sparse but often includes such dryland species as *Elymus elymoides* and *Gayophytum spp*. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature for *Pinus jeffreyi* is a pink or light red color with a broad, round crown. The *Abies concolor* have narrow conical crowns that appear dark red in color, and occasionally display a small white top (due to die back at the top of the tree) in the aerial photos. The stand can vary from dispersed to dense and can have some shrub presence in the understory. *Elymus elymoides* is not visible on the aerial photos since it is generally sparse in the herbaceous layer.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to sub xeric Elevation – 1769 -- 2919 m (5805 -- 9576 ft) Shape – flat, undulating Slope position – low slope Steepness – gentle to moderate

ASPECT:



- Jeffrey Pine Woodland Alliance (3070)
- White Fir-Jeffrey Pine-(Sugar Pine) Woodland Mapping Unit (3550)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094)

3084 – JEFFREY PINE-CANYON LIVE OAK/WHITELEAF MANZANITA WOODLAND ASSOCIATION

Pinus jeffreyi-Quercus chrysolepis/Arctostaphylos viscida Woodland Association



DISTRIBUTION:



DESCRIPTION:

The *Pinus jeffreyi-Quercus chrysolepis/Arctostaphylos viscida* woodland association is mapped on steep, dry slopes between 1646 -- 2749 m (5401 -- 9019 ft). The open tree canopy is dominated by open *Pinus jeffreyi* (usually less than 10% cover) emergent to a sparse canopy layer of *Quercus chrysolepis*. The sparse shrub layer usually contains *Arctostaphylos viscida* and/or *A. patula*. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Pinus jeffreyi yields less infrared reflectance than normal due to the extremely dry settings it is found in. *Quercus chrysolepis* appears brighter and visibly shorter than the conifer. *Arctostaphylos viscida* yields a dark brown signature in this setting.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1646 -- 2749 m (5401 -- 9019 ft) Shape – convex Slope position – variable Steepness – steep





- Ponderosa Pine-California Black Oak/Whiteleaf Manzanita Woodland Association (3053) ٠
- ٠
- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072) Jeffrey Pine/Whitethorn Ceanothus Woodland Association (3073) ٠



3085 – JEFFREY PINE-CALIFORNIA RED FIR WOODLAND ASSOCIATION *Pinus jeffreyi-Abies magnifica* Woodland Association

MUGR_SE

DISTRIBUTION:



DESCRIPTION:

The *Pinus jeffreyi* - *Abies magnifica* woodland association is mapped on moderate to steep slopes of varying aspect between 2270 -- 3031 m (7447 -- 9943 ft). The open tree canopy is dominated by a mixture of *Pinus jeffreyi* and *Abies magnifica*, with *P. contorta var. murrayana* often important and *P. lambertiana* contributing lesser amounts of cover. The shrub layer can be sparse or well developed, and frequently contains *Arctostaphylos patula, Ceanothus cordulatus,* and/or *Chrysolepis sempervirens. Arabis platysperma, Eriogonum nudum,* and *Achnatherum occidentale* are the most frequent species in the herb layer, which averages between 20 and 25% cover. The hydrology is upland. (NatureServe October 2006, Potter 1994).

PHOTO INTERPRETATION SIGNATURE:

The *Pinus jeffreyi* - *Abies magnifica* woodland association is mapped in transitional areas between xeric high elevation stands of Pinus jeffreyi and more mesic stands dominated by *Abies magnifica*. Scattered *Pinus lambertiana* are not usually visible in these stands.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to subxeric Elevation – 2270 -- 3031 m (7447 -- 9943 ft) Shape – convex, undulating Slope position – midslope, high slope, ridgetop Steepness – moderate to steep





- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Jeffrey Pine/Whitethorn Ceanothus Woodland Association (3073)
- California Red Fir Forest Association (4051)
- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus) Forest Mapping Unit (4054)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest Mapping Unit (4065)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)

SINGLELEAF PINYON PINE WOODLAND ALLIANCE



SEKI.1745_2161

Singleleaf Pinyon Pine-Canyon Live Oak

3110 – SINGLELEAF PINYON PINE WOODLAND ALLIANCE Pinus monophylla Woodland Alliance



DISTRIBUTION:



DESCRIPTION:

The *Pinus monophylla* woodland alliance is mapped on steep slopes of varying aspect between 1203 -- 2706 m (3946 -- 8879 ft). The open tree canopy is dominated by *Pinus monophylla*, often in mixture with *Quercus chrysolepis*. The shrub layer can be well developed and is most often dominated by *Arctostaphylos viscida* or shrubby *Q.chrysolepis; Garrya flavescens* may also be present. The herbaceous layer is sparse to absent. The hydrology is upland. Soils are well drained loamy sands.

PHOTO INTERPRETATION SIGNATURE:

These small, sparse pines yield little or no color infrared signature and have irregularly shaped crowns. Open rock and bare ground is the dominant visual in most mapped stands. *Quercus chrysolepis* is typically the brightest signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1203 -- 2706 m (3946 -- 8879 ft) Shape – convex, concave, undulating Slope position – low slope, midslope, high slope Steepness – steep to very steep





- Singleleaf Pinyon Pine-Canyon Live Oak/Whiteleaf Manzanita Woodland Association (3114)
- Sierra Juniper Woodland Alliance (4100)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

3114 – SINGLELEAF PINYON PINE-CANYON LIVE OAK/WHITELEAF MANZANITA WOODLAND ASSOCIATION

Pinus monophylla-Quercus chrysolepis/Arctostaphylos viscida Woodland Association



DISTRIBUTION:



DESCRIPTION:

The *Pinus monophylla-Quercus chrysolepis/Arctostaphylos viscida* woodland mapping unit is mapped on steep slopes of varying aspect between 1203 -- 2706 m (3946 -- 8879 ft). The open tree canopy is dominated by a mixture of *Pinus monophylla* and *Quercus chrysolepis*. The shrub layer can be well developed and is most often dominated by *Arctostaphylos viscida* or shrubby *Q. chrysolepis; Garrya flavescens* may also be present. The herbaceous layer is sparse to absent. The hydrology is upland. Soils are well drained loamy sands.

PHOTO INTERPRETATION SIGNATURE:

The *Pinus monophylla* is a short, small tree with irregularly shaped crowns, characterized by a light or medium pink color. *Quercus chrysolepis* appears as a short tree that has bright pink or red colored broad, round crowns. Typically the dense *Quercus chrysolepis* occurs adjacent to or over a coarse tan or brown shrub layer that ranges from sparse to dense patches. *Cercocarpus* is generally extremely sparse in this type; when visible it tends to be a very dark brown.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1203 -- 2706 m (3946 -- 8879 ft) Shape – convex, concave, undulating Slope position – low slope, midslope, high slope Steepness – steep to very steep

ASPECT:



- Canyon Live Oak Forest Alliance (1020) •
- •
- Singleleaf Pinyon Pine Woodland Alliance (3110) Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association • (4107)
- Curl-leaf Mountain Mahogany Woodland Alliance (5230)

WESTERN WHITE PINE WOODLAND ALLIANCE



SEKI-AA.0314

Western White Pine Woodland



3130 – WESTERN WHITE PINE WOODLAND ALLIANCE Pinus monticola Woodland Alliance

MOSI_SW

DISTRIBUTION:



DESCRIPTION:

The *Pinus monticola* woodland alliance is mapped on gentle to steep primarily north to northeast facing slopes between 1773 --3278 m (5817 -- 10756 ft). The open tree canopy of the associations making up this alliance is dominated by *Pinus monticola*; other important conifers may include *Abies magnifica* and *P. contorta var. murrayana*. In Sequoia National Park, these stands may also include low cover of *P. balfouriana ssp. austrina*. The shrub layer can be either sparse or well developed and frequently contains dense patches of *Arctostaphylos patula*, *Chrysolepis sempervirens*, and/or *Holodiscus microphyllus*. The herbaceous layer is characteristically sparse, but frequently includes *Achnatherum occidentale*, *Aster breweri*, *Carex exserta*, *Carex rossii*, and/or *Juncus parryi*. The hydrology is upland. Soils are moderately to well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature of *Pinus monticola* is dark pink or red and has a large, irregular, diffused crown shape. These stands are typically open and have either a rocky or an herbaceous understory.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1773 --3278 m (5817 -- 10756 ft) Shape – convex, concave, undulating Slope position – low slope, midslope, high slope Steepness – gentle to steep





- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine Woodland Association (3038)
- Jeffrey Pine Woodland Alliance (3070)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- Whitebark Pine Woodland Alliance (3140)
- Limber Pine Woodland Alliance (3150)
- Foxtail Pine Woodland Alliance (3200)
- Foxtail Pine Woodland Superassociation (3203)
- Foxtail Pine-Western White Pine Woodland Superassociation (3204)
- Mountain Hemlock–Western White Pine Forest Association (4033)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest Mapping Unit (4065)
- Sierra Juniper Woodland Alliance (4100)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

3132 – WESTERN WHITE PINE-SIERRA LODGEPOLE PINE WOODLAND ASSOCIATION

Pinus monticola-Pinus contorta var. murrayana Woodland Association



TDPE_SE

DISTRIBUTION:



DESCRIPTION:

The Pinus monticola - Pinus contorta var. murrayana woodland association is mapped on moderate to steep slopes of varying aspect between 2495 -- 3278 m (8186 -- 10756 ft). The open tree canopy is dominated by a mixture of Pinus monticola and P. contorta var. murrayana, with each species contributing at least 10% relative cover to the canopy. Abies magnifica, P. albicaulis, and P. balfouriana ssp. austrina are also often present at low cover. The shrub layer can be sparse or well developed and is frequently dominated by Arctostaphylos patula, Chrysolepis sempervirens, and/or Holodiscus microphyllus. The characteristically sparse herbaceous layer may include Arabis platysperma, Aster breweri, Carex exserta, C. rossii, and Juncus parryi. The hydrology is upland. Soils are moderately well drained sandy loams. (NatureServe October 2006). In the aggregated database, the Pinus monticola - Pinus contorta var. murrayana woodland association is aggregated into the Pinus monticola - Pinus contorta var. murrayana- (Abies magnifica) forest mapping unit (4540).

PHOTO INTERPRETATION SIGNATURE:

The photo signature of the *Pinus monticola* is red or pink in color, and has large, open irregularly shaped crowns. The signature of *P. contorta var. murrayana* is red or brown in color with a tight, rounded crown. These stands are typically open. Settings can be somewhat rocky and usually display minimal understory signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2495 -- 3278 m (8186 -- 10756 ft) Shape – convex, concave, undulating Slope position – midslope, high slope, ridgetop Steepness – moderate to steep

ASPECT:



- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine Woodland Association (3038)
- Sierra Lodgepole Pine Xeric Forest Superassociation (3049)
- Western White Pine Woodland Alliance (3130)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- Whitebark Pine Woodland Alliance (3140)
- Foxtail Pine-Western White Pine Woodland Superassociation
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)
- Mountain Hemlock-Sierra Lodgepole Pine-Western White Pine Forest Association (4043)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Western White Pine Forest Association (4057)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

3133 – WESTERN WHITE PINE/(GREENLEAF MANZANITA-BUSH CHINQUAPIN-OCEANSPRAY) WOODLAND MAPPING UNIT Pinus monticola/(Arctostaphylos patula-Chrysolepis sempervirens-Holodiscus discolor) Woodland Mapping Unit



LODG_NE

DISTRIBUTION:



DESCRIPTION:

The Pinus monticola/(Arctostaphylos patula-Chrysolepis sempervirens-Holodiscus discolor) woodland mapping unit is mapped on moderately steep to steep slopes of varying aspect between 2313 -- 3278 m (7588 -- 10756 ft). The open tree canopy is dominated by Pinus monticola, with other subalpine conifers (Abies magnifica, P. balfouriana ssp. austrina, and/or P. contorta var. murrayana) sometimes contributing low amounts of cover. The shrub layer is well developed and may include dense patches of Arctostaphylos nevadensis, A. patula, Chrysolepis sempervirens, and/or Holodiscus microphyllus. The herbaceous layer is characteristically sparse. The hydrology is upland. Soils are well drained sands.

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Pinus monticola* is typically red or pink with broad, irregularly shaped crowns. The shrubs in this mapping unit appear smooth overall with some tufts interspersed, ranging in color from brown to orange, depending on what species are present. The stand pattern varies, but is predominantly found as sparse clumps of Western White Pine trees over the mixed shrubs that can range from a dispersed to a more dense undercover. Photo interpreters mapped this association generally along ridges, adjacent spurs and upper exposed slopes.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2313 -- 3278 m (7588 -- 10756 ft) Shape – convex, concave Slope position – ridges, adjacent spurs and upper exposed slopes Steepness – moderately steep to steep

ASPECT:



- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Jeffrey Pine/Whitethorn Ceanothus Woodland Association (3073)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Whitebark Pine Woodland Alliance (3140)
- Foxtail Pine/Bush Chinquapin Woodland Association (3202)
- Foxtail Pine-Western White Pine Woodland Superassociation (3204)
- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus) Forest Mapping Unit (4054)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest Mapping Unit (4065)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

WHITEBARK PINE WOODLAND ALLIANCE



SEKI.0163_93

Whitebark Pine Woodland

- 3140 WHITEBARK PINE WOODLAND ALLIANCE Pinus albicaulis Woodland Alliance

MOBR_SE

DISTRIBUTION:



DESCRIPTION:

Associations within the *Pinus albicaulis* woodland alliance are mapped on gentle to very steep subalpine slopes of varying aspect between 2501 -- 3841 m (8204 -- 12603 ft). The open tree canopy is dominated by *Pinus albicaulis*, with *P. balfouriana ssp. austrina*, *P. contorta var. murrayana*, or *Tsuga mertensiana* important in mixed types. Trees may be either upright at lower elevations, or form dense krummholz stands near treeline. The shrub layer can be sparse or well developed; *Chrysolepis sempervirens*, *Holodiscus microphyllus*, *Phyllodoce breweri* and *Vaccinium caespitosum* may be important components, depending on local site characteristics. The herbaceous layer ranges from absent on steeper rocky sites to a moderately dense cover of graminoids or forbs on more mesic sites, where characteristic species may include Carex exserta, *C. rossii*, *Eriogonum ovalifolium*, *Juncus parryi*, *Penstemon davidsonii* and *Trisetum spicatum*. The hydrology is upland. Soils are well-drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature of *Pinus albicaulis* is variable. It can look dark brown or dark red in color with an irregularly shaped crown that can sometimes look like multiple crowns emanating from a single trunk. It can also appear in a krummholz form where the tree is extremely short and twisted with a spreading crown, sometimes looking like a red or brown colored shrub. *P. albicaulis* tends to have a somewhat lighter colored signature than *P. contorta var. murrayana* and a less rounded crown.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to sub mesic Elevation – 2501 -- 3841 m (8204 -- 12603 ft) Shape – convex, concave, undulating Slope position – low slope, midslope, high slope Steepness – gentle to very steep

ASPECT:


- Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (3033)
- Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (3043)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142)
- Whitebark Pine/Shorthair Sedge Woodland Association (3144)
- Limber Pine Woodland Alliance (3150)
- Foxtail Pine Woodland Alliance (3200)
- Foxtail Pine/Bush Chinquapin Woodland Association (3202)
- Foxtail Pine Woodland Superassociation (3203)
- Whitebark Pine-Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3530)
- Sierra Juniper Woodland Alliance (4100)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110)



3142 – WHITEBARK PINE/DAVIDSON'S PENSTEMON WOODLAND ASSOCIATION Pinus albicaulis/Penstemon davidsonii Woodland Association



DISTRIBUTION:



DESCRIPTION:

The *Pinus albicaulis/Penstemon davidsonii* woodland association is mapped on steep slopes of varying aspect between 2697 -- 3841 m (8847 -- 12603 ft) and attains the highest elevation of the *Pinus albicaulis* types mapped in Sequoia and Kings Canyon National Parks. The dominant growth form is krummholz, characterized by dense shrub-like mats of *P. albicaulis* with occasional emergent, upright stems. Scattered individuals of stunted *P. contorta var. murrayana* may also be present. *Ribes montigenum* and/or *Artemisia tridentata* may be present in the shrub layer. The herbaceous layer is sparse but may include patches of *Achnatherum occidentale, Carex exserta, C. rossii, Eriogonum ovalifolium, Lupinus lepidus, Juncus drummondii, J. parryi,* and/or *Penstemon davidsonii*. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature for the *Pinus albicaulis* in this association is typically a krummholz tree. It looks brown with a smooth looking round crown, occurring in sparse clumps in rocky areas. *Penstemon davidsonii* is not discernible on the aerial photo but is referenced as an indicator species in this high elevation association.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2697 -- 3841 m (8847 -- 12603 ft) Shape – convex, undulating Slope position – low slope, midslope, high slope Steepness – steep

ASPECT:



- Whitebark Pine Woodland Alliance (3140)
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142)
- Whitebark Pine/Shorthair Sedge Woodland Association (3144)
- Foxtail Pine Woodland Superassociation (3203)
- Foxtail Pine-Sierra Lodgepole Pine-Whitebark Pine) Krummholz Woodland Mapping Unit (3520)
- Whitebark Pine-Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3530)
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110)



3144 – WHITEBARK PINE/SHORTHAIR SEDGE WOODLAND ASSOCIATION *Pinus albicaulis/Carex exserta* Woodland Association



DISTRIBUTION:



DESCRIPTION:

The Pinus albicaulis/Carex exserta woodland association is mapped on gentle to steep slopes of varying aspect between 2806 -- 3670 m (9205 -- 12040 ft). The tree canopy is dominated by Pinus albicaulis, but P. balfouriana ssp. austrina and P. contorta var. murrayana may also be present. The shrub layer is sparse to absent, with occasional Holodiscus microphyllus. The understory is dominated by Carex exserta (C. filifolia var. erostrata sensu Hickman 1993), with Eriogonum ovalifolium, Juncus parryi, Penstemon davidsonii, Phyllodoce breweri, and/or Vaccinium caespitosum often contributing lower amounts of cover. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Pinus albicaulis typically appears short and occasionally in krummholz form in this association. These small brown trees occur in a sparse density over the moderate to dense pockets of *Carex exserta*, which appear as a cream or tan color in the photo. There are often dry, narrow, linear meadows running through or adjacent to these stands and there is often gray colored scree mixed in with the *C. exserta*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to sub xeric Elevation – 2806 -- 3670 m (9205 -- 12040 ft) Shape – convex, undulating Slope position – low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



- Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (3033)
- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (3042)
- Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (3043)
- Whitebark Pine Woodland Alliance (3140)
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142)



3148 – WHITEBARK PINE-MOUNTAIN HEMLOCK WOODLAND ASSOCIATIONN *Pinus albicaulis-Tsuga mertensiana* Woodland Association

DISTRIBUTION:



DESCRIPTION:

The *Pinus albicaulis* - *Tsuga mertensiana* woodland association is mapped on steep northwest to northeast facing slopes between 2804 -- 3335 m (9198 -- 10940 ft). The tree canopy is dominated by a sparse to moderately dense mixture of *Pinus albicaulis* and *Tsuga mertensiana*, with each species contributing at least 5% cover. The shrub layer commonly includes *Ribes montigenum* and *Salix drummondiana*. The sparse herbaceous layer can be relatively diverse, and commonly includes *Selaginella watsonii, Antennaria rosea, Arabis platysperma, Carex exserta, C. rossii, Cryptogramma acrostichoides, Elymus elymoides, Juncus parryi, Penstemon newberryi, Phlox diffusa, Phyllodoce breweri, Sedum obtusatum, Penstemon newberryi, and/or Trisetum spicatum. The hydrology is upland. (NatureServe October 2006).*

PHOTO INTERPRETATION SIGNATURE:

Most stands noted by photo interpreters contain trees that appear reduced in size, although not technically krummholz in form. Stands are generally very small and distinctions between the two conifers are difficult to establish; *Tsuga mertensiana* generally has narrower crowns and a somewhat darker green signature. Stands are generally mapped in submesic conditions on steep north trending upper slopes.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to submesic Elevation – 2804 -- 3335 m (9198 -- 10940 ft) Shape – concave to neutral Slope position – upper slopes Steepness – steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Mountain Hemlock–Western White Pine Forest Association (4033) ٠
- ٠
- Mountain Hemlock-Sierra Lodgepole Pine Forest Association (4041) Mountain Hemlock-Sierra Lodgepole Pine-Western White Pine Forest Association (4043) •

3150 – LIMBER PINE WOODLAND ALLIANCE Pinus flexilis Woodland Alliance



MOKA_SE

DISTRIBUTION:



DESCRIPTION:

The *Pinus flexilis* woodland alliance is mapped on moderate to steep southwest to northeast facing slopes between 2232 -- 3544 m (7324 -- 11628 ft). The tree canopy of this seldom encountered type is characterized by the presence of *Pinus flexilis*, but may include *Abies concolor*, *P. albicaulis*, *P. balfouriana ssp. austrina*, *P. contorta var. murrayana*, *P. jeffreyi*, and/or *P. monticola*. In stands near the Kern crest, the canopy is most frequently codominated by *P.balfouriana ssp. austrina*; west of the Kern Canyon, *P. contorta var. murrayana* is more important. The shrub layer commonly contains *Arctostaphylos patula*, *Artemisia tridentata*, *Chrysolepis sempervirens*, and/or *Holodiscus microphyllus*. The herbaceous layer is sparse. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Pinus flexilis is a small to medium sized tree that has an irregularly shaped crown that sometimes looks windswept. It is found in very steep canyons, sometimes over a sparse mixed shrub layer, but usually in rocky environments. Mapped stands are generally small in size.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2232 -- 3544 m (7324 -- 11628 ft) Shape – concave, convex, undulating Slope position – midslope, ridgetop Steepness – moderately steep to steep





- Western White Pine Woodland Alliance (3130)
- Whitebark Pine Woodland Alliance (3140)
- Foxtail Pine Woodland Alliance (3200)
- Sierra Juniper Woodland Alliance (4100)

FOXTAIL PINE WOODLAND ALLIANCE



SEKI-AA.0479_1044

Foxtail Pine-Western White Pine Woodland



3200 – FOXTAIL PINE WOODLAND ALLIANCE Pinus balfouriana ssp. austrina Woodland Alliance

MOKA_NE

DISTRIBUTION:



DESCRIPTION:

The Pinus balfouriana ssp. austrina woodland alliance is mapped on gentle to steep subalpine slopes of varying aspect between 2506 -- 3829 m (8223 -- 12561ft). The open tree canopy is dominated by Pinus balfouriana ssp. austrina, but may also include Abies magnifica, Juniperus occidentalis var. australis, P. albicaulis, P. contorta var. murrayana, P. flexilis, P. jeffreyi, or P. monticola. P. balfouriana ssp. Austrina only occasionally forms krummholz stands at high elevations. The shrub layer may be sparse to relatively dense and is most frequently dominated by Chrysolepis sempervirens, although Arctostaphylos nevadensis, A. patula, or Holodiscus discolor are also sometimes important. The herbaceous layer is characteristically sparse to absent but when developed the most frequently encountered associates include Achnatherum occidentale, Arabis platysperma, Carex exserta, C. rossii, Elymus elymoides, Eriogonum polypodum, and Juncus parryi. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Pinus balfouriana ssp. austrina has a highly variable crown shape and size ranging from broad in open pure stands at high elevations to narrow crowns in dense stands especially when sharing dominance with *P. contorta var. murrayana. P. balfouriana ssp. austrina* generally yields a dark red to magenta signature that is usually darker *than P. contorta var. murrayana*, which frequently co-dominates stands at lower elevations. Photo interpreters generally noted *Chrysolepis sempervirens* or *Arctostaphylos nevadensis* as occasional shrub components of south trending lower elevation stands.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2506 -- 3829 m (8223 -- 12561ft) Shape – concave, convex, undulating Slope position – low slope, midslope, high slope Steepness – gentle to very steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Western White Pine Woodland Alliance (3130)
- Whitebark Pine Woodland Alliance (3140)
- Limber Pine Woodland Alliance (3150)



3202 – FOXTAIL PINE/BUSH CHINQUAPIN WOODLAND ASSOCIATION Pinus balfouriana ssp. austrina/Chrysolepis sempervirens Woodland Association

MOKA_NE

DISTRIBUTION:



DESCRIPTION:

The Pinus balfouriana ssp. austrina/Chrysolepis sempervirens woodland association is mapped on relatively steep slopes of primarily south to west facing xeric subalpine slopes between 2679 -- 3521 m (8791 -- 11553 ft). The open tree canopy is dominated by Pinus balfouriana ssp. austrina, but may also include Juniperus occidentalis var. australis, P. contorta var. murrayana, P. jeffreyi, or P. monticola. The shrub layer is well developed and is characterized by the presence by Chrysolepis sempervirens, although Arctostaphylos nevadensis, Artemisia tridentata, and Holodiscus discolor are also frequently encountered. The herbaceous layer is absent to sparse. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

Pinus balfouriana ssp. austrina in this xeric setting have a less reflective signature, but individual trees are large and crowns are broad. The shrub understory is bright red when *Chrysolepis sempervirens* dominates and brown when *Arctostaphylos nevadensis* is dominant in the understory.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2679 -- 3521 m (8791 -- 11553 ft) Shape – primarily convex, but also concave or undulating Slope position – midslope, high slope Steepness – somewhat to very steep





- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland
- Mapping Unit (3133)
- Whitebark Pine Woodland Alliance (3140)
 Foxtail Pine Woodland Superassociation (3203)



3203 – FOXTAIL PINE WOODLAND SUPERASSOCIATION Pinus balfouriana ssp. austrina Woodland Superassociation

MOBR_SE

DISTRIBUTION:



DESCRIPTION:

The *Pinus balfouriana ssp. austrina* woodland superassociation is mapped on gentle to steep subalpine slopes of varying aspect between 2506 -- 3609 m (8223 -- 11840 ft). The open tree canopy is dominated by *Pinus balfouriana ssp. austrina*, with *Pinus albicaulis*, *P. contorta var. murrayana*, and/or *P. monticola* contributing low amounts of cover. Shrub cover is generally low, but *Chrysolepis sempervirens*, *Holodiscus discolor*, and *Phyllodoce breweri* are frequently present. The herbaceous layer is sparse but often includes *Achnatherum occidentale*, *Arabis platysperma*, *Carex exserta*, *C. rossii*, *Elymus elymoides*, *Eriogonum polypodum*, and *Juncus parryi*. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Pinus balfouriana ssp. austrina in nearly pure stands generally have medium to large crowns, even in the highest elevation stands where other conifers are typically much smaller. Stands are rather open with little or no herbaceous understory, yielding a white signature adjacent to the pine woodland.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2506 -- 3609 m (8223 -- 11840 ft) Shape – convex, undulating Slope position – midslope, high slope, ridgetop Steepness – gentle to steep





- Western White Pine Woodland Alliance (3130)
- Whitebark Pine Woodland Alliance (3140)
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142)
- Foxtail Pine/Bush Chinquapin Woodland Association (3202)
- Foxtail Pine-Western White Pine Woodland Superassociation (3204)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)



3204 – FOXTAIL PINE-WESTERN WHITE PINE WOODLAND SUPERASSOCIATION Pinus balfouriana ssp. austrina-Pinus monticola Woodland Superassociation

MOKA_SE

DISTRIBUTION:



DESCRIPTION:

The Pinus balfouriana ssp. austrina-Pinus monticola woodland superassociation is mapped on moderately steep to steep slopes of varying aspect in the upper montane between 2537 -3343 m (8322 -- 10967 ft). The open tree canopy is dominated by a mixture of *Pinus balfouriana ssp. austrina* and *P. monticola*, with *Abies magnifica* and *P. contorta var. murrayana* frequently contributing low to moderate amounts of cover. Shrubs may be absent but can be important, with the shrub layer most frequently dominated by patches of *Chrysolepis sempervirens*. The herbaceous layer may also be sparse to well developed, with *Artemisia norvegica ssp. saxatilis, Elymus elymoides, Lupinus latifolius var. columbianus,* and *Monardella odoratissima* most frequently characterizing the understory. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

Pinus monticola generally is lighter in color than the *adjacent P. balfouriana ssp. austrina*; and are usually a bit taller with a less rounded crown. Generally, they are a less common component to the *P. balfouriana ssp. austrina*. *P. contorta var. murrayana* can be in the canopy and usually has a narrow crown in this type. When *Abies magnifica* is a component of the stand, it is similar in color to the *Pinus monticola*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2537 – 3343 m (8322 – 10967 ft) Shape – convex, undulating Slope position – midslope, high slope, ridgetop Steepness – moderately steep to steep

ASPECT:



- Western White Pine Woodland Alliance (3130) •
- •
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132) Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland ٠ Mapping Unit (3133)
- Foxtail Pine Woodland Superassociation (3203)
- California Red Fir-Western White Pine Forest Association (4057)



3205 – DEAD FOXTAIL PINE MAPPING UNIT Dead Pinus balfouriana ssp. austrina Mapping Unit

MOWI_SW

DISTRIBUTION:



DESCRIPTION:

The dead *Pinus balfouriana ssp. austrina* mapping unit is mapped on moderate to steep convex subalpine slopes of varying aspect between 3015 – 3829 m (9893 – 12561 ft), most frequently adjacent to living stands of *Pinus balfouriana ssp. austrina*. The open tree canopy is characterized by dead *P. balfouriana ssp. austrina*, and may consist of either standing snags and/or downed logs. The shrub layer is absent, and the herbaceous layer is characteristically sparse. When mapped above the current treeline, these 'ghost forests' likely represent a lowering of treeline due to climate change over the last several millennia, with general declines in temperature and possibly increasing moisture. Forest interior sites are more likely to represent foxtail killed by fire over the last couple of hundred years where re-establishment of the forest is occurring slowly; in some cases, such burned stands may occur all the way up to treeline and be confused with climate change (Anthony Caprio, pers. comm., October 2006). The hydrology of this type is upland.

PHOTO INTERPRETATION SIGNATURE:

Stands of dead *Pinus balfouriana ssp. austrina* are extremely difficult to detect, as the standing trees yield almost no signature adjacent to the talus or scree underneath. Trees are more discernable when down as opposed to erect. Denser stands are more easily recognizable.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 3015 -- 3829 m (9893 -- 12561 ft) Shape – convex Slope position – midslope to high slope Steepness – moderate to steep

ASPECT:



- Alpine Talus Slope (0100)
- Alpine Scree Slope (0200)
 Foxtail Pine Woodland Superassociation (3203)

3520 - (FOXTAIL PINE-SIERRA LODGEPOLE PINE-WHITEBARK PINE) KRUMMHOLZ WOODLAND MAPPING UNIT (Pinus balfouriana ssp. austrina-Pinus contorta var. murrayana-Pinus albicaulis) Krummholz Woodland Mapping Unit





DISTRIBUTION:



DESCRIPTION:

The (*Pinus balfouriana ssp. austrina-Pinus contorta var. murrayana-Pinus albicaulis*) krummholz woodland mapping unit is mapped on occasionally gentle to more typically very steep rocky subalpine slopes between 3097 -- 3703 m (10162 -- 12148 ft). These stands of low-lying, wind pruned krummholz trees over loose sands or talus define the upper edge of the timberline. Because individual species of krummholz cannot be determined from aerial photography, this mapping unit includes stands dominated by a single species and also those that represent mixtures of two pines. North of the Kings-Kern divide, *Pinus albicaulis* and *P. contorta var. murrayana* are the most frequently encountered krummholz pines, while in the headwaters of the Kern River, *P. albicaulis* and *P. balfouriana ssp. austrina* occur in mixture. To the south, *P. contorta var. murrayana* (and less frequently, *P. balfouriana ssp. austrina*) dominate. Shrubs are rare in these stands, and the sparse herbaceous layer is characterized by scattered alpine perennial species. Hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

Used when photo interpreters cannot reliably separate out conifer types using environmental correlates or color infrared signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 3097 -- 3703 m (10162 -- 12148 ft) Shape – Slope position – lowslope, midslope, highslope, ridgetop Steepness – gentle to very steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Whitebark Pine Woodland Alliance (3140)
- Whitebark Pine/Davidson Penstemon association (3142)
 Whitebark Pine-Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3530)

3530 - WHITEBARK PINE-FOXTAIL PINE-LODGEPOLE PINE WOODLAND

SUPERALLIANCE Pinus albicaulis-Pinus balfouriana ssp. austrina-Pinus contorta var. murrayana Woodland Superalliance



MOBR_SE

DISTRIBUTION:



DESCRIPTION:

The *Pinus albicaulis-Pinus balfouriana ssp. austrina-Pinus contorta var. murrayana* superalliance is mapped on moderate to very steep slopes of varying aspect between 2612 -- 3666 m (8568 -- 12029 ft). The open tree canopy is dominated by a mixture of *Pinus albicaulis, Pinus balfouriana ssp. austrina,* and/or *Pinus contorta var. murrayana.* Stands of this type may be dominated by any one of these three tree taxa, depending on local site conditions; the difficulty in distinguishing these from one another on the aerial photography requires the use of this mapping unit. The shrub layer may be sparse or relatively well developed, and may contain *Chrysolepis sempervirens, Holodiscus microphyllus,* and/or *Phyllodoce breweri.* The herbaceous layer may also be sparse or well developed, with *Carex filifolia* most likely to contribute significant cover. They hydrology is upland. Soils are well drained sandy loams.

PHOTO INTERPRETATION SIGNATURE:

Mapped when the photo interpreter recognizes both *Pinus albicaulis* and *P. balfouriana ssp. austrina* with or without *P. contorta var. murrayana* in stands where canopies range from sparse to moderate. *P. balfouriana ssp. austrina* are generally much larger than *P. albicaulis* where at these high elevations the *P. albicaulis* often assumes a krummholz form. Colors are often quite similar between the two pines.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - xeric

Elevation – 2612 -- 3666 m (8568 -- 12029 ft) Shape – convex, concave, undulating Slope position – low slope, midslope, high slope Steepness – moderate to very steep

ASPECT:



- Whitebark Pine Woodland Alliance (3140) ٠
- •
- Whitebark Pine/Davidson's Penstemon Woodland Association (3142) (Foxtail Pine-Sierra Lodgepole Pine-Whitebark Pine) Krummholz Woodland Mapping Unit • (3520)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)

3540 - FOXTAIL PINE-SIERRA LODGEPOLE PINE WOODLAND SUPERALLIANCE Pinus balfouriana ssp. austrina-Pinus contorta var. murrayana Woodland Superalliance



MOBR_SE

DISTRIBUTION:


DESCRIPTION:

The *Pinus balfouriana ssp. austrina-Pinus contorta var. murrayana* superalliance is mapped on gentle to steep subalpine slopes of variable aspects between 2602 -- 3506 m (8536 --11502 ft). The open tree canopy is dominated by a variable mixture of *P. balfouriana ssp. austrina* and *P. contorta var. murrayana*, but may also frequently include *Abies magnifica* and/or *P. monticola*. These stands are mapped as a superalliance due to the difficulty of determining which conifer is dominant in any given location. The shrub layer is generally sparse (0-40% absolute cover) but is most frequently dominated by patches of *Chrysolepis sempervirens* or *Phyllodoce breweri*. The characteristically sparse herbaceous layer most often includes *Achnatherum occidentale*, *Carex exserta*, *C. rossii*, and *Juncus parryi*. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

Compared with other foxtail pine associations, this type is generally mapped on better developed soils in less steep and less rocky environments. Stands can be moderately dense. Separating the two species can be nearly impossible, especially at the lower elevation ranges where *Pinus balfouriana ssp. austrina* contributes less than 10% of the coniferous component. Photo interpreters rely on upslope stands of *P. balfouriana ssp. austrina* and downslope *P. contorta var. murrayana* and use a high degree of inference to determine the cut off points between both higher elevation pure stands of *P. balfouriana ssp. austrina* and lower elevation *P. contorta var. murrayana* associations.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2602 -- 3506 m (8536 -- 11502 ft) Shape – concave, convex, undulating Slope position – low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Sierra Lodgepole Pine-Whitebark Pine/Ross Sedge Forest Association (3033)
- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Sierra Lodgepole Pine/Shorthair Sedge Woodland Association (3042)
- Sierra Lodgepole-Whitebark Pine/Shorthair Sedge Forest Association (3043)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Foxtail Pine Woodland Superassociation (3203)
- Whitebark Pine-Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3530)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)

3550 – WHITE FIR-JEFFREY PINE-(SUGAR PINE) WOODLAND MAPPING UNIT Pinus jeffreyi-Abies concolor Woodland & Abies concolor-Pinus lambertiana-Pinus jeffreyi Woodland Mapping Unit



LODG_NW

DISTRIBUTION:



DESCRIPTION:

The Pinus jeffreyi-Abies concolor woodland & Abies concolor-Pinus lambertiana-Pinus jeffreyi forest superalliance is mapped on gentle to steep slopes of varying aspect between 1600 -- 2725 m (5248 -- 8941 ft). The tree canopy can be open or closed, and is dominated by a mixture of Pinus jeffreyi and Abies concolor with P. lambertiana often important. A.magnifica, Calocedrus decurrens, P. contorta var. murrayana, and Quercus kelloggii may also contribute varying amounts of cover. The shrub layer may be sparse or well developed with Arctostaphylos patula, Ceanothus cordulatus, Chrysolepis sempervirens, Prunus emarginata, and Ribes spp. most frequently encountered. The herbaceous layer is poorly developed; commonly encountered species include Apocynum androsaemifolium, Elymus elymoides, Erigeron breweri, Eriogonum nudum, and Pteridium aquilinum. The hydrology is upland. Soils are well drained loamy sand. In the aggregated database, the Pinus jeffreyi-Abies concolor woodland & Abies concolor-Pinus lambertiana-Pinus jeffreyi forest superalliance is aggregated into the Pinus jeffreyi woodland alliance (3070).

PHOTO INTERPRETATION SIGNATURE:

This woodland is typically a dense stand of trees with few shrubs visible in the understory. The signature for *Pinus jeffreyi* is a pink or light red color with a broad, round crown, while the *Abies concolor* is a dark red color, occasionally with a white top, with narrow conical crowns in the aerial photos. The *P. lambertiana* is pink or red with a large star shaped crown.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to subxeric Elevation – 1600 -- 2725 m (5248 -- 8941 ft) Shape – convex, concave, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Jeffrey Pine/Whitethorn Ceanothus Woodland Association (3073)
- Jeffrey Pine-White Fir/Roundleaf Snowberry/Squirreltail Woodland Association (3083)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- California Red Fir-White Fir-Sugar Pine Forest Association (4073)
- White Fir Forest Mapping Unit (4081)
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094)

GIANT SEQUOIA FOREST ALLIANCE



SEKI-AA.0282_896

Giant Sequoia-Sugar Pine/Pacific Dogwood Forest

4020 – GIANT SEQUOIA FOREST ALLIANCE Sequoiadendron giganteum Forest Alliance



CAMO_SE

DISTRIBUTION:



DESCRIPTION:

The Sequoiadendron giganteum forest alliance is mapped on gentle to steep slopes of varying aspect between 1371 -- 2426 m (4497 -- 7958 ft) on the western slope of the Great Western Divide. The tree canopy is dominated by a mixture of montane conifers, including *Abies concolor, Calocedrus decurrens,* and *Pinus lambertiana,* which provide a matrix within which Sequoiadendron giganteum provides an important component. A secondary layer of *Cornus nuttallii* is frequently present. The shrub layer is generally open and contains scattered patches of *Ceanothus integerrimus, Chrysolepis sempervirens, Corylus cornuta var. californica,* and young conifers. The herbaceous layer is generally sparse but can be locally well developed depending on microsite characteristics; it frequently includes *Adenocaulon bicolor, Draperia systyla, Galium spp., Lupinus polyphyllus var. burkei,* and *Pteridium aquilinum.* The hydrology is upland. Soils are moderately well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature for *Sequoiadendron giganteum* is slightly variable since it can occur in a variety of settings. The signature is a red irregular shaped tree crown that ranges in density from moderately dense to dense, sometimes with openings in the canopy that reveal post disturbance shrubs or bare ground. Crown sizes are huge and billowy, with vegetative portions extending broadly down the main stem, which is especially evident toward air photo edges.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 1371 -- 2426 m (4497 -- 7958 ft) Shape – concave, convex, undulating Slope position – low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Giant Sequoia-Sugar Pine/Pacific Dogwood Forest Association (4021) •
- Giant Sequoia-White Fir-California Red Fir Forest Association (4023) White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094) ٠
- •

4021 – GIANT SEQUOIA-SUGAR PINE/PACIFIC DOGWOOD FOREST ASSOCIATION

Sequoiadendron giganteum-Pinus lambertiana/Cornus nuttallii Forest Association



DISTRIBUTION:



DESCRIPTION:

The Sequoiadendron giganteum-Pinus lambertiana/Cornus nuttallii forest is mapped on gentle to steep montane slopes of varying aspect between 1371 -- 2426 m (4497 -- 7958 ft). The tree canopy is dominated by a mixture of Abies concolor, Calocedrus decurrens, Pinus lambertiana, and Sequoiadendron giganteum, frequently with a patchy subcanopy of Cornus nuttallii. The shrub layer is generally open and contains scattered patches of Ceanothus integerrimus, Chrysolepis sempervirens, Corylus cornuta var. californica, and young conifers. The herbaceous layer is characteristically sparse but can be locally well developed depending on microsite characteristics; it frequently includes Adenocaulon bicolor, Draperia systyla, Galium spp., Lupinus polyphyllus var. burkei, and Pteridium aquilinum. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

In this association, the photo signature for *Sequoiadendron giganteum* is a very large tree with a dark red to orange irregular billowy shaped crown, and the *Pinus lambertiana* signature looks like a smaller pink or red tree with a large star shaped crown. *Abies concolor* sometimes makes up a minor component and has a narrow, red, conical. *Cornus nuttallii* is not always present in this forest type and is not distinct on the aerial photo unless noted in forest openings. Stands are generally dense with very few openings in the canopy.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 1371 -- 2426 m (4497 -- 7958 ft) Shape – concave, convex, undulating Slope position – low slope, midslope Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Giant Sequoia Forest Alliance (4020)
- Giant Sequoia-White Fir-California Red Fir Forest Association (4023)
- California Red Fir-White Fir-Sugar Pine Forest Association (4073)
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094)



4023 – GIANT SEQUOIA-WHITE FIR-CALIFORNIA RED FIR FOREST ASSOCIATION Sequoiadendron giganteum-Abies concolor-Abies magnifica Forest Association

LODG_SW

DISTRIBUTION:



DESCRIPTION:

The Sequoiadendron giganteum-Abies concolor-Abies magnifica forest is mapped on moderately steep to steep south to southwest facing slopes between 1900 -- 2576 m (6232 -- 8450 ft). This forest type represents the highest elevation expression of the Sequoiadendron giganteum forest alliance. The tree canopy is dominated by a mixture of Abies concolor, A. magnifica, and Sequoiadendron giganteum. The shrub layer is generally sparse, but may contain patches of Chrysolepis sempervirens, Corylus cornuta var. californica, and/or Symphoricarpos rotundifolius. The herbaceous layer is sparse to well developed; the most frequently encountered species include Galium sparsiflorum, Lupinus polyphyllus var. burkei, Osmorhiza brachypoda, and Pteridium aquilinum. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

The Sequoiadendron giganteum photo signature is a typically large tree with a dark red, irregularly shaped crown. Abies magnifica is a red or dark red color with a large, broad, conical crown, and *A. concolor* has a red signature that looks like a skinny tree with a narrow conical crown. Stands are generally dense with very few openings in the canopy. There is little or no presence of *Pinus lambertiana* in this forest type and *A. magnifica* often dominates the canopy.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 1900 -- 2576 m (6232 -- 8450 ft) Shape – convex Slope position – midslope, high slope Steepness – moderately steep to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Giant Sequoia Forest Alliance (4020) ٠
- Giant Sequoia-Sugar Pine/Pacific Dogwood Forest Association (4021) California Red Fir-White Fir-Sugar Pine Forest Association (4073) ٠
- ٠
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094) •

MOUNTAIN HEMLOCK FOREST ALLIANCE



SEKI.0258_367

Mountain Hemlock Forest

4030 – MOUNTAIN HEMLOCK FOREST ALLIANCE Tsuga mertensiana Forest Alliance

DISTRIBUTION:



DESCRIPTION:

The *Tsuga mertensiana* forest alliance is mapped on moderately steep to steep north to northeast facing slopes between 2535 – 3302 m (8317 – 10832 ft). The open, sometimes stunted tree canopy is dominated by *Tsuga mertensiana*, but may also have significant amounts of *Pinus contorta var. murrayana* and/or *P. monticola*. Low amounts of *Abies magnifica* or *P. albicaulis* may also be present. The shrub layer is well developed and contains a mesic understory of *Cassiope mertensiana*, *Ledum glandulosum*, *Phyllodoce breweri*, and *Ribes velutinum*. The herbaceous layer can be sparse or dense, and most frequently includes *Antennaria spp.*, *Aquilegia formosa*, *Arabis platysperma*, *Aster breweri*, *Cryptogramma acrostichoides*, *Epilobium angustifolium ssp. circumvagum*, *Heuchera micrantha*, *Orthilia secunda*, and/or *Selaginella watsonii*. The hydrology is upland. Soils are well drained sandy loams to moderately well drained loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Tsuga mertensiana generally occurs in very small stands in Kings Canyon but individual trees are usually quite large with a conical to irregularly shaped crown. Colors are deep red and occur in moderately dense to dense stands. Most stands are viewed off the photo center (nadir) on steep north trending slopes yielding signatures where much of the crown can be viewed in some situations. Confusion is possible between *T. mertensiana* and large *P. albicaulis* or *P. monticola*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 2535 -- 3302 m (8317 -- 10832 ft) Shape – concave, undulating Slope position – midslope Steepness – moderately steep to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
 California Red Fir Forest Association (4051)



4033 – MOUNTAIN HEMLOCK-WESTERN WHITE PINE FOREST ASSOCIATION Tsuga mertensiana-Pinus monticola Forest Association

DISTRIBUTION:



DESCRIPTION:

The *Tsuga mertensiana-Pinus monticola* forest association is mapped on steep north facing slopes between 2703 -- 3103 m (8867 -- 10180 ft). The open tree canopy is dominated by a mixture of *Tsuga mertensiana* and *Pinus monticola. P. contorta var. murrayana* and/or *Abies magnifica* may also be present in the canopy but do not contribute significant cover. The shrub layer is characteristically sparse but may include *Ledum glandulosum, Phyllodoce breweri, Ribes montigenum,* and/or *Ribes velutinum.* The herbaceous layer is typically open and may include *Arabis platysperma, Poa secunda, Arabis lyallii, Poa wheeleri, Juncus parryi,* and *Carex rossii.* The hydrology is upland. Soils are well drained loams and sandy loams. (NatureServe October 2006, Potter 1998).

PHOTO INTERPRETATION SIGNATURE:

This type is mapped in steep north upper slopes where adjacent stands of *Pinus monticola* are noted by the photo interpreter. Both species are very similar when co-occurring but *Tsuga mertensiana* is usually a bit darker red with a less diffused crown.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2703 -- 3103 m (8867 -- 10180 ft) Shape – various Slope position – midslope, high slope Steepness – steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Whitebark Pine–Mountain Hemlock Woodland Association (3148)
- Mountain Hemlock-Sierra Lodgepole Pine-Western White Pine Forest Association (4043)



4041 – MOUNTAIN HEMLOCK-SIERRA LODGEPOLE PINE FOREST ASSOCIATION Tsuga mertensiana-Pinus contorta var. murrayana Forest Association

MOSI_SW

DISTRIBUTION:



DESCRIPTION:

The Tsuga mertensiana- Pinus contorta var. murrayana forest association is mapped on moderately steep north to northeast facing slopes between 2727 -- 3180 m (8947 -- 10433 ft). The open tree canopy is dominated by a mixture of Tsuga mertensiana and Pinus contorta var. murrayana, with each species contributing at least 10% relative cover. P. monticola and/or Abies magnifica may also be present in the canopy but do not contribute significant cover. The shrub layer is characteristically sparse but may include significant amounts of Ledum glandulosum and/or Phyllodoce breweri. The herbaceous layer is typically open and may include Arabis platysperma, Poa secunda, Juncus parryi, and Carex rossii. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Stands are often dense yielding variability in color between the *Pinus contorta var. murrayana* and the brighter adjacent *Tsuga mertensiana*. This type for the most part is mapped on gentler slopes compared with other hemlock associations, often grading into drier *Pinus contorta var. murrayana/Carex rossii* forests downslope.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2727 -- 3180 m (8947 -- 10433 ft) Shape – concave, convex Slope position – low slope, midslope Steepness – moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Sierra Lodgepole Pine/Ross Sedge Forest Association (3041)
- Whitebark Pine–Mountain Hemlock Woodland Association (3148)
- Mountain Hemlock-Sierra Lodgepole Pine-Western White Pine Forest Association (4043)

4042 – MOUNTAIN HEMLOCK-SIERRA LODGEPOLE PINE-WHITEBARK PINE FOREST MAPPING UNIT

Tsuga mertensiana-Pinus contorta var. murrayana-Pinus albicaulis Forest Mapping Unit



DISTRIBUTION:



DESCRIPTION:

The *Tsuga mertensiana-Pinus contorta var. murrayana-Pinus albicaulis* mapping unit is mapped on moderately steep north to northeast facing slopes between 2859 -- 3302 m (9380 -- 10832 ft). The open tree canopy is dominated by a mixture of *Tsuga mertensiana, Pinus contorta var. murrayana,* and *P. albicaulis*, with at least 10% relative cover of each tree species. The shrub layer is characteristically sparse but may include patches of *Ledum glandulosum* and/or *Phyllodoce breweri*. The herbaceous layer is typically open and may include a variety of herbs such as *Juncus parryi, Penstemon newberryi*, or *Selaginella watsonii*. The hydrology is upland. Soils are moderately well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

A high elevation *Tsuga mertensiana* type is almost impossible to distinguish from the *Pinus albicaulis* - *Tsuga mertensiana* mesic forest superassociation (3148) where *Pinus contorta var. murrayana* is not easily seen. In this community, *P. contorta var. murrayana* are inconspicuous and generally have to be inferred by the photo interpreter as this type is usually found just downslope from Tsuga *mertensiana* and *P. albicaulis*. Separation between *Tsuga mertensiana* and *P. albicaulis* is fairly easy; at higher elevations *P. albicaulis* often display a krummholz form, while *T. mertensiana* generally maintains it's tree-like stature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2859 -- 3302 m (9380 -- 10832 ft) Shape – concave, convex Slope position – midslope Steepness – moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Whitebark Pine–Mountain Hemlock Woodland Association (3148)
- Mountain Hemlock-Sierra Lodgepole Pine Forest Association (4041)

4043 – MOUNTAIN HEMLOCK-SIERRA LODGEPOLE PINE-WESTERN WHITE PINE FOREST ASSOCIATION

Tsuga mertensiana-Pinus contorta var. murrayana-Pinus monticola Forest Association



DISTRIBUTION:



DESCRIPTION:

The *Tsuga mertensiana-Pinus contorta var. murrayana-Pinus monticola* forest association is mapped on moderately steep north to northeast facing slopes between 2859 -- 3302 m (9380 -- 10832 ft). The open tree canopy is dominated by a mixture of *Tsuga mertensiana, Pinus contorta var. murrayana,* and *P. monticola,* with at least 10% relative cover of each tree species. *Abies magnifica* is occasionally present in the overstory. The shrub layer is characteristically sparse but may include patches of *Ribes spp.* and/or *Phyllodoce breweri.* The herbaceous layer is typically open and may include a variety of herbs such as *Juncus parryi, Penstemon newberryi, Poa secunda,* or *Selaginella watsonii.* The hydrology is upland. Soils are moderately well drained to well drained sandy clay loams or loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Some of the *Tsuga mertensiana* associations may prove too fine to map; especially between this type and the type often found adjacent to it on steeper slopes: *Tsuga mertensiana – Pinus monticola* forest association (4033). These two associations are likely not separable using just the aerial photography. It is necessary to distinguish these two associations based on environmental setting.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2859 -- 3302 m (9380 -- 10832 ft) Shape – convex Slope position – midslope Steepness – steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Whitebark Pine–Mountain Hemlock Woodland Association (3148)
- Mountain Hemlock–Western White Pine Forest Association (4033)
- Mountain Hemlock-Sierra Lodgepole Pine Forest Association (4041)

CALIFORNIA RED FIR FOREST ALLIANCE



SEKI-AA.0615_1168

California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest

4050 – CALIFORNIA RED FIR FOREST ALLIANCE Abies magnifica Forest Alliance



DISTRIBUTION:



DESCRIPTION:

The Abies magnifica forest alliance is mapped on gentle to steep slopes of varying aspect between 2003 -- 3275 m (6572 -- 10744 ft). The tree canopy of associations in this upper montane alliance is dominated by Abies magnifica. Other trees in the canopy may include A. concolor, Pinus contorta var. murrayana, P. jeffreyi, P. lambertiana, and P. monticola. The shrub layer ranges from absent to well developed, and most frequently includes Acer glabrum, Arctostaphylos nevadensis, A. patula, Artemisia tridentata, Ceanothus cordulatus, Chrysolepis sempervirens, Holodiscus discolor, Ledum glandulosum, Phyllodoce breweri, Prunus emarginata, Ribes spp., or Symphoricarpos mollis. The herbaceous layer is characteristically sparse to absent, with Apocynum androsaemifolium, Arabis spp., Aster breweri, Carex rossii, Elymus elymoides, Hieracium albiflorum, Lupinus latifolius var. columbianus, Monardella odoratissima, Pedicularis semibarbata, Pteridium aquilinum, Pyrola picta, and Senecio triangularis among the most frequently encountered species. The hydrology is upland. Soils are moderately well drained to well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The signature of *Abies magnifica* is a large tree with a broad, deep red crown – darker red than similar white fir, which often displays some dead growth at the top of the tree.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2003 -- 3275 m (6572 -- 10744 ft) Shape – concave, convex, undulating Slope position – low slope, midslope, high slope, ridgetop Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus)
 Forest Mapping Unit (4054)
- California Red Fir–White Fir Forest Alliance (4070)
- White Fir-Sugar Pine Forest Alliance (4080)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)
- White Fir-Sugar Pine/Greenleaf Manzanita-Whitethorn Ceanothus Forest Mapping Unit (4095)

4051 – CALIFORNIA RED FIR FOREST ASSOCIATION Abies magnifica Forest Association



MOSI_SW

DISTRIBUTION:


DESCRIPTION:

The Abies magnifica forest association is mapped on moderate to steep slopes of varying aspect between 2182 -- 3127 m (7159 -- 10259 ft). The typically dense and multi-layered tree canopy is dominated by Abies magnifica. The shrub layer is usually absent; however, Arctostaphylos nevadensis, Chrysolepis sempervirens, and Ceanothus cordulatus may be present on drier or disturbed sites. The sparse herbaceous layer may contain Aster breweri, Corallorhiza maculata, Pedicularis semibarbata, and Pyrola picta along with significant regeneration of A. magnifica. The hydrology is upland. Soils are well drained sandy loam. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

The *Abies magnifica* photo signature is a large tree with a broad, red, conical crown. The stand is usually very dense, but can be slightly open in disturbed settings or toward the edge of stands. Overall signature in this association is very uniform due to the high dominance of *A. magnifica*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2182 -- 3127 m (7159 -- 10259 ft) Shape – convex, undulating Slope position – low slope, midslope, high slope Steepness – moderate to steep





- Jeffrey Pine-California Red Fir Woodland Association (3085)
- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus) Forest Mapping Unit (4054)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit (4063)
- California Red Fir-White Fir Forest Association (4071)
- White Fir Forest Mapping Unit (4081)
- White Fir Mature Even-age Stands Mapping Unit (4082)

4054 – CALIFORNIA RED FIR/PINEMAT MANZANITA-(GREENLEAF MANZANITA-WHITETHORN CEANOTHUS) FOREST MAPPING UNIT Abies magnifica/Arctostaphylos nevadensis-(Arctostaphylos patula-Ceanothus cordulatus) Forest Mapping Unit



LODG_NE

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica/Arctostaphylos nevadensis-(Arctostaphylos patula-Ceanothus cordulatus) forest mapping unit is mapped on moderate to steep slopes of varying aspect between 2200 -- 3167 m (7219 -- 10391 ft). The characteristically open tree canopy is dominated by Abies magnifica. Other trees in the canopy may include A. concolor, Pinus contorta var. murrayana, P. jeffreyi, P. lambertiana, and P. monticola. The shrub layer is typically dominated by mats of Arctostaphylos nevadensis, but may also include patches of A. patula, Artemisia tridentata, Ceanothus cordulatus, Chrysolepis sempervirens, Holodiscus discolor, Prunus emarginata, or Ribes spp. The herbaceous layer is characteristically sparse to absent, but most frequently includes Arabis spp., Aster breweri, Elymus elymoides, or Pteridium aquilinum. The hydrology is upland. (NatureServe October 2006, Potter 1998). In the aggregated database, the Abies magnifica/Arctostaphylos nevadensis-(Arctostaphylos patula-Ceanothus cordulatus) forest mapping unit is aggregated into the Abies magnifica-(Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit (4064).

PHOTO INTERPRETATION SIGNATURE:

The Abies magnifica photo signature is a large tree with a broad, red, conical crown. The stand is usually open with mixed shrubs that look smooth and orange or pink in the understory. The shrubs that occur in this stand: (generally *Arctostaphylos nevadensis*, *A. patula* and *Chrysolepis sempervirens*) give the signature significant variability. Other conifers that may be a minor component of the stand, especially *Pinus jeffreyi*, as a rule yield a lighter pink signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2200 -- 3167 m (7219 -- 10391 ft) Shape – convex Slope position – low slope, midslope, high slope, ridgetop Steepness – moderate to steep

ASPECT:



- Jeffrey Pine-California Red Fir Woodland Association (3085)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- California Red Fir Forest Alliance (4050)
- California Red Fir Forest Association (4051)
- California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest Mapping Unit (4065)
- California Red Fir–White Fir Forest Alliance (4070)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- White Fir-Sugar Pine Forest Alliance (4080)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)

4055 – CALIFORNIA RED FIR-WESTERN WHITE PINE-SIERRA LODGEPOLE PINE

FOREST ASSOCIATION Abies magnifica-Pinus monticola-Pinus contorta var. murrayana Forest Association



MOSI_SW

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica-Pinus monticola-Pinus contorta var. murrayana forest association is mapped on gentle to steep slopes of varying aspect between 2383 -- 3275 m (7819 -- 10744 ft). The moderately dense tree canopy is dominated by a mixture of Abies magnifica, Pinus monticola and P. contorta var. murrayana. The shrub layer is absent to sparse, with Arctostaphylos nevadensis, A. patula, Chrysolepis sempervirens and various Ribes spp. among the most frequently encountered species. The herbaceous layer is also sparse to absent, with Arabis spp., Aster breweri, Elymus elymoides, Pteridium aquilinum, and Senecio triangularis most common. The hydrology is upland. Soils are well drained sands or sandy loams. (NatureServe 2006, Potter 1998). In the aggregated database, the Abies magnifica-Pinus monticola - Pinus contorta var. murrayana (Abies magnifica) forest mapping unit (4540).

PHOTO INTERPRETATION SIGNATURE:

The *Abies magnifica* photo signature is typically a large tree with a broad, red, conical crown. The signature of *Pinus monticola* is a dark pink or red crown that is shaped irregularly. The photo signature of *P. contorta var. murrayana* appears is a dark red or brown colored crown with a pointed or irregular shape. The signatures for *P. monticola* and the *A. magnifica* can be similar where the two conifers co-occur, and this association is therefore difficult to determine based on signature alone. Photo interpreters map this type in less steep settings than other *P. monticola* types and in slightly more mesic conditions.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2383 -- 3275 m (7819 -- 10744 ft). Shape – concave, convex, undulating Slope position – low slope, midslope, high slope, ridgetop Steepness – gentle to steep

ASPECT:



- Jeffrey Pine-California Red Fir Woodland Association (3085)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)
- California Red Fir Forest Association (4051)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit (4063)
- California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest Mapping Unit (4065)



4057 – CALIFORNIA RED FIR-WESTERN WHITE PINE FOREST ASSOCIATION Abies magnifica-Pinus monticola Forest Association

MOSI_SW

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica-Pinus monticola forest association is mapped on moderate to very steep slopes of predominantly north to northeast or northwest facing aspect between 2003 -- 3169 m (6572 -- 10398 ft). The moderately dense tree canopy is dominated by a mixture of Abies magnifica and Pinus monticola, with occasional A. concolor, Juniperus occidentalis var. australis, P. balfouriana ssp. austrina, or P. jeffreyi. A. magnifica is the dominant tree in this association, but P. monticola is always present and contributes relatively high cover. The shrub layer is absent to sparse, with patches of Arctostaphylos nevadensis, A. patula, Chrysolepis sempervirens, and various Ribes spp. among the most frequently encountered species. The sparse to absent herbaceous layer is characterized by Arabis platysperma and Aster breweri. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006, Potter 1998).

PHOTO INTERPRETATION SIGNATURE:

The photo signature for *Abies magnifica* appears as a large tree with a broad, red, conical crown and the signature for *Pinus monticola* looks like a large, irregularly shaped dark pink or red crown. The canopy for this type ranges from open to closed and has an uneven texture. Photo interpreters map this type in fairly steep north trending settings that trended between xeric and mesic. It is mapped generally on steeper and higher slopes than the *Abies magnifica-Pinus monticola-Pinus contorta var. murrayana* forest association (4055).

ENVIRONMENTAL CHARACTERISTICS:

Microclimate -- submesic

Elevation – 2003 -- 3169 m (6572 -- 10398 ft) Shape – concave, convex, undulating Slope position – midslope, high slope, ridgetop Steepness – moderate to very steep

ASPECT:



- Jeffrey Pine-California Red Fir Woodland Association (3085)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- Foxtail Pine-Western White Pine Woodland Superassociation
- California Red Fir Forest Association (4051)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit (4063)
- California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest Mapping Unit (4065)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)

4063 – CALIFORNIA RED FIR-SIERRA LODGEPOLE PINE/WHITEFLOWER HAWKWEED FOREST MAPPING UNIT

Abies magnifica-Pinus contorta var. murrayana/Hieracium albiflorum Forest Mapping Unit



LODG_NW

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica-Pinus contorta var. murrayana/Hieracium albiflorum forest association is mapped on gentle to moderately steep slopes of varying aspect between 2018 -- 3172 m (6620 -- 10406 ft). The dense, multi-layered tree canopy is dominated by a mixture of Abies magnifica and Pinus contorta var. murrayana. A. concolor may also be important and scattered P. jeffreyi and P. monticola may also occur. In some cases east of the Great Western Divide, A. concolor can either be dominant or co-dominant with A. magnifica and/or P. contorta var. murrayana. Conifer regeneration dominates the shrub layer, with Ribes spp. characterizing moister sites and patches of Ceanothus cordulatus and Chrysolepis sempervirens indicating drier conditions. The herbaceous layer is characterized by the presence of scattered Hieraceum albiflorum, with Arabis platysperma, Carex rossii, Kelloggia galioides, Osmorhiza chilensis, Pedicularis semibarbata, and Poa bolanderi frequently encountered as well. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006, Potter 1998).

PHOTO INTERPRETATION SIGNATURE:

The Abies magnifica photo signature is a large tree with a broad, red, conical crown. The photo signature of *Pinus contorta var. murrayana* appears as a dark red or brown colored crown with a pointed or irregular shape. Where the two conifers share dominance it is difficult to distinguish individual trees, so photo interpreters note overall signature trends of the stand. In this association, it appears more variable in color than pure *P. contorta var. murrayana* or *A. magnifica* associations. This association is usually very dense and located in mesic environments.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2018 -- 3172 m (6620 -- 10406 ft) Shape – concave, convex, flat, undulating Slope position – low slope, midslope Steepness – gentle to moderately steep

ASPECT:



- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022)
- Sierra Lodgepole Pine Woodland Association (3038)
- Sierra Lodgepole Pine Mesic Forest Superassociation (3048)
- California Red Fir Forest Association (4051)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir-White Fir Forest Association (4071)
- White Fir Forest Mapping Unit (4081)

4064 - CALIFORNIA RED FIR-(WESTERN WHITE PINE)/(PINEMAT MANZANITA-

BUSH CHINQUAPIN) FOREST MAPPING UNIT Abies magnifica-(Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) Forest Mapping Unit



California Red Fir - Western White Pine

4064 - CALIFORNIA RED FIR-(WESTERN WHITE PINE)/(PINEMAT MANZANITA-BUSH CHINQUAPIN) FOREST MAPPING UNIT Abies magnifica-(Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) Forest Mapping Unit

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica-(Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit is an aggregation of the Abies magnifica/Arctostaphylos nevadensis-(Arctostaphylos patula-Ceanothus cordulatus) forest mapping unit (4054) and the Abies magnifica-Pinus monticola/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit (4065). The aggregated type is mapped on moderate to steep slopes of varying aspects between 2074 -- 3274 m (6803 -- 10741 ft). The characteristically open tree canopy is dominated by Abies magnifica, with Pinus monticola codominant at higher elevations and on upper slopes. The shrub layer can be dominated by either Arctostaphylos nevadensis or Chrysolepis sempervirens, with A. patula or Ceanothus cordulatus occasionally important. The herbaceous layer is characteristically sparse to absent, but most frequently includes Arabis spp., Aster breweri, Elymus elymoides, Monardella odoratissima or Pteridium aquilinum. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

The Abies magnifica-(Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit represents an aggregated high elevation mixed conifer type containing Abies magnifica and usually Pinus monticola over a shrub understory. Signatures vary widely depending on shrub understory and disturbance history, and generally post fire settings contain more Ceanothus cordulatus).

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - xeric

Elevation – 2074 -- 3274 m (6803 -- 10741 ft) Shape – neutral to convex Slope position – mid to upper slopes Steepness – moderate to steep

ASPECT:



- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Jeffrey Pine-California Red Fir Woodland Association (3085)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- California Red Fir Forest Alliance (4050)
- California Red Fir Forest Association (4051)
- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus) Forest Mapping Unit (4054)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest Mapping Unit (4065)
- California Red Fir–White Fir Forest Alliance (4070)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- White Fir-Sugar Pine Forest Alliance (4080)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)

4065 – CALIFORNIA RED FIR-WESTERN WHITE PINE/(PINEMAT MANZANITA-BUSH CHINQUAPIN) FOREST MAPPING UNIT Abies magnifica-Pinus monticola/(Arctostaphylos nevadensis-Chrysolepis sempervirens) Forest Mapping Unit



MUGR_SE

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica-Pinus monticola/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit is mapped on moderate to steep slopes of varying aspect between 2074 - 3274 m (6803 -- 10741 ft). The characteristically open tree canopy is dominated by a mixture of Abies magnifica and Pinus monticola. Other trees in the canopy may include *P. balfouriana ssp. austrina, P. contorta var. murrayana,* and *P. jeffreyi.* The shrub layer is typically dominated by mats of Arctostaphylos nevadensis or patches of Chrysolepis sempervirens. The herbaceous layer is characteristically sparse to absent, but most frequently includes Achnatherum occidentale, Arabis platysperma, Aster breweri, Elymus elymoides, and Monardella odoratissima. The hydrology is upland. Soils are well drained sands or sandy loams. (NatureServe October 2006, Potter 1998). In the aggregated database, the Abies magnifica-Pinus monticola/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit is aggregated into the Abies magnifica-(Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit is espression of the Abies magnifica-Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit is aggregated into the Abies magnifica-(Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit is aggregated into the Abies magnifica-Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit is aggregated into the Abies magnifica-(Pinus monticola)/(Arctostaphylos nevadensis-Chrysolepis sempervirens) forest mapping unit (4064).

PHOTO INTERPRETATION SIGNATURE:

The *Abies magnifica* photo signature is a large tree with a broad, red, conical crown. The signature of the *Pinus monticola* is a dark pink or red crown that is shaped irregularly. There is sparse to dense shrub understory that appears brown, orange or pink depending on species dominance.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2074 -- 3274 m (6803 -- 10741 ft) Shape – convex Slope position – midslope, high slope, ridgetop Steepness – moderate to steep

ASPECT:



- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Jeffrey Pine-California Red Fir Woodland Association (3085)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland Mapping Unit (3133)
- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus) Forest Mapping Unit (4054)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Western White Pine Forest Association (4057)

CALIFORNIA RED FIR-WHITE FIR FOREST ALLIANCE



SEKI.003_24

California Red Fir-White Fir Forest



4070 – CALIFORNIA RED FIR-WHITE FIR FOREST ALLIANCE Abies magnifica-Abies concolor Forest Alliance

GIFO_NE

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica-Abies concolor forest alliance is mapped on gentle to steep slopes of varying aspect between 1703 -- 3077 m (5587 -- 10095 ft). The tree canopy of associations in this montane alliance is dominated by a mixture of Abies magnifica and A. concolor. Other trees in the canopy may include Juniperus occidentalis var. australis, Pinus contorta var. murrayana, P. jeffreyi, P. lambertiana, and P. monticola. The shrub layer ranges from absent to well developed, and most frequently includes Acer glabrum, Arctostaphylos patula, Ceanothus cordulatus, Chrysolepis sempervirens, Prunus emarginata, Ribes spp., or Symphoricarpos spp. The herbaceous layer is characteristically sparse to absent, with Apocynum androsaemifolium, Arabis platysperma, Aster breweri, Elymus glaucus, Hieracium albiflorum, Lupinus spp., Monardella odoratissima, Pteridium aquilinum, and Pyrola picta among the most frequently encountered species. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006). In the aggregated database, the Abies magnifica-Abies concolor forest alliance includes the Abies magnifica-Abies concolor forest alsociation (4071), the. Abies magnifica-Abies concolor-Pinus lambertiana forest association (4072), and the Abies magnifica-Abies concolor-Pinus lambertiana forest association (4073).

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Abies magnifica* is a large tree with a broad, red, conical crown. *A. concolor* appears brighter red with narrow conical crowns in the aerial photos, sometimes with a white dot on the tip of the crown as a result of die off. *A. magnifica* is generally a larger tree with a crown that remains full further down the main stem than the smaller *A. concolor*. Separation between the two species is extremely difficult on signature alone except in the most optimal circumstances.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 1703 -- 3077 m (5587 -- 10095 ft) Shape – concave, convex, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



- California Red Fir Forest Alliance 4050)
- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus)
 Forest Mapping Unit (4054)
- California Red Fir-White Fir Forest Association (4071)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- California Red Fir-White Fir-Sugar Pine Forest Association (4073)
- White Fir-Sugar Pine Forest Alliance (4080)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)
- White Fir-Sugar Pine/Greenleaf Manzanita-Whitethorn Ceanothus Forest Mapping Unit (4095)

• 4071 – CALIFORNIA RED FIR-WHITE FIR FOREST ASSOCIATION Abies magnifica-Abies concolor Forest Association



LODG_NW

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica-Abies concolor forest association is mapped on gentle to steep slopes of varying aspect between 1951 -- 3077 m (6401 -- 10095 ft). The dense tree canopy is dominated by a mixture of Abies magnifica and A. concolor. The shrub layer ranges from absent to well developed, and most frequently includes Ceanothus cordulatus, Chrysolepis sempervirens, Prunus emarginata, Ribes spp., or Symphoricarpos spp. The herbaceous layer is characteristically sparse to absent, with Apocynum androsaemifolium, Arabis platysperma, Aster breweri, Elymus glaucus, Hieracium albiflorum, Lupinus spp., Monardella odoratissima, Pteridium aquilinum, and Pyrola picta among the most frequently encountered species. The hydrology is upland. Soils are well drained sandy loams. In the aggregated database, the Abies magnifica-Abies concolor forest alliance (4070).

PHOTO INTERPRETATION SIGNATURE:

The photo signature of *Abies magnifica* is a large tree with a broad, red, conical crown. *A. concolor* appears brighter red with narrow conical crowns in the aerial photos, sometimes with a white dot on the tip of the crown (due to die off). *A. magnifica* is generally a larger tree than the smaller *A. concolor*. These forests are usually dense and are difficult to distinguish from the pure *A. concolor* (4081) and pure *A. magnifica* (4051) stands.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 1951 -- 3077 m (6401 -- 10095 ft) Shape – concave, convex, undulating Slope position – low slope, midslope Steepness – gentle to steep

ASPECT:



- Jeffrey Pine-White Fir/Roundleaf Snowberry/Squirreltail Woodland Association (3083)
- California Red Fir Forest Association (4051)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit (4063)
- California Red Fir–White Fir Forest Alliance (4070)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- California Red Fir-White Fir-Sugar Pine Forest Association (4073)
- White Fir Forest Mapping Unit (4081)
- White Fir Mature Even-age Stands Mapping Unit (4082)
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094)

• 4072 – CALIFORNIA RED FIR-WHITE FIR-JEFFREY PINE FOREST ASSOCIATION Abies magnifica-Abies concolor-Pinus jeffreyi Forest Association



MUGR_SE

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica-Abies concolor-Pinus jeffreyi forest association is mapped on moderate to steep slopes of varying aspect between 1939 -- 2897 m (6361 -- 9506 ft). The moderately dense tree canopy is characterized by Abies concolor and Pinus jeffreyi in mixture with A. magnifica. The shrub layer may be sparse or consist of patches of Arctostaphylos patula, Ceanothus cordulatus, Chrysolepis sempervirens, Prunus emarginata, or Symphoricarpos rotundifolius. The herbaceous layer is typically poorly developed, with Hieracium albiflorum, Kelloggia galioides, Pedicularis semibarbata, Phacelia hydrophylloides, and Viola purpurea most frequently encountered. Sites are upland and soils are well drained sandy loams. (Potter 1998). In the aggregated database, the Abies magnifica-Abies concolor-Pinus jeffreyi forest association is aggregated into the Abies magnifica-Abies concolor forest alliance (4070).

PHOTO INTERPRETATION SIGNATURE:

The *Pinus jeffreyi* photo signature has a large, pink or red colored, round crown. *Abies magnifica* has a broad, red, conical crown remaining full further down the main stem. *A. concolor* is smaller than the *P. jeffreyi* or *A. magnifica* and appears brighter red with narrow conical crowns on the aerial photos, sometimes with a white tip on the crown (from die off). This is generally a woodland type where *P. jeffreyi* is usually identifiable due to the larger rounded crown. It sometimes has a minor shrub component to the rocky understory.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to sub mesic Elevation – 1939 -- 2897 m (6361 -- 9506 ft) Shape – neutral to slightly convex Slope position – lowslope, midslope, highslope Steepness – moderate to steep

ASPECT:



- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Jeffrey Pine/Whitethorn Ceanothus Woodland Association (3073)
- Jeffrey Pine-White Fir/Roundleaf Snowberry/Squirreltail Woodland Association (3083)
- Jeffrey Pine-California Red Fir Woodland Association (3085)
- White Fir-Jeffrey Pine-(Sugar Pine) Woodland Mapping Unit (3550)
- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus) Forest Mapping Unit (4054)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir–White Fir Forest Alliance (4070)
- California Red Fir-White Fir Forest Association (4071)
- California Red Fir-White Fir-Sugar Pine Forest Association (4073)
- White Fir Forest Mapping Unit (4081)
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094)
- White Fir-Sugar Pine/Greenleaf Manzanita-Whitethorn Ceanothus Forest Mapping Unit (4095)



4073 – CALIFORNIA RED FIR-WHITE FIR-SUGAR PINE FOREST ASSOCIATION Abies magnifica-Abies concolor-Pinus lambertiana Forest Association

MUGR_SE

DISTRIBUTION:



DESCRIPTION:

The Abies magnifica-Abies concolor-Pinus lambertiana forest association is mapped on moderate to steep slopes of varying aspect between 1703 -- 2611 m (5587 -- 8567 ft). The tree canopy of these dense multi-layered forest stands is generally dominated by a mixture of Abies concolor and A. magnifica, and characterized by the presence of scattered Pinus lambertiana. Calocedrus decurrens and P. jeffreyi may also occur. The shrub layer may be patchy or sparse, with Chrysolepis sempervirens and Ribes spp. most frequently encountered. The characteristically sparse herbaceous layer most often includes Aster breweri, Monardella odoratissima, Hieracium albiflorum, and/or Pteridium aquilinum. Sites are upland and soils are well-drained sandy loams or loams. (NatureServe January 2007). In the aggregated database, the Abies magnifica-Abies concolor forest alliance (4070).

PHOTO INTERPRETATION SIGNATURE:

The *Pinus lambertiana* photo signature has a large pink or red star shaped crown. The *Abies magnifica* signature looks like a large tree with a broad, red, conical crown. The *A. concolor* is smaller than the *P. lambertiana* or the *A. magnifica* and appears brighter red with narrow conical crowns on the aerial photos, sometimes with a white tip on the crown (due to die off). This is generally a closed stand, but can have some openings where there may be a minor shrub component. There can be a minor component of *P. jeffreyi*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - xeric

Elevation – 1703 -- 2611 m (5587 -- 8567 ft) Shape – neutral to slightly convex Slope position – lowslopes and midslopes Steepness – moderate to steep

ASPECT:



- White Fir-Jeffrey Pine-(Sugar Pine) Woodland Mapping Unit (3550)
- Giant Sequoia-Sugar Pine/Pacific Dogwood Forest Association (4021)
- Giant Sequoia-White Fir-California Red Fir Forest Association (4023)
- California Red Fir–White Fir Forest Alliance (4070)
- California Red Fir-White Fir Forest Association (4071)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- White Fir Forest Mapping Unit (4081)
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094)
- White Fir-Sugar Pine/Greenleaf Manzanita-Whitethorn Ceanothus Forest Mapping Unit (4095)

WHITE FIR-SUGAR PINE FOREST ALLIANCE



SEKI-AA.0030_540

White Fir-Sugar Pine-Incense-cedar Forest



4080 – WHITE FIR -SUGAR PINE FOREST ALLIANCE Abies concolor-Pinus lambertiana Forest Alliance

GIFO_NE

DISTRIBUTION:


DESCRIPTION:

The Abies concolor-Pinus lambertiana forest alliance is mapped on gentle to steep slopes of varying aspect between 1109 -- 2897 m (3638 -- 9504 ft). This forest alliance includes some of the most extensive montane forests mapped in the two parks, including stands of what is frequently referred to as the 'mixed conifer' forest. The tree canopy is dominated by a mixture of *Abies concolor* and *Pinus lambertiana*, with *Calodedrus decurrens* important on lower elevation sites. Other trees in the canopy frequently include *P. jeffreyi*, *P. ponderosa*, and/or *Quercus kelloggii*; *P. contorta var. murrayana* may also occur in colder air drainages. The shrub layer is dominated by regeneration of the coniferious overstory and may also contain *Arctostaphylos patula*, *Ceanothus cordulatus*, *Chamaebatia foliolosa*, *Chrysolepis sempervirens*, *Cornus nuttallii*, *Corylus cornuta var. californica*, *Prunus emarginata*, or *Ribes spp.* depending on site conditions. The herbaceous layer is characteristically sparse, but frequently includes *Adenocaulon bicolor*, *Apocynum androsaemifolium*, *Draperia systyla*, *Galium sparsiflorum*, *Hieracium albiflorum*, and/or *Pteridium aquilinum* in addition to young conifer seedlings. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Photo interpreters map this alliance in dense woodland or forest settings that open up only in post disturbance-related settings such as following fire. Mature *Pinus lambertiana* maintain their large star-shaped crown even in forest settings and contrast easily with the narrow conical crowns of the *Abies concolor*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – sub mesic Elevation – 1109 -- 2897 m (3638 -- 9504 ft) Shape – concave, convex, flat, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



- California Red Fir Forest Alliance (4050)
- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus)
 Forest Mapping Unit (4054)
- California Red Fir–White Fir Forest Alliance (4070)
- White Fir Forest Mapping Unit (4081)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)
- White Fir-Sugar Pine/Greenleaf Manzanita-Whitethorn Ceanothus Forest Mapping Unit (4095)





MUGR_SW

DISTRIBUTION:



DESCRIPTION:

The Abies concolor forest mapping unit is mapped on gentle to moderately steep slopes of varying aspect between 1109 -- 2897 m (3638 -- 9504 ft). The open to dense tree canopy is characterized by the dominance of Abies concolor, with Calocedrus decurrens, Pinus jeffreyi, and *P. lambertiana* frequently co-occuring. A subcanopy of *Cornus nuttalli, Corylus cornuta,* or *Quercus kelloggii* may be present, The shrub layer may be sparse to dense, with Arctostaphylos patula, Ceanothus cordulatus, Ribes spp., and Symphoricarpos most frequently encountered. The herbaceous layer is characteristically sparse, but in more open stands may be well developed. Frequently encountered species include Apocynum androsaemifolium, Galium sparsiflorum, Gayophytum spp., and Pteridium aquilinum. Soils of these upland stands are well-drained sandy loams and loams.

PHOTO INTERPRETATION SIGNATURE:

Mapped where little or no *Pinus lambertiana* is observed, primarily in narrow protected ravines and coves. Crown canopy appears as a uniform *Abies concolor* signature of narrow conical crowns.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to submesic Elevation – 1109 -- 2897 m (3638 -- 9504 ft) Shape – neutral to concave Slope position – canyon bottom, lowslope, midslope Steepness – gentle to moderately steep

ASPECT:



- Black Cottonwood Forest Association (2053)
- Jeffrey Pine-White Fir/Roundleaf Snowberry/Squirreltail Woodland Association (3083)
- White Fir-Jeffrey Pine-(Sugar Pine) Woodland Mapping Unit (3550)
- California Red Fir Forest Association (4051)
- California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit (4063)
- California Red Fir-White Fir Forest Association (4071)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- California Red Fir-White Fir-Sugar Pine Forest Association (4073)
- White Fir-Sugar Pine Forest Alliance (4080)
- White Fir Mature Even-age Stands Mapping Unit (4082)
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094)



4082 – WHITE FIR MATURE EVEN-AGE STANDS MAPPING UNIT Abies concolor Mature Even-age Stands Mapping Unit

GIFO_NW

DISTRIBUTION:



DESCRIPTION:

The Abies concolor mature even-age stands mapping unit is mapped on gentle to moderately steep slopes of varying aspect between 1510 -- 953 m (4953 -- 3128 ft). The tree canopy is dominated by Abies concolor, with A. magnifica, Calodedrus decurrens and Pinus lambertiana also frequently important. The defining characteristic of these stands is the dominance of even-aged mature (as opposed to the regeneration mapped as conifer reproduction (910) A. concolor, likely indicating late post burn status.

PHOTO INTERPRETATION SIGNATURE:

Even age stands of young *Abies concolor* give off a fairly regular patterning throughout the stand – young firs tend to have a brighter infrared signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to submesic Elevation – 1510 -- 953 m (4953 -- 3128 ft) Shape – neutral to concave Slope position – canyon bottom, lowslope, midslope Steepness – gentle to moderately steep

ASPECT:



- Conifer Reproduction (0910)
- California Red Fir Forest Association (4051)
- California Red Fir-White Fir Forest Association (4071)
- White Fir Forest Mapping Unit (4081)

4084 – WHITE FIR-(CALIFORNIA RED FIR-SUGAR PINE-JEFFREY PINE)/WHITETHORN CEANOTHUS-(GREENLEAF MANZANITA) FOREST MAPPING UNIT

Abies concolor-(Abies magnifica-Pinus lambertiana-Pinus jeffreyi)/Ceanothus cordulatus-(Arctostaphylos patula) Forest Mapping Unit



TDPE_SW

DISTRIBUTION:



DESCRIPTION:

The Abies concolor-(Abies magnifica-Pinus lambertiana-Pinus jeffreyi)/Ceanothus cordulatus-(Arctostaphylos patula) forest mapping unit is mapped on moderate to moderately steep slopes of varying aspect between 1641 -- 2792 m (5384 -- 9160 ft). The tree canopy of these open to moderately dense stands is dominated by Abies concolor, with A. magnifica, Pinus jeffreyi, and/or P. lambertiana contributing varying amounts of cover. A. concolor generally dominates the canopy layer; A. magnifica, P. jeffreyi, and/or P. lambertiana can be present, subordinate or exist occasionally as a co-dominant. The shrub layer is typically well developed, and is characterized by patches of Ceanothus cordulatus, although Arctostaphylos patula is frequently important. The herbaceous layer is characteristically sparse, with Apocynum androsaemifolium, Eriogonum nudum, and Gayophytum spp. most frequently encountered. This mapping unit is mapped most frequently in post-fire environments.

PHOTO INTERPRETATION SIGNATURE:

This type is typical in disturbance related openings in *Abies concolor* and *Abies concolor* - *Pinus lambertiana* types in post fire settings. *Ceanothus cordulatus* signature tends to be uniformly smooth and pink. The conifer signature varies due to the variable composition of the tree canopy.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1641 -- 2792 m (5384 -- 9160 ft) Shape – variable Slope position – lowslope, midslope Steepness – moderate to steep

ASPECT:



- Conifer Reproduction (0910)
- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Jeffrey Pine/Whitethorn Ceanothus Woodland Association (3073)
- California Red Fir Forest Alliance (4050)
- California Red Fir/Pinemat Manzanita-(Greenleaf Manzanita-Whitethorn Ceanothus) Forest Mapping Unit (4054)
- California Red Fir–White Fir Forest Alliance (4070)
- White Fir-Sugar Pine Forest Alliance (4080)
- White Fir-Sugar Pine/Greenleaf Manzanita-Whitethorn Ceanothus Forest Mapping Unit (4095)
- Whitethorn Ceanothus Shrubland Alliance (5110)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit (5520)



4094 – WHITE FIR-SUGAR PINE-INCENSE-CEDAR FOREST SUPERASSOCIATION Abies concolor-Pinus lambertiana-Calocedrus decurrens Forest Superassociation

MUGR_SW

DISTRIBUTION:



DESCRIPTION:

The Abies concolor-Pinus lambertiana-Calocedrus decurrens forest superassociation is mapped on moderate to steep montane slopes of varying aspect between 1253 -- 2530 m (4110 -- 8302 ft). Stands of this late successional forest are characterized by a dense, several layered conifer overstory co-dominated by Abies concolor and Calocedrus decurrens, with Pinus lambertiana consistently present as a minor associate. P. jeffreyi, P. ponderosa, and/or Quercus kelloggii may also be present. The shrub layer is dominated by regeneration of the coniferous overstory and may also contain Arctostaphylos patula, Ceanothus cordulatus, Chamaebatia foliolosa, Chrysolepis sempervirens, Cornus nuttallii, Corylus cornuta var. californica, Prunus emarginata, or Ribes spp. The sparse herbaceous layer is characterized by Adenocaulon bicolor, with Draperia systyla, Galium sparsiflorum, Hieracium albiflorum, Pteridium aquilinum, and Smilacina racemosa among the most frequently encountered herbaceous species. The hydrology is upland. Soils are well drained sandy loams. (Fites 1994, NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The Abies concolor-Pinus lambertiana-Calocedrus decurrens forest superassociation may form extensive transitions between the Pinus ponderosa-Calocedrus decurrens-Quercus kelloggii forest association (3063) at lower elevations and the Abies magnifica-Abies concolor-Pinus lambertiana forest association (4073) at higher elevations. In these settings, it can be extremely difficult to differentiate accurately. Pinus lambertiana has a crown signature similar to *P. monticola*, but with even more extensive branching higher up on the main stem. Calocedrus decurrens is not discernable in a mixed conifer environment. It generally occurs in closed stands with little disturbance.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to submesic Elevation – 1253 -- 2530 m (4110 -- 8302 ft) Shape – concave, convex, undulating Slope position – low slope, midslope, high slope Steepness – moderate to steep

ASPECT:



- Ponderosa Pine-Incense-cedar-California Black Oak Forest Association (3063)
- White Fir-Jeffrey Pine-(Sugar Pine) Woodland Mapping Unit (3550)
- Giant Sequoia-Sugar Pine/Pacific Dogwood Forest Association (4021)
- Giant Sequoia-White Fir-California Red Fir Forest Association (4023)
- California Red Fir-White Fir Forest Association (4071)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- California Red Fir-White Fir-Sugar Pine Forest Association (4073)
- White Fir Forest Mapping Unit (4081)
- White Fir-Sugar Pine/Greenleaf Manzanita-Whitethorn Ceanothus Forest Mapping Unit (4095)

4095 – WHITE FIR-SUGAR PINE/GREENLEAF MANZANITA-WHITETHORN

CEANOTHUS FOREST MAPPING UNIT Abies concolor-Pinus lambertiana/Arctostaphylos patula-Ceanothus cordulatus Forest Mapping Unit



GIFO_NE

DISTRIBUTION:



DESCRIPTION:

The Abies concolor-Pinus lambertiana/Arctostaphylos patula-Ceanothus cordulatus forest mapping unit is mapped on moderate to steep slopes of varying aspect between 1415 -- 2491 m (4643 -- 8172 ft). The tree canopy is dominated by Abies concolor, with Pinus lambertiana consistently present as a minor associate. The shrub layer is well developed and contains a mixture of Arctostaphylos patula and Ceanothus cordulatus. Prunus emarginata and/or Ribes spp. may also be present. The herbaceous layer is poorly developed to absent. The hydrology is upland. Soils are moderately well drained sandy loams.

PHOTO INTERPRETATION SIGNATURE:

This type is similar to higher elevation conifer / shrub types where *Abies magnifica* dominates the canopy. There is a frequent presence of *Pinus lambertiana* separating out this lower elevation mixed conifer community from those where *Abies magnifica dominates*. There are also adjacent and nearby stands of vegetation in modeling out this type; such as black oak or canyon oak which again are not associated with the higher elevation mixed conifer.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to sub mesic Elevation – 1415 -- 2491 m (4643 -- 8172 ft) Shape – variable Slope position – low slope, midslope Steepness – moderate to steep





- Jeffrey Pine/Whitethorn Ceanothus Woodland Association (3073)
- Giant Sequoia Forest Alliance (4020)
- California Red Fir Forest Alliance (4050)
- California Red Fir–White Fir Forest Alliance (4070)
- California Red Fir-White Fir-Jeffrey Pine Forest Association (4072)
- California Red Fir-White Fir-Sugar Pine Forest Association (4073)
- White Fir-Sugar Pine Forest Alliance (4080)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)
- White Fir-Sugar Pine-Incense-cedar Forest Superassociation (4094)

SIERRA JUNIPER WOODLAND ALLIANCE



SEKI.0038_54

Sierra Juniper Woodland



4100 – SIERRA JUNIPER WOODLAND ALLIANCE Juniperus occidentalis var. australis Woodland Alliance

MOKA_NW

DISTRIBUTION:



DESCRIPTION:

The Juniperus occidentalis var. australis woodland alliance is mapped on moderate to very steep exposed, rocky slopes of primarily south to southwest aspect between 1966 -- 3335 m (6450 -- 10942 ft). Although the sparse tree canopy is characterized by the presence of Juniperus occidentalis var. australis, Pinus jeffreyi is often the dominant tree. Abies magnifica, P. balfouriana ssp. austrina, P. contorta var. murrayana, and P. monticola are also common associates. The shrub layer can be sparse or well developed, and is most frequently dominated by Arctostaphylos nevadensis, A. patula, Artemisia tridentata, Cercocarpus ledifolius, Chrysolepis sempervirens, Eriogonum wrightii, Holodiscus microphyllus, or Ribes cereum. The herbaceous layer is sparse, with Carex exserta, Elymus elymoides, and Penstemon newberryi among the most frequently encountered species. The hydrology is upland. Soils are moderately well drained to well drained sandy loam. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Photo interpreters note the presence of *Juniperus occidentalis var. australis* nearly always in rocky settings. When present in stands with *Pinus jeffreyi*, the two trees are hard to separate, although *J. occidentalis var. australis* generally has a brighter red crown than the larger more rounded *P. jeffreyi*. Young *P. jeffreyi* and *J. occidentalis var. australis* are often indistinguishable.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1966 -- 3335 m (6450 -- 10942 ft) Shape – convex, undulating Slope position – low slope, midslope, high slope Steepness – moderate to very steep

ASPECT:



- Sparsely Vegetated to Non-vegetated Exposed Rock (0961)
- Jeffrey Pine Woodland Alliance (3070)
- Singleleaf Pinyon Pine Woodland Alliance (3110)
- Western White Pine Woodland Alliance (3130)
- Whitebark Pine Woodland Alliance (3140)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

4107 - SIERRA JUNIPER/CURL-LEAF MOUNTAIN MAHOGANY-BIG SAGEBRUSH

WOODLAND ASSOCIATION Juniperus occidentalis var. australis-Cercocarpus ledifolius/Artemisia tridentata Woodland Association





DISTRIBUTION:



DESCRIPTION:

The Juniperus occidentalis var. australis - Cercocarpus ledifolius / Artemisia tridentata woodland association is mapped on moderately steep south to southwest facing rocky outcrops between 2123 -- 3306 m (6965 -- 10845 ft). The open tree canopy is dominated by Juniperus occidentalis var. australis, with occasional Pinus jeffreyi. The shrub layer may be sparse to dense, and is characterized by the presence of Cercocarpus ledifolius; as mapped in Sequoia and Kings Canyon National Parks, Artemisia tridentata may or may not be present. Dense patches of Arctostaphylos patula or Chrysolepis sempervirens may also be present. The sparse herbaceous layer is composed primarily of dryland graminoids such as Elymus elymoides. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The Juniperus occidentalis var. australis - Cercocarpus ledifolius / Artemisia tridentata woodland association is a very dry, rocky type where typical montane chaparral species are replaced with Cercocarpus ledifolius, yielding a very dark brown signature. Both trees and shrubs are usually very sparse in cover, which distinguishes it from Juniperus occidentalis var. australis stands over other montane chaparral species that sometimes form a fairly dense shrub layer.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2123 -- 3306 m (6965 -- 10845 ft) Shape – undulating Slope position – low slope, midslope, high slope Steepness – moderately steep

ASPECT:



- Sparsely Vegetated to Non-vegetated Exposed Rock (0961)
- Singleleaf Pinyon Pine Woodland Alliance (3110)
- Singleleaf Pinyon Pine-Canyon Live Oak/Whiteleaf Manzanita Woodland Association (3114)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland (3133)
- Whitebark Pine Woodland Alliance (3140)
- Sierra Juniper Woodland Alliance (4100)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

Aerial Information Systems, Inc.





4108 – SIERRA JUNIPER WOODLAND ASSOCIATION Juniperus occidentalis var. australis Woodland Association

USGS-NPS Vegetation Mapping Program Sequoia and Kings Canyon National Parks Photo Interpretation Report

DESCRIPTION:

The Juniperus occidentalis var. australis woodland association is mapped on moderate to very steep dry, rocky slopes of varying aspect between 2105 -- 3335 m (6906 -- 10942 ft). The tree canopy of these open woodlands is characterized by the presence of Juniperus occidentalis var. australis, with Pinus jeffreyi frequently occurring as a codominant. Abies magnifica, P. balfouriana ssp. austrina, P. contorta var. murrayana, or P. monticola may also be present. The sparse to well developed shrub layer is most frequently dominated by Arctostaphylos patula, with , A. nevadensis, Artemisia tridentata, Ceanothus cordulatus, and/or Chrysolepis sempervirens also frequently encountered. The herbaceous layer is typically sparse and is characterized by Elymus elymoides, Elymus glaucus, Eriogonum spp., and/or Penstemon newberryi.

PHOTO INTERPRETATION SIGNATURE:

The presence of montane chaparral species, especially *Arctostaphylos patula* or *Chrysolepis* sempervirens is used by the photo interpreters to denote this *Juniperus occidentalis var. australis* association. Stands are often noted with a *Pinus jeffreyi* component and overall the conifer overstory is a bit denser than the other two *J. occidentalis var. australis* associations.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2105 -- 3335 m (6906 -- 10942 ft) Shape – rocky outcrops Slope position – lowslope, midslope, highslope, ridgetop Steepness – moderate to very steep

ASPECT:



- Sparsely Vegetated to Non-vegetated Exposed Rock (0961)
- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine Woodland Association (3038)
- Jeffrey Pine/Greenleaf Manzanita Woodland Association (3072)
- Singleleaf Pinyon Pine Woodland Alliance (3110)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland (3133)
- Whitebark Pine Woodland Alliance (3140)
- Sierra Juniper Woodland Alliance (4100)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

4109 – SIERRA JUNIPER/(OCEANSPRAY-BIG SAGEBRUSH) WOODLAND

SUPERASSOCIATION Juniperus occidentalis var. australis/(Holodiscus discolor-Artemisia tridentata) Woodland Superassociation



MOKA_NW

DISTRIBUTION:



DESCRIPTION:

The Juniperus occidentalis var. australis/(Holodiscus discolor-Artemisia tridentata)woodland superassociation is mapped on moderate to very steep dry rocky slopes of varying aspect between 2048 -- 3320 m (6720 -- 10892 ft). The tree canopy of these open woodlands is dominated by Juniperus occidentalis var. australis, with lesser amounts of Pinus balfouriana ssp. austrina, P. contorta var. murrayana, or P. jeffreyi often present. The shrub layer is typically well developed and may be dominated by either Artemisia tridentata or Holodiscus discolor. Arctostaphylos patula, Chrysolepis sempervirens, and Eriogonum wrightii may also be present in the shrub layer. The herbaceous layer may be sparse to well developed, and is most frequently characterized by dryland species such as Carex exserta, Elymus elymoides, Eriogonum nudum, and Monardella odoratissima.

PHOTO INTERPRETATION SIGNATURE:

Photo interpreters infer the presence of *Holodiscus discolor* (as it is not detectable on the imagery) by noting the absence of montane chaparral in extremely rocky, sparsely vegetated settings. Conifer cover (usually just *Juniperus occidentalis var. australis*) is extremely sparse.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2048 -- 3320 m (6720 -- 10892 ft) Shape – convex Slope position – lowslope, midslope, highslope Steepness – moderate to very steep





- Sparsely Vegetated to Non-vegetated Exposed Rock (0961)
- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine/Big Sagebrush Forest Association (3034)
- Sierra Lodgepole Pine Woodland Association (3038)
- Singleleaf Pinyon Pine Woodland Alliance (3110)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland (3133)
- Whitebark Pine Woodland Alliance (3140)
- Sierra Juniper Woodland Alliance (4100)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper Woodland Association (4108)

INCENSE-CEDAR FOREST ALLIANCE



SEKI.0264_125

Incense-cedar - White Alder Forest



4111 – INCENSE-CEDAR FOREST ALLIANCE Calocedrus decurrens Forest Association

LODG_SW

DISTRIBUTION:



DESCRIPTION:

The *Calocedrus decurrens-Alnus rhombifolia* forest association is mapped on gentle to moderately steep north facing lowslopes and canyon bottoms between 927 -- 2113 m (3041 - 6931 ft). These stands are associated with watercourses and river terraces. The tree canopy is dominated by a mixture of *Calocedrus decurrens* and *Alnus rhombifolia*, with occasional contributions by *Abies concolor, Acer macrophyllum*, and/or *Torreya californica*. The sparse shrub layer is dominated by regenerating conifers and may also contain *Cornus sericea, Corylus cornuta var. californica*, and *Rubus parviflorus*. The herbaceous layer is sparse to absent but may contain a mix of upland and wetland species. The hydrology is upland to riverine. (Potter 2005).

PHOTO INTERPRETATION SIGNATURE:

This type is found in watersheds large enough to support perennial streams within the lower mixed conifer belt. Most stands are in deeply incised non-glaciated narrow canyons that are too narrow to map. In this setting, *Calocedrus decurrens* generally has a narrower more conical crown than *Pinus ponderosa*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 927 -- 2113 m (3041 -- 6931 ft) Shape – concave to flat Slope position – canyon bottom, low slope Steepness – gentle to moderately steep

ASPECT:



- Black Cottonwood Forest Association (2053)
- White Alder Temporarily Flooded Forest Alliance (2060)
 Ponderosa Pine-Incense-cedar Forest Alliance (3060)

4540 - WESTERN WHITE PINE-SIERRA LODGEPOLE PINE-(CALIFORNIA RED FIR) WOODLAND

Pinus monticola-Pinus contorta var. murrayana-(Abies magnifica) Woodland



Western White Pine – Sierra Lodgepole Pine

4540 - WESTERN WHITE PINE-SIERRA LODGEPOLE PINE-(CALIFORNIA RED FIR) WOODLAND

Pinus monticola-Pinus contorta var. murrayana-(Abies magnifica) Woodland



DISTRIBUTION:


DESCRIPTION:

The Pinus monticola - Pinus contorta var. murrayana- (Abies magnifica) forest mapping unit is an aggregation of the Pinus monticola - Pinus contorta var. murrayana woodland association (3132) and the Abies magnifica-Pinus monticola-Pinus contorta var. murrayana woodland association (4055). The aggregated mapping unit is mapped on gentle to steep slopes of varying aspect between 2383 -- 3278 m (7819 -- 10756 ft). The open to moderately dense tree canopy is dominated by a mixture of Pinus monticola and P. contorta var. murrayana, with Abies magnifica important in lower elevation stands. P. albicaulis, and P. balfouriana ssp. austrina are also often present at low cover. The shrub layer is absent to well developed; when present, it is frequently dominated by Arctostaphylos nevadensis A. patula, Chrysolepis sempervirens, , various Ribes spp. and/or Holodiscus microphyllus. The herbaceous layer is sparse to absent, with Arabis spp., Aster breweri, Elymus elymoides, Pteridium aquilinum, Carex exserta, C. rossii, Juncus parryi and Senecio triangularis most common. The hydrology is upland. Soils are well drained sands or sandy loams. (NatureServe 2006, Potter 1998: Abies magnifica-Pinus monticola-Pinus contorta var. murrayana Forest Association) (NatureServe October 2006: Pinus monticola - Pinus contorta var. murrayana / sparse understory woodland Association).

PHOTO INTERPRETATION SIGNATURE:

This is a high elevation mixed conifer aggregation, allowing the presence or absence of *Abies* magnifica in the canopy. This type is mapped when photo interpreters note the presence of both *Pinus monticola* and *P. contorta var. murrayana* in the stand. This aggregated type is created in recognition of the difficulty in interpreting the relative dominance of the two pine species in addition to the amount of *A. magnifica* present in a stand.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2383 -- 3278 m (7819 -- 10756 ft) Shape – convex, concave, undulating Slope position – lowslope, midslope, highslope, ridgetop Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Jeffrey Pine-California Red Fir Woodland Association (3085)
- Western White Pine Woodland Alliance (3130)
- Western White Pine-Sierra Lodgepole Pine Woodland Association (3132)
- Western White Pine/(Greenleaf Manzanita-Bush Chinquapin-Oceanspray) Woodland (3133)
- Foxtail Pine-Sierra Lodgepole Pine Woodland Superalliance (3540)
- California Red Fir Forest Association (4051)
- California Red Fir-Western White Pine Forest Association (4057)
- California Red Fir-Sierra Lodgepole Pine/Whiteflower Hawkweed Forest Mapping Unit (4063)
- California Red Fir-Western White Pine/(Pinemat Manzanita-Bush Chinquapin) Forest (4065)
- Sierra Lodgepole Pine Sparse/Outcrop Woodland Superassociation (3021)
- Sierra Lodgepole Pine Woodland Association (3038)
- Sierra Lodgepole Pine Xeric Forest Superassociation (3049)
- Whitebark Pine Woodland Alliance (3140)
- Foxtail Pine-Western White Pine Woodland Superassociation (3204)
- Mountain Hemlock-Sierra Lodgepole Pine-Western White Pine Forest Association (4043)
- California Red Fir-Western White Pine-Sierra Lodgepole Pine Forest Association (4055)
- California Red Fir-Western White Pine Forest Association (4057)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Sierra Juniper Woodland Association (4108)
- Sierra Juniper/(Oceanspray-Big Sagebrush) Woodland Superassociation (4109)

BIRCHLEAF MOUNTAIN MAHOGANY SHRUBLAND ALLIANCE



SEKI.0224_272

Birchleaf Mountain Mahogany Shrubland



5010 – BIRCHLEAF MOUNTAIN MAHOGANY SHRUBLAND ALLIANCE Cercocarpus montanus var. glaber Shrubland Alliance



DISTRIBUTION:



DESCRIPTION:

The Cercocarpus montanus var. glaber shrubland alliance is mapped on moderate to steep slopes of varying aspect between 490 -- 1964 m (1607 -- 6443 ft). The canopy of associations in this alliance is dominated by large, sometimes tree-like Cercocarpus montanus var. glaber (C. betuloides sensu Hickman 1993), often in association with Aesculus californica, Quercus chrysolepis, Q. kelloggii, Q.wislezeni, and/or Umbellularia californica. The dense and diverse shrub layer is not well differentiated from the tree canopy. Shrub associates include Adenostoma fasciculatum, Arctostaphylos mewukka, A. viscida, Ceanothus spp., Cercis canadensis var. texensis, Chamaebatia foliolosa, Eriodictyon californicum, Fremontodendron californicum ssp. californicum, Quercus garryana var. breweri, Quercus wislizeni var. wislizeni, Rhamnus ilicifolia, Toxicodendron diversilobum, and Umbellularia californica. The herbaceous layer can be sparse or well developed, and is often composed of a rich mix of low elevation graminoids and forbs. The hydrology is upland. Soils are well drained sandy loams to sandy clay loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Cercocarpus montanus var. glaber generally yields a very dark brown signature on the imagery with a stipple like pattern as reflected in the narrow crowns. *Cercocarpus montanus var. glaber is* similar in signature (especially color) to *Adenostoma fasciculatum*; however not as smooth in texture.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - xeric

Elevation – between 490 -- 1964 m (1607 -- 6443 ft) Shape – convex Slope position – low slope, midslope, high slope, ridgetop Steepness – moderately steep to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak/Birchleaf Mountain Mahogany Forest Mapping Unit (1021)
- California Buckeye Woodland Alliance (2110)
- Birchleaf Mountain Mahogany/California Redbud-California Flannelbush Shrubland Association (5011)
- Birchleaf Mountain Mahogany/Whiteleaf Manzanita Shrubland Association (5012)
- Whiteleaf Manzanita Shrubland Alliance (5070)
- Curl-leaf Mountain Mahogany Woodland Alliance (5230)

5011 - BIRCHLEAF MOUNTAIN MAHOGANY/CALIFORNIA REDBUD-CALIFORNIA

FLANNELBUSH SHRUBLAND ASSOCIATION Cercocarpus montanus var. glaber-Cercis canadensis var. Fremontodendron californicum ssp. californicum Shrubland Association texensis-





DISTRIBUTION:



DESCRIPTION:

The Cercocarpus montanus var. glaber-Cercis canadensis var. texensis-Fremontodendron californicum ssp. californicum shrubland association is mapped on moderately steep north to northeast facing slopes between 490 -- 1711 m (1607 -- 5615 ft). The canopy of this relatively dense shrubland is not clearly differentiated, but is dominated by Cercocarpus montanus var. glaber (C. betuloides sensu Hickman 1993). Tree associates frequently include Aesculus californica, Quercus chrysolepis, Quercus wislizeni var.wislizeni, and Umbellularia californica. Shrub associates include Adenostoma fasciculatum, Arctostaphylos mewukka, A. viscida, Ceanothus spp., Cercis canadensis var. texensis, Eriodictyon californicum, Fremontodendron californicum ssp. californicum, Rhamnus ilicifolia, and Toxicodendron diversilobum. The herbaceous layer is relatively well developed and is composed of a diverse mix of low elevation annual graminoids and forbs.

PHOTO INTERPRETATION SIGNATURE:

This association yields a highly variable signature depending on presence of live oak in the stand. Generally it trends brown to yellow, while *Arctostaphylos* trends pink, *Cercocarpus* trends towards brown, and live oak adds significant infrared (reds and pinks) to the signature. Aggregations of these or similar species give the northern mixed chaparral habitats a fairly characteristic signature throughout the state where it occurs.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 490 -- 1711 m (1607 -- 5615 ft) Shape – convex Slope position – low slope, midslope Steepness – moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak/Birchleaf Mountain Mahogany Forest Mapping Unit (1021) ٠
- Interior Live Oak-California Buckeye/Birchleaf Mountain Mahogany-California Redbud • Forest Association (1044)
- •
- Birchleaf Mountain Mahogany Shrubland Alliance (5010) Birchleaf Mountain Mahogany/Whiteleaf Manzanita Shrubland Association (5012) •

5012 – BIRCHLEAF MOUNTAIN MAHOGANY/WHITELEAF MANZANITA SHRUBLAND ASSOCIATION

Cercocarpus montanus var. glaber-Arctostaphylos viscida Shrubland Association





DISTRIBUTION:



DESCRIPTION:

The Cercocarpus montanus var. glaber/Arctostaphylos viscida shrubland association is mapped on moderately steep to steep south facing slopes between 767 -- 1964 m (2516 -- 6443 ft). The overstory is dominated by large specimens of Cercocarpus montanus var. glaber (C. betuloides sensu Hickman 1993), with emergent Pinus ponderosa, Quercus chrysolepis, Q. kelloggii, or Umbellularia californica sometimes present as well. The shrub layer is well developed and is dominated by C. montanus var. glaber, with either Arctostaphylos mewukka or A. viscida present as co-dominants. Ceanothus cuneatus may also be important. The herbaceous layer can be sparse or well developed and is most often characterized by the presence of annual Bromus spp. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

This types is similar to the *Cercocarpus montanus var. glaber-Cercis canadensis var. texensis-Fremontodendron californicum ssp. californicum* shrubland association (5011), but with more pink hues from the *Arctostaphylos* and less red. Overall, there is less live oak component present than in 5011. This generally tends to be more xeric than 5011 and therefore signature contains less infrared.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 767 -- 1964 m (2516 -- 6443 ft) Shape – convex Slope position – low slope, midslope, high slope Steepness – moderately steep to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Canyon Live Oak/Birchleaf Mountain Mahogany Forest Mapping Unit (1021)
- Birchleaf Mountain Mahogany Shrubland Alliance (5010)
- Birchleaf Mountain Mahogany/California Redbud-California Flannelbush Shrubland Association (5011)
- Whiteleaf Manzanita Shrubland Alliance (5070)

CHAMISE SHRUBLAND ALLIANCE



Chamise Shrubland



5020 – CHAMISE SHRUBLAND ALLIANCE Adenostoma fasciculatum Shrubland Alliance

SHMO_NE

DISTRIBUTION:



DESCRIPTION:

The Adenostoma fasciculatum shrubland alliance is mapped on moderate to steep slopes of varying aspect between 486 -- 1725 m (1595 -- 5658 ft). The shrub canopy is dominated by a dense, usually impenetrable thicket of Adenostoma fasciculatum. Other shrubs that may contribute significant cover include Arctostaphylos viscida, Ceanothus cuneatus, Cercocarpus montanus var. glaber, Quercus berberidifolia, and occasionally Yucca whipplei. Scattered Pinus ponderosa, Quercus chrysolepis, and Q. wislizen var. wislizenii are sometimes emergent to the shrub canopy. The herbaceous layer is sparse to non-existent. Following fire, stands of A. fasciculatum are frequently succeeded by a diverse mix of chaparral shrubs and herbs that give way to the A. fasciculatum dominated types within 5 to 10 years. The hydrology is upland. (NatureServe October 2006).

This alliance includes stands with Adenostoma fasciculatum cover greater than 60%. If Adenostoma fasciculatum is 30-60%, and another species has 30-60% cover, then the stand is a member of a mixed alliance. In the aggregated database, the Adenostoma fasciculatum shrubland alliance includes the Adenostoma fasciculatum shrubland association (5021).

PHOTO INTERPRETATION SIGNATURE:

Adenostoma fasciculatum tends to have a dark brown to brown-green signature depending on the extent of post flower inflorescence remaining on the stems when the aerial photos are taken. The signature of pure, undisturbed stands of *A. fasciculatum* is similar throughout California.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 486 -- 1725 m (1595 -- 5658 ft) Shape – convex Slope position – low slope, midslope, ridgetop Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- •
- Chamise Shrubland Association (5021) Chamise-California Yerba Santa Shrubland Association (5025) ٠
- Chamise-Buckbrush Shrubland Association (5031)

5021 – CHAMISE SHRUBLAND ASSOCIATION Adenostoma fasciculatum Shrubland Association



SHMO_NE

DISTRIBUTION:



DESCRIPTION:

The Adenostoma fasciculatum shrubland association is mapped on hot, exposed, moderately steep to steep south, southwest or west facing slopes between 486 -- 1506 m (1595 -- 4940 ft). The shrub canopy is dominated by a dense, usually impenetrable thicket of Adenostoma fasciculatum. Arctostaphylos viscida, Ceanothus cuneatus, Cercocarpus montanus var. glaber, Quercus berberidifolia, and Yucca whipplei may also occur in the shrub layer but do not contribute significant cover. The herbaceous layer is sparse to absent, with the understory characterized primarily by leaf litter from the dominant shrub. Herbaceous species may include Vulpia myuros, Eriophyllum confertiflorum, Aira caryophyllea, Bromus hordeaceus, Daucus pusillus, Erodium microcephalum. (NatureServe October 2006). In the aggregated database, the Adenostoma fasciculatum shrubland alliance (5020).

PHOTO INTERPRETATION SIGNATURE:

The Adenostoma fasciculatum shrubland association is mapped in areas where photo signature appears uniform across the stand and where stands are relatively undisturbed. Overall signature is uniform and smooth trending towards the mid browns, with *Arctostaphylos viscida* trending to the oranges and *Ceanothus cuneatus* trending towards the pinks. The signature of these pure stands may vary due to rockiness or age of stand.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 486 -- 1506 m (1595 -- 4940 ft) Shape – convex

Slope position – low slope, midslope Steepness – moderately steep to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Chamise Shrubland Alliance (5020)
- Chamise/Whiteleaf Manzanita Shrubland Association (5022)
- Chamise-Chaparral Yucca Shrubland Association (5023)
- Chamise-California Yerba Santa Shrubland Association (5025)
- Chamise-Buckbrush Shrubland Association (5031)



5022 – CHAMISE/WHITELEAF MANZANITA SHRUBLAND ASSOCIATION Adenostoma fasciculatum/Arctostaphylos viscida Shrubland Association



DISTRIBUTION:



DESCRIPTION:

The Adenostoma fasciculatum/Arctostaphylos viscida shrubland association is mapped on moderate to steep exposed slopes of varying aspect between 635 -- 1725 m (2082 -- 5658 ft). The shrub canopy is dominated by a dense, usually impenetrable mixture of Adenostoma fasciculatum and Arctostaphylos viscida, with each species contributing at least 20% cover. Lesser amounts of Ceanothus cuneatus, Cercocarpus montanus var. glaber, Dendromecon rigida, and Fraxinus dipetala may also be present. The herbaceous layer is sparse to absent, with the understory characterized primarily by leaf litter from the dominant shrub species. Frequently encountered herbaceous species include annual graminoids and forbs characteristic of dry foothill sites, such as Bromus spp., Vulpia spp., and Galium spp. The hydrology is upland. Soils are well drained sandy loams.

PHOTO INTERPRETATION SIGNATURE:

Arctostaphylos viscida is distinguished by a rounded defined crown, especially evident in stands that have not burned recently. In contrast, the Adenostoma fasciculatum has a diffused and undefined crown. Colors range from brown to pink depending on which species is dominant.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 635 -- 1725 m (2082 -- 5658 ft) Shape – convex Slope position – low slope, midslope, ridgetop Steepness – moderate to steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Chamise Shrubland Association (5021)
 Chamise-Buckbrush Shrubland Association (5031)
 Whiteleaf Manzanita Shrubland Alliance (5070)



5023– CHAMISE-CHAPARRAL YUCCA SHRUBLAND ASSOCIATION Adenostoma fasciculatum-Yucca whipplei Shrubland Association



DISTRIBUTION:



DESCRIPTION:

The Adenostoma fasciculatum-Yucca whipplei shrubland association is mapped on gentle to steep slopes of generally south to westfacing aspect between 650 -- 1338 m (2134 -- 4390 ft). The canopy of this dense shrubland is dominated by Adenostoma fasciculatum. The association is characterized by the presence of Yucca whipplei, which often occurs in openings in the chaparral. Plot data are lacking to describe the understory of this type, which is frequently associated with marble substrate.

PHOTO INTERPRETATION SIGNATURE:

When Yucca whipplei is a significant component of Adenostoma fasciculatum stands, it is visible as light colored dots within the typical dark brown signature of A. fasciculatum. This association is discernable only when Y. whipplei makes up at least 3-5% of the stand and is visible in relatively open settings.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 650 – 1338 m (2134 – 4390 ft) Shape – convex Slope position – variable; mid to high slopes Steepness – gentle to steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Chamise Shrubland Association (5021)
 Chaparral Yucca Shrubland Alliance (5270)



5025 – CHAMISE-CALIFORNIA YERBA SANTA SHRUBLAND ASSOCIATION Adenostoma fasciculatum-Eriodictyon californicum Shrubland Association



DISTRIBUTION:



DESCRIPTION:

The Adenostoma fasciculatum-Eriodictyon californicum shrubland association is mapped on relatively recently burned (within 2-5 years), moderately steep to steep slopes of varying aspect between 542 – 1604 m (1777 – 5264 ft). This mapping unit captures areas that are midsuccessional between Adenostoma fasciculatum dominated shrublands and the diverse fire-following community that is relatively short-lived. The open to closed shrub layer is dominated by a highly variable mixture of Adenostoma fasciculatum, Arctostaphylos viscida, Ceanothus cuneatus, Dendromecon rigida, Eriodictyon californicum, Lotus scoparius, and Malacothamnus fremontii. The herbaceous layer is often well developed and can include a diverse mixture of such species as Allophyllum gilloides, Anagallis arvensis, Avena barbata, Bromus diandrus, B. hordeaceous, B. madritensis, Calochortus amoenus, Calystegia malacophylla, Centaurea melitensis, Chlorogalum pomeridianum var. pomeridianum, Dichelostemma capitatum, Galium parisiense, Gnaphalium californicum, Hypochaeris glabra, Layia pentachaeta, Lotus spp., Phacelia cicutaria var. cicutaria, Pterostegia drymarioides, and Solanum xanti. The hydrology is upland. Soils are well drained sandy clay loams.

PHOTO INTERPRETATION SIGNATURE:

This type has a highly variable signature, generally dependent on date, frequency and intensity of past burns and the resulting species composition. Generally the only common signature characteristic in post burn stands is the relative smooth texture the younger plants give off on the imagery.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 542 -- 1604 m (1777 -- 5264 ft) Shape – convex Slope position – low slope, midslope, ridgetop Steepness – moderately steep to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Chamise Shrubland Alliance (5020)
 Chamise Shrubland Association (5021)
 Chamise-Buckbrush Shrubland Association (5031)



5031 – CHAMISE-BUCKBRUSH SHRUBLAND ASSOCIATION Adenostoma fasciculatum-Ceanothus cuneatus Shrubland Association

DISTRIBUTION:



DESCRIPTION:

The Adenostoma fasciculatum-Ceanothus cuneatus shrubland association is mapped on moderate to steep exposed slopes of varying aspect between 671 -- 1579 m (2200 -- 5181 ft). The shrub canopy is dominated by an open to closed mixture of Adenostoma fasciculatum and Ceanothus cuneatus, with each species contributing at least 20% cover. Lesser amounts of Arctostaphylos viscida, Cercocarpus montanus var. glaber, and Fraxinus dipetala may also be present. The herbaceous layer is generally sparse to absent, although gaps in the shrub canopy can support dense patches of annual grasses and forbs. Frequently encountered herbaceous species include annual graminoids and forbs characteristic of dry foothill sites, such as Bromus spp., Vulpia spp., and Galium spp. The hydrology is upland. Soils are well drained sandy loams to clay loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Adenostoma fasciculatum is generally the dominant in this setting. Ceanothus cuneatus gives off a light orange to pink signature and integrates evenly with the browner *A. fasciculatum*. Generally a late post fire type (higher amounts of *C. cuneatus* may indicate more recent burn history), the signature is characteristically smoother than that of pure *A. fasciculatum*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 671 -- 1579 m (2200 -- 5181 ft) Shape – convex Slope position – low slope, midslope, upper slope Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Chamise Shrubland Alliance (5020)
- Chamise Shrubland Association (5021)
- Chamise/Whiteleaf Manzanita Shrubland Association (5022)
- Chamise-California Yerba Santa Shrubland Association (5025)

BUCKBRUSH SHRUBLAND ALLIANCE



SEKI.0404_465

Buckbrush Shrubland





LODG_SW

DISTRIBUTION:



DESCRIPTION:

The *Ceanothus cuneatus* shrubland alliance is mapped on moderate to steep south to southwest facing slopes between 488 -- 1760 m (1600 -- 5773 ft). The shrub layer is dominated by *Ceanothus cuneatus*, with *Aesculus californica, Quercus chrysolepis,* or *Q. douglasii* occasionally emergent. Other shrub species may include *Adensostoma fasciculatum, Cercocarpus montanus var. glaber,* or *Eriodictyon californicum.* The herbaceous layer is generally sparse. Most stands of this type are established after disturbance and are transitional to other chaparral and forest vegetation types. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Ceanothus cuneatus gives off an orange to pinkish signature that is generally quite smooth, which is typical of post disturbance types of chaparral.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 488 -- 1760 m (1600 -- 5773 ft) Shape – convex Slope position – low slope Steepness – moderate to steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Whiteleaf Manzanita Shrubland Alliance (5070)
 Chaparral Whitethorn Shrubland Alliance (5060)



5060 – CHAPARRAL WHITETHORN SHRUBLAND ALLIANCE Ceanothus leucodermis Shrubland Alliance

DISTRIBUTION


DESCRIPTION:

The *Ceanothus leucodermis* shrubland alliance is mapped on moderately steep to steep slopes between 753 -- 1673 m (2472 -- 5490 ft). The shrub canopy is dominated by *Ceanothus leucodermis*. Other shrubs present may include *Adenostoma fasciculatum*, *Arctostaphylos viscida*, *Ceanothus integerrimus*, *Eriodictyon californicum*, *Rhus trilobata*, or *Yucca whipplei*. This short-lived shrub community depends on fire for establishment, and will transition to other shrub or tree dominated types in its absence. The herbaceous layer is sparse. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Ceanothus leucodermis is very similar to wedge-leaf *C. cuneatus* except it is generally a bit more orange and is usually found in more pure stands. *C. cuneatus* often occurs with *Adenostoma fasciculatum* as a mixed type.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 753 -- 1673 m (2472 -- 5490 ft) Shape – convex Slope position – midslope, upper slope Steepness – moderately steep to steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Whitethorn Ceanothus Shrubland Alliance (5110) Bitter Cherry Shrubland Alliance (6300) Buckbrush Shrubland Alliance (5050) •
- •
- •

WHITELEAF MANZANITA SHRUBLAND ALLIANCE



SEKI-AA.0231_823

Whiteleaf Manzanita Shrubland



5070 – WHITELEAF MANZANITA SHRUBLAND ALLIANCE Arctostaphylos viscida Shrubland Alliance

GIFO_SE

DISTRIBUTION:



DESCRIPTION:

The Arctostaphylos viscida shrubland alliance is mapped on moderately steep slopes of primarily southfacing aspect between 625 -- 2118 m (2049 -- 6950 ft). The dense shrub layer is dominated by Arctostaphylos viscida, although stands of A. mewukka may also be mapped as this type. Other shrub associates commonly include Adenostoma fasciculatum, Ceanothus cuneatus, C. leucodermis, C. betuloides, Quercus garryana var. breweri, Q.wislizeni var.wislizeni, and Rhamnus tomentella. In areas where adjacent to forests or woodlands, emergent Pinus ponderosa, Q. chrysolepis, and Q. kelloggii may occur. The herbaceous layer is sparse to absent, although the perennial bulb Chlorogalum pomeridianum var. pomeridianum is frequently present. The hydrology is upland. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The texture of the *Arctostaphylos viscida* shrubland alliance is more hummocky than other low elevation chaparral stands, reflecting the often distinct crown of *Arctostaphylos viscida*. Signatures yield a generally orange color in most stands. Pure stands are noted by photo interpreters on ridgelines and adjacent spurs.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 625 -- 2118 m (2049 -- 6950 ft) Shape – convex Slope position – midslope, ridgelines Steepness – moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Birchleaf Mountain Mahogany Shrubland Alliance (5010) ٠
- Birchleaf Mountain Mahogany/Whiteleaf Manzanita Shrubland Association (5012) Chamise/Whiteleaf Manzanita Shrubland Association (5022) •
- ٠
- ٠ Buckbrush Shrubland Alliance (5050)
- Greenleaf Manzanita Shrubland Alliance (5090) ٠
- Mountain Misery Dwarf-shrubland Alliance (5130) •

BUSH CHINQUAPIN SHRUBLAND ALLIANCE



SEKI.0012_09

Bush Chinquapin Shrubland

- 5080 BUSH CHINQUAPIN SHRUBLAND ALLIANCE Chrysolepis sempervirens Shrubland Alliance

DISTRIBUTION:



DESCRIPTION:

The *Chrysolepis sempervirens* shrubland alliance is mapped on moderate to steep xeric slopes of varying aspect between 2014 -- 3561 m (6608 -- 11683 ft). The dense shrub canopy is dominated by *Chrysolepis sempervirens*. Other shrubs may include *Arctostaphylos patula, Artemisia tridentata, Holodiscus discolor, Prunus emarginata,* and *Ribes cereum*. Emergent tree species are occasional and may include *Abies magnifica, A. concolor, Pinus balfouriana ssp. austrina, P. contorta var. murrayana,* or *P. monticola,* The herbaceous layer is characteristically sparse, with *Achnatherum occidentale ssp. occidentalis, Ageratina occidentalis, Apocynum androsaemifolium, Castilleja applegatei ssp. disticha, Elymus elymoides ssp. californicus, Monardella odoratissima,* and *Pteridium aquilinum* among the most frequently encountered species. The hydrology is upland. Soils are well drained sands and sandy loams. (NatureServe October 2006). In the aggregated database, the *Chrysolepis sempervirens* shrubland alliance is aggregated into the *Arctostaphylos patula Chrysolepis sempervirens*.

PHOTO INTERPRETATION SIGNATURE:

Generally *Chrysolepis sempervirens* yields the brightest infrared signature of all the montane chaparral species and thus may be confused with more mesic shrub species, such as *salix* or *Betula occidentalis*. Higher elevation conifers are an occasional emergent to the shrub layer.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2014 -- 3561 m (6608 -- 11683 ft). Shape – convex, undulating Slope position – low slope, midslope, high slope Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Greenleaf Manzanita Shrubland Alliance (5090)
- Pinemat Manzanita Dwarf-shrubland Alliance (5280)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit (5520)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Superalliance (5590)
- Willow spp. Talus Shrubland Mapping Unit (6700)

GREENLEAF MANZANITA SHRUBLAND ALLIANCE



Greenleaf Manzanita Shrubland Alliance



5090 – GREENLEAF MANZANITA SHRUBLAND ALLIANCE Arctostaphylos patula Shrubland Alliance

MOKA_NE

DISTRIBUTION:



DESCRIPTION:

The Arctostaphylos patula shrubland alliance is mapped on gentle to steep primarily south to southwest facing xeric slopes between 1423 -- 3095 m (4670 -- 10153 ft). The open to closed shrub canopy is dominated by Arctostaphylos patula. Other shrubs that may be present include Artemisia tridentata, Ceanothus cordulatus, Chrysolepis sempervirens, and/or Prunus emarginata. Emergent tree species are occasionally present and may include Abies concolor, A. magnifica, Calocedrus decurrens, Juniperus occidentalis var. australis, Pinus contorta var. murrayana, P. jeffreyi, P. lambertiana, P. ponderosa, Quercus chrysolepis, or Q. kelloggii, depending on elevation and the composition of the adjacent forest. The herbaceous layer is typically sparse, and is frequently characterized by dryland herbs such as Achnatherum occidentale, Apocynum androsaemifolium, Bromus tectorum, Calyptridium umbellatum, Comandra umbellata ssp. californica, and Elymus elymoides. The hydrology is upland. Soils are well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Arctostaphylos patula yields a signature intermediate in color between *A. viscida* (light orange) and *Chrysolepis sempervirens* (usually bright red). *A. nevadensis* yields a similar signature but has smaller crowns.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1423 -- 3095 m (4670 -- 10153 ft) Shape – convex, undulating Slope position – low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Jeffrey Pine Woodland Alliance (3070)
- Whiteleaf Manzanita Shrubland Alliance (5070)
- Bush Chinquapin Shrubland Alliance (5080)
- Pinemat Manzanita Dwarf-shrubland Alliance (5280)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit (5520)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Superalliance (5590)

WHITETHORN CEANOTHUS SHRUBLAND ALLIANCE



SEKI.0013_09

Whitethorn Ceanothus Shrubland



5110 – WHITETHORN CEANOTHUS SHRUBLAND ALLIANCE Ceanothus cordulatus Shrubland Alliance

GIFO_NE

DISTRIBUTION:



DESCRIPTION:

The Ceanothus cordulatus shrubland alliance is mapped on moderately steep south to southwest facing xeric slopes between 1059 -- 3075 m (3473 -- 10090 ft). The generally dense shrub canopy is dominated by Ceanothus cordulatus, with Arctostaphylos patula, Chrysolepis sempervirens, or Prunus emarginata often contributing significant cover. An emergent young tree layer is often present and may include Abies concolor, Pinus jeffreyi, or Quercus kelloggii. The herbaceous layer is characteristically sparse but often includes Lotus crassifolius and/or Pteridium aquilinum. This post-fire community is usually considered successional to A. concolor or A. magnifica forest. The hydrology is upland. Soils are well drained sands or sandy loams. (NatureServe October 2006). In the aggregated database, the Ceanothus cordulatus shrubland alliance is aggregated into the Arctostaphylos patula-Chrysolepis sempervirens-Ceanothus cordulatus shrubland superalliance (5590).

PHOTO INTERPRETATION SIGNATURE:

Ceanothus cordulatus has a smooth pink to red signature, and young stands may be occasionally confused with herbaceous signatures. Younger stands with more recent fire history tend to be more pure and have a smoother signature while older stands tend to mix with other montane chaparral species, thus creating difficulty in determining relative shrub density.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1059 -- 3075 m (3473 -- 10090 ft) Shape – convex, undulating Slope position – low slope, midslope Steepness – moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)
- Chaparral Whitethorn Shrubland Alliance (5060)

- Bitter Cherry Shrubland Alliance (6300)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit (5520)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Superalliance (5590)
- Deerbrush Shrubland Alliance (6010)
- Mesic Post Fire Herbaceous Mapping Unit (7702)
- Post Fire Shrub/Herbaceous Mapping Unit (7703)

MOUNTAIN MISERY DWARF-SHRUBLAND ALLIANCE



Mountain Misery Dwarf Shrubland



5130 – MOUNTAIN MISERY DWARF-SHRUBLAND ALLIANCE Chamaebatia foliolosa Dwarf-shrubland Alliance

GIFO_SW

DISTRIBUTION:



DESCRIPTION:

The *Chamaebatia foliolosa* dwarf-shrubland alliance (provisional) is mapped on gentle to steep slopes of primarily south to southwest facing aspect between 1451 -- 2413 m (4761 -- 7916 ft). This dwarf-shrubland is dominated by *Chamaebatia foliolosa*, which sometimes forms small interstitial stands following disturbance in the lower and middle elevation montane forests. Field sampling is needed to describe and verify this type.

PHOTO INTERPRETATION SIGNATURE:

Chamaebatia foliolosa yields a bright orange to pink signature with a smooth texture. Emergent conifers or taller shrubs stand out adjacent to the generally continuous, even mat of *C. foliolosa*. Most patches are too small to pull out as mappable stands – larger, mappable stands are associated with more recent burns.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1451 -- 2413 m (4761 -- 7916 ft) Shape – variable Slope position – variable Steepness – variable

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Mesic Post Fire Herbaceous Mapping Unit (7702)
 Post Fire Shrub/Herbaceous Mapping Unit (7703)

INDIAN MANZANITA SHRUBLAND ALLIANCE



SEKI-AA.0068_705

Indian Manzanita Shrubland



5140 – INDIAN MANZANITA SHRUBLAND ALLIANCE Arctostaphylos mewukka Shrubland Alliance

LODG_SE

DISTRIBUTION:



DESCRIPTION:

The Arctostaphylos mewukka shrubland alliance is mapped on moderately steep south to southwest facing slopes between 1135 -- 1999 m (3723 -- 6559 ft). The dense shrub canopy is dominated by Arctostaphylos mewukka, but most often occurs in mixture with lower amounts of Ceanothus cordulatus, C. cuneatus, C. integerrimus var. californicus, Cercocarpus, Quercus garryana var. breweri, or Q. wislizeni var. wislizeni. Emergent trees may include Pinus ponderosa, Q. chrysolepis, Q. kelloggii, or Q. wislizeni var. wislizeni. The characteristically sparse herbaceous layer frequently contains non-native Bromus spp. This resprouting manzanita type is maintained by fire, although in areas where fire has been absent for many decades large mature stands appear to persist.

PHOTO INTERPRETATION SIGNATURE:

The signature of *Arctostaphylos mewukka* is similar to that of *A. Viscida*, but the texture is generally more even and cover more continuous as is typical of more recent post fire signatures. The signature is also similar to other post fire *Ceanothus* types but tends to be less bright.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1135 -- 1999 m (3723 -- 6559 ft) Shape – convex Slope position – midslope Steepness – moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Whiteleaf Manzanita Shrubland Alliance (5070)
 Chaparral Whitethorn Shrubland Alliance (5060)

BIG SAGEBRUSH SHRUBLAND ALLIANCE



Big Sagebrush Shrubland

Aerial Information Systems, Inc.

- 5160 BIG SAGEBRUSH SHRUBLAND ALLIANCE Artemisia tridentata Shrubland Alliance

MOKA_NE

DISTRIBUTION:



DESCRIPTION:

The Artemisia tridentata shrubland alliance is mapped on moderate to steep slopes and canyon bottoms of varying aspect between 1611 -- 3502 m (5284 -- 11489 ft). The sparse to moderately dense shrub canopy (25-70% cover) is dominated by Artemisia tridentata ssp. vaseyana. Other shrub species present may include Arctostaphylos patula, Ceanothus cordulatus, Chrysolepis sempervirens, Eriogonum wrightii, Holodiscus discolor, Ribes cereum, or Symphoricarpos rotundifolius. Emergent trees may include Abies magnifica, Juniperus occidentalis var. australis, Pinus contorta var. murrayana, or P. jeffreyi. The herbaceous layer may be sparse or well developed, with Achnatherum occidentale, Apocynum androsaemifolium, Castilleja applegatei, Elymus elymoides, E. glaucus, Eriogonum nudum, Hazardia whitneyi var. whitneyi, Monardella odoratissima, and Pteridium aquilinum among the most frequently encountered species. The hydrology is upland. Soils are moderately well drained sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Artemisia tridentata generally has a gray to light pink signature depending on the health of the plants in the stand and proximity to meadow edge grasses.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1611 -- 3502 m (5284 -- 11489 ft) Shape – convex, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen/Big Sagebrush Forest Superassociation (2016)
- Sierra Lodgepole Pine/Big Sagebrush Forest Association (3034)
- Mountain Big Sagebrush & Timberline Sagebrush & Oceanspray & Red Mountainheather Shrubland Superalliance (5510)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit (5520)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Superalliance (5590)
- Upland Herbaceous (7000)
- Shorthair Sedge Herbaceous Alliance (7120)



5200 – TIMBERLINE SAGEBRUSH SHRUBLAND ALLIANCE Artemisia rothrockii Shrubland Alliance



DISTRIBUTION:



DESCRIPTION:

The Artemisia rothrockii shrubland alliance is mapped on gently sloping meadow and forest margins between 2786 -- 3569 m (9140 -- 11709 ft). The relatively open shrub canopy is dominated by Artemisia rothrockii. Emergent subalpine conifers, such as *Pinus balfouriana ssp. austrina, P. contorta var. murrayana,* and *P. albicaulis,* may be present. The herbaceous layer reflects that of the surrounding vegetation, and frequently includes *Carex exserta, Eriogonum incanum, Juncus balticus, Monardella odoratissima* and/or *Penstemon heterodoxus.* The hydrology is upland. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

An extremely difficult type to discern on the photography, stands are generally very small and sparse; often occurring within and adjacent to drier meadows. Slight texture along the meadow edge can be helpful in determining this type.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2786 -- 3569 m (9140 -- 11709 ft) Shape – undulating Slope position – low slope Steepness – gentle

ASPECT:



- TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:
 Mountain Big Sagebrush & Timberline Sagebrush & Oceanspray & Red Mountainheather Shrubland Superalliance 5510)
 - Upland Herbaceous (7000)



5230 – CURL-LEAF MOUNTAIN MAHOGANY WOODLAND ALLIANCE Cercocarpus ledifolius Woodland Alliance

MOKA_NE

DISTRIBUTION:



DESCRIPTION:

The Cercocarpus ledifolius woodland alliance is mapped on dry, rocky southfacing slopes and ridges between 2169 -- 3384 m (7117 -- 11104 ft). The tree layer is characterized by an open canopy of Cercocarpus ledifolius, with Juniperus occidentalis var. australisor Pinus monophylla present as well. The shrub canopy often includes Artemisia tridentata ssp. vaseyana, or Holodiscus discolor. The herbaceous layer is relatively sparse and is characterized by native bunchgrasses. (NatureServe October 2006)

PHOTO INTERPRETATION SIGNATURE:

This type is generally found in sparse settings, and most individuals yield a dark brown signature. Stands that form an understory to Pinus monophylla are often very sparse and difficult to detect.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – Xeric Elevation – 2169 -- 3384 m (7117 -- 11104 ft) Shape – Neutral to convex Slope position – Mid to upper Steepness – Steep to very steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Singleleaf Pinyon Pine-Canyon Live Oak/Whiteleaf Manzanita Woodland Association (3114)
- Sierra Juniper/Curl-leaf Mountain Mahogany-Big Sagebrush Woodland Association (4107)
- Birchleaf Mountain Mahogany Shrubland Alliance (5010)
CHAPARRAL YUCCA SHRUBLAND ALLIANCE



SEKI.0183_128

Chaparral Yucca Shrubland

5270 – CHAPARRAL YUCCA SHRUBLAND ALLIANCE Yucca whipplei Shrubland Alliance



SHMO_NE

DISTRIBUTION:



DESCRIPTION:

The Yucca whipplei shrubland alliance is mapped on steep, south facing rocky marble outcrops between 438 -- 2063 m (1438 -- 6768 ft). The sparse shrub canopy is dominated by scattered Yucca whipplei. Other frequently encountered shrub associates include Adenostoma fasciculatum, Cercocarpus montanus var. glaber, Eriodictyon californicum, and Toxicodendron diversilobum. The herbaceous layer can be sparse to well developed, and is often dominated by a mixture of annual grassland species. Selaginella hansenii frequently co-occurs with Y. whipplei in these stands. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

The *Yucca whipplei* shrubland alliance is mappable only where *Yucca whipplei* forms relatively dense patches. They are sometimes discernable against rocky backgrounds as extremely small crowned individuals, often showing up with a yellowish or white color.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 438 -- 2063 m (1438 -- 6768 ft) Shape – convex Slope position – low slope, midslope, high slope Steepness – moderate to steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES: • Sparsely Vegetated to Non-vegetated Exposed Rock (0961)

- Canyon Live Oak/Birchleaf Mountain Mahogany Forest Mapping Unit (1021) Chamise-Chaparral Yucca Shrubland Association (5023) ٠
- •

PINEMAT MANZANITA DWARF-SHRUBLAND ALLIANCE



SEKI.0020_13

Pinemat Manzanita Dwarf-shrubland



5280 – PINEMAT MANZANITA DWARF-SHRUBLAND ALLIANCE Arctostaphylos nevadensis Dwarf-shrubland Alliance



DISTRIBUTION:



DESCRIPTION:

The Arctostaphylos nevadensis dwarf-shrubland alliance is mapped on gentle to moderate northeast to southwest facing slopes between 2427 -- 3394 m (7964 -- 11136 ft). The shrub canopy is dominated by low-lying mats of Arctostaphylos nevadensis. Other shrub associates may include A. patula, Chrysolepis sempervirens, or Holodiscus discolor. The sparse to absent herbaceous layer may include scattered Calochortus leichtlinii, Castilleja applegatei ssp. disticha, Cymopterus terebinthinus var. californicus, Elymus elymoides ssp. californicus, Eriogonum nudum, Gayophytum diffusum ssp. diffusum, and/or Penstemon newberryi. This type is most often found at upper montane forest margins, and is frequently adjacent to stands of Abies magnifica and Pinus monticola. The hydrology is upland. Soils are well drained sandy loams.

PHOTO INTERPRETATION SIGNATURE:

Arctostaphylos nevadensis is similar to *A. patula* in color but has a smoother texture. This type often occurs at forest edges but generally in very small stands except as an understory to higher elevation mixed conifers. Most stands are below mimum mapping unit as they are difficult to map in this setting.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2427 -- 3394 m (7964 -- 11136 ft) Shape – convex Slope position – midslope, high slope Steepness – moderate





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Bush Chinquapin Shrubland Alliance (5080)
- Greenleaf Manzanita Shrubland Alliance (5090)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit (5520)



5300 – WATER BIRCH SHRUBLAND ALLIANCE Betula occidentalis Shrubland Alliance

DISTRIBUTION:



DESCRIPTION:

The *Betula occidentalis* shrubland alliance is mapped along watercourses and on spring fed mesic montane and subalpine slopes between 1999 -- 2954 m (6559 -- 9693 ft). It is a common east side species, and stands dominated by *Betula occidentalis* are restricted to the eastern portions of Kings Canyon National Park. *Cornus sericea* frequently co-dominates the shrub layer, with *Salix spp.* often contributing significant cover as well. The herbaceous layer is dense and species rich, with *Pteridium aquilinum* and *Rubus parviflorus* occuring as dominants over a variety of mesic herbs. Sites are characterized by upland or riparian hydrology and well drained sandy clay loam soils. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The photo signature for *Betula occidentalis* is pink in color with a rounded crown that appears as a smooth textured shrub in isolated thickets along steep riparian environments.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 1999 -- 2954 m (6559 -- 9693 ft) Shape – concave Slope position – low to midslope Steepness – gentle to moderately sloping





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen Forest Alliance (2010)
- Black Cottonwood Temporarily Flooded Forest Alliance (2050)
- White Alder Temporarily Flooded Forest Alliance (2060)
- Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland Mapping Unit (5530)
- Bitter Cherry Shrubland Alliance (6300)
- Willow spp./Meadow Shrubland Mapping Unit (6500)
- Willow spp. Riparian Shrubland Mapping Unit (6600)
- Willow spp. Talus Shrubland Mapping Unit (6700)

5510 – MOUNTAIN BIG SAGEBRUSH & TIMBERLINE SAGEBRUSH & OCEANSPRAY & RED MOUNTAINHEATHER SHRUBLAND SUPERALLIANCE Artemisia tridentata ssp. vaseyana Shrubland & Artemisia rothrockii Shrubland & Holodiscus discolor Shrubland and Phyllodoce breweri Shrubland Superalliance



MOBR_SE DISTRIBUTION:



DESCRIPTION:

The Artemisia tridentata ssp. vaseyana shrubland & Artemisia rothrockii shrubland & Holodiscus discolor shrubland and Phyllodoce breweri shrubland superalliance is mapped on gentle to moderately steep slopes of varying aspect between 2000 -- 3860 m (6563 -- 12665 ft). The shrub canopy of this mapping unit can be dominated by Artemisia rothrockii, Artemisia tridentata ssp. vaseyi, Eriogonum wrightii, Holodiscus discolor, Ledum glandulosum, or Phyllodoce breweri. All of these are low lying, relatively open stands of sub-shrubs that occur in openings within the subalpine forest or above treeline and which are difficult to differentiate using aerial photography. The hydrology is upland. Soils are well drained sandy loams.

PHOTO INTERPRETATION SIGNATURE:

This is an extremely difficult signature to detect. It is generally sparse and rocky in scree, talus or rocky settings. The signature varies depending on rock type, setting, and plant density, which is almost always sparse.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2000 -- 3860 m (6563 -- 12665 ft) Shape – convex, concave, undulating Slope position – low slope, midslope Steepness – gentle to moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Talus Slope (0100) ٠
- Alpine Scree Slope (0200) •
- Non-alpine Talus (0950) ٠
- Sparsely Vegetated to Non-vegetated Exposed Rock (0961) Big Sagebrush Shrubland Alliance (5160) Timberline Sagebrush Shrubland Alliance (5200) •
- •
- •
- Red Mountainheather Dwarf-shrubland Alliance (5550) •

5520 – GREENLEAF MANZANITA-BUSH CHINQUAPIN-WHITETHORN CEANOTHUS SHRUBLAND MAPPING UNIT Arctostaphylos patula-Chrysolepis sempervirens-Ceanothus cordulatus Shrubland Mapping Unit



DISTRIBUTION:



DESCRIPTION:

The Arctostaphylos patula-Chrysolepis sempervirens-Ceanothus cordulatus shrubland mapping unit is mapped on moderate to steep primarily south to southwest facing slopes between 1627 -- 3478 m (5338 -- 11412 ft). These stands represent the more xeric phase of what has traditionally been treated as mixed montane chaparral. The dense shrub canopy is dominated by a mixture of Arctostaphylos patula. Ceanothus cordulatus, and Chrysolepis sempervirens in varying amounts. Other shrub species present may include Acer glabrum, Arctostaphylos nevadensis, Artemisia tridentata, Chamaebatia foliolosa, Eriogonum wrightii, Holodiscus discolor, Prunus emarginata, Ribes cereum, Sambucus mexicana, or Symphoricarpos spp; however, one or more of the three primary xeric chaparral species must dominate. Emergent trees may include Abies concolor, A. magnifica, Calocedrus decurrens, Juniperus occidentalis var. australis, Pinus jeffreyi, P. lambertiana or P. monticola. The herbaceous layer is typically sparse to absent, but frequently includes Apocynum androsaemifolium, Elymus glaucus, Epilobium angustifolium, Eriogonum nudum, Lotus crassifolius, Monardella odoratissima, and/or Pteridium aquilinum. In the aggregated database, the Arctostaphylos patula-Chrysolepis sempervirens-Ceanothus cordulatus shrubland mapping is aggregated into the Arctostaphylos patula-Chrysolepis sempervirens-Ceanothus cordulatus montane chaparral superalliance (5590).

PHOTO INTERPRETATION SIGNATURE:

A mix of montane chaparral species is noted in this mapping unit and gives off a wide variation of signatures depending on species dominance in the stand. See individual types for specific signatures.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1627 -- 3478 m (5338 -- 11412 ft) Shape – convex, undulating Slope position – low slope, midslope, high slope Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen/Big Sagebrush Forest Superassociation (2016)
- Jeffrey Pine Woodland Alliance (3070)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)
- Bush Chinquapin Shrubland Alliance (5080)
- Greenleaf Manzanita Shrubland Alliance (5090)
- Whitethorn Ceanothus Shrubland Alliance (5110)
- Big Sagebrush Shrubland Alliance (5160)
- Pinemat Manzanita Dwarf-shrubland Alliance (5280)
- Mountain Big Sagebrush & Timberline Sagebrush & Oceanspray & Red Mountainheather Shrubland Superalliance (5510)
- Deerbrush Shrubland Alliance (6010)

5530 – BITTER CHERRY-GOOSEBERRY SPP.-(MOUNTAIN MAPLE) SHRUBLAND MAPPING UNIT

Prunus emarginata - Ribes spp.-(Acer glabrum) Shrubland Mapping Unit



LODG_NW

DISTRIBUTION:



DESCRIPTION:

The *Prunus emarginata-Ribes spp.-(Acer glabrum*) shrubland mapping unit is mapped on moderate to steep primarily south to southeast facing slopes between 1434 -- 3417 m (4704 - 11211 ft). These stands represent the more mesic phase of what has traditionally been treated as mixed montane chaparral. The dense shrub canopy is co-dominated by a mixture of *Prunus emarginata* and various species of *Ribes (Ribes cereum, R. montigenum, R. nevadense,* or *R. roezlii*), with *Acer glabrum* frequently contributing significant cover as well. Other shrub species present may include *Arctostaphylos nevadensis, A. patula, Artemisia tridentata, Ceanothus cordulatus, Chrysolepis sempervirens, Eriogonum wrightii, Holodiscus discolor, Rubus parviflorus, Salix spp.,* or *Sambucus mexicana*. Emergent trees may include *Abies concolor, A. magnifica, Pinus jeffreyi,* or *Quercus kelloggii*. The herbaceous layer can be sparse or well developed and is most frequently characterized by *Artemisia ludoviciana* or *Pteridium aquilinum*. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

The *Prunus emarginata-Ribes spp.-(Acer glabrum)* shrubland mapping unit generally gives off a very bright orange to reddish signature, except for areas dominated by *Prunus emarginata* where the signature tends more toward brown in color. It is possible to confuse upland herbaceous vegetation and *Chrysolepis sempervirens* shrubland..

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 1434 -- 3417 m (4704 -- 11211 ft) Shape – concave, convex, undulating Slope position – low slope, midslope Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen Forest Alliance (2010)
- Quaking Aspen/Willow spp. Forest Mapping Unit (2013)
- Quaking Aspen/Meadow Mapping Unit (2017)
- Water Birch Shrubland Alliance (5300)
- Bitter Cherry Shrubland Alliance (6300)
- Willow spp./Meadow Shrubland Mapping Unit (6500)
- Willow spp. Riparian Shrubland Mapping Unit (6600)
- Willow spp. Talus Shrubland Mapping Unit (6700)
- Upland Herbaceous (7000)
- Intermittently to Seasonally Flooded Meadow (8000)



5550 – RED MOUNTAINHEATHER DWARF-SHRUBLAND ALLIANCE *Phyllodoce breweri* Dwarf-shrubland Alliance



DISTRIBUTION:



DESCRIPTION:

The *Phyllodoce breweri* dwarf-shrubland alliance is mapped on gentle to moderately steep slopes of varying aspect between 2851 -- 3880 m (9354 -- 12729 ft). The low-lying shrub canopy is dominated by mats of *Phyllodoce breweri*; often *Holodiscus discolor* or *Vaccinium caespitosum* are also important. The herbaceous layer may be sparse or well developed. Frequently encountered herbs include *Antennaria media, Arabis platysperma, Calamagrostis breweri, Calyptridium monospermum, Carex exserta, Elymus elymoides ssp. californicus, Eriogonum incanum, Juncus parryi, Penstemon heterodoxus, Rumex paucifolius, and <i>Trisetum spicatum*. Environments where *P. breweri* dominates range from low angle meadow margins and moist forest edges to rocky talus slopes. The hydrology is upland. Soils are well drained sandy loams.

PHOTO INTERPRETATION SIGNATURE:

The *Phyllodoce breweri* dwarf-shrubland alliance is difficult to discern due to most patches being well below minimum mapping unit. Larger stands are brown to light brown in contrast with light rock they can be found adjacent to. The pattern is stipple, meaning individual crowns are often visible against the light soil color.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 2851 -- 3880 m (9354 -- 12729 ft) Shape – concave, convex, undulating Slope position – low slope, midslope, high slope Steepness – gentle to moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:
Big Sagebrush & Timberline Sagebrush & Oceanspray & Red Mountainheather Shrubland Superalliance (5510)

5590 – GREENLEAF MANZANITA-BUSH CHINQUAPIN-WHITETHORN CEANOTHUS

SHRUBLAND SUPERALLIANCE Arctostaphylos patula-Chrysolepis sempervirens-Ceanothus cordulatus Shrubland Superalliance

DISTRIBUTION:



DESCRIPTION:

The Arctostaphylos patula-Chrysolepis sempervirens-Ceanothus cordulatus shrubland superalliance is mapped on moderate to steep primarily south to southwest facing slopes between 1627 -- 3478 m (5338 -- 11412 ft). These stands represent the more xeric phase of what has traditionally been treated as mixed montane chaparral. The dense shrub canopy is dominated by a mixture of Arctostaphylos patula. Ceanothus cordulatus, and Chrysolepis sempervirens in varying amounts. This superalliance can also include stands dominated by either Chrysolepis sempervirens or Ceanothus cordulatus, which are often difficult to differentiate using aerial photography. Stands dominated by Arctostaphylos patula, however, are easily distinguished and are mapped in the 5090 Arctostaphylos patula shrubland alliance. Other shrub species present may include Acer glabrum, Arctostaphylos nevadensis, Artemisia tridentata, Chamaebatia foliolosa, Eriogonum wrightii, Holodiscus discolor, Prunus emarginata, Ribes cereum, Sambucus mexicana, or Symphoricarpos spp; however, one or more of the three primary xeric chaparral species must dominate. Emergent trees may include Abies concolor, A. magnifica, Calocedrus decurrens, Juniperus occidentalis var. australis, Pinus jeffreyi, P. lambertiana or P. monticola. The herbaceous layer is typically sparse to absent, but frequently includes Apocynum androsaemifolium, Elymus glaucus, Epilobium angustifolium, Eriogonum nudum, Lotus crassifolius, Monardella odoratissima, and/or Pteridium aquilinum. In the aggregated database, the Arctostaphylos patula-Chrysolepis sempervirens-Ceanothus cordulatus shrubland superalliance includes the Chrysolepis sempervirens shrubland alliance (5080), the Ceanothus cordulatus shrubland alliance (5110) and the Arctostaphylos patula-Chrysolepis sempervirens-Ceanothus cordulatus shrubland mapping unit (5520).

PHOTO INTERPRETATION SIGNATURE:

A mix of montane chaparral species is noted in this alliance and gives off a wide variation of signatures depending on species dominance in the stand. See individual types for specific signatures. Pure stands containing one of the three primary species may be included.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1627 -- 3478 m (5338 -- 11412 ft) Shape – convex, undulating Slope position – lowslope, midslope, highslope Steepness – moderate to steep

ASPECT



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen/Big Sagebrush Forest Superassociation (2016)
- Jeffrey Pine Woodland Alliance (3070)
- White Fir-(California Red Fir-Sugar Pine-Jeffrey Pine)/Whitethorn Ceanothus-(Greenleaf Manzanita) Forest Mapping Unit (4084)
- Chaparral Whitethorn Shrubland Alliance (5060)
- Bush Chinquapin Shrubland Alliance (5080)
- Greenleaf Manzanita Shrubland Alliance (5090)
- Whitethorn Ceanothus Shrubland Alliance (5110)
- Big Sagebrush Shrubland Alliance (5160)
- Pinemat Manzanita Dwarf-shrubland Alliance (5280)
- Mountain Big Sagebrush & Timberline Sagebrush & Oceanspray & Red Mountainheather Shrubland Superalliance (5510)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit (5520)
- Deerbrush Shrubland Alliance (6010)
- Bitter Cherry Shrubland Alliance (6300)
- Willow spp. Talus Shrubland Mapping Unit (6700)
- Mesic Post Fire Herbaceous Mapping Unit (7702)
- Post Fire Shrub/Herbaceous Mapping Unit (7703)

DEERBRUSH SHRUBLAND ALLIANCE



SEKI.0269_144

Deerbrush Shrubland



6010 – DEERBRUSH SHRUBLAND ALLIANCE Ceanothus integerrimus Shrubland Alliance



DISTRIBUTION:



DESCRIPTION:

The Ceanothus integerrimus shrubland alliance is mapped on moderate to steep slopes of varying aspect between 1305 -- 2390 m (4281 -- 7841 ft). The dense shrub canopy is dominated by Ceanothus integerrimus, but often includes Arctostaphylos patula, C. cordulatus, C. leucodermis, Chamaebatia foliolosa, Ribes roezlii var. roezlii, or Sambucus mexicana. Emergent trees may include Abies concolor, Calocedrus decurrens, Pinus lambertiana, P. ponderosa, or Quercus kelloggii. The herbaceous layer is typically sparse (0-5% cover), but may include patches of Lotus crassifolius and Pteridium aquilinum in addition to such annuals as Bromus tectorum and Vulpia microstachys. C. integerrimus var. californicus dominated stands typically occur following a major disturbance such as fire or logging, and are considered transitional to various montane forest types. The hydrology is upland. Soils are well drained sandy clay loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Ceanothus integerrimus has a pink to red signature and has a characteristic early seral post burn texture that is smooth and therefore difficult to separate out from *C. cordulatus. C. cordulatus* generally occurs at higher elevations. Other post burn types in similar elevations are not as red.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 1305 -- 2390 m (4281 -- 7841 ft) Slope position – low slope, midslope, high slope Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Whitethorn Ceanothus Shrubland Alliance (5110)
- Indian Manzanita Shrubland Alliance (5140)
- Greenleaf Manzanita-Bush Chinquapin-Whitethorn Ceanothus Shrubland Mapping Unit (5520)
- Bitter Cherry Shrubland Alliance (6300)
- Mesic Post Fire Herbaceous Mapping Unit (7702)
- Post Fire Shrub/Herbaceous Mapping Unit (7703)

OREGON WHITE OAK SHRUBLAND ALLIANCE



SEKI.0209_100

Oregon White Oak / Birchleaf Mountain Mahogany Shrubland



DISTRIBUTION:



DESCRIPTION:

The Quercus garryana var. breweri shrubland alliance is mapped on moderate to steep slopes of primarily northfacing aspect between 890 -- 1824 m (2919 -- 5984 ft). The dense shrub canopy is dominated by the shrub form of Quercus garryana var. breweri. Other shrubs present may include Arctostaphylos patula, Ceanothus cordulatus, C. velutinus, C. cuneatus, and Cercocarpus montanus var. glaber. Emergent conifers, such as Abies concolor and Calocedrus decurrens, may be present, as well as individuals of Quercus kelloggii. Continuous stands of this alliance frequently occur immediately adjacent to stands of Q. kelloggii forest and are marked by a relatively abrupt transition. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Quercus garryana var. breweri yields a pink to red signature with a smooth texture. It's often found adjacent to taller *Q. kelloggii* or *Q. chrysolepis* stands that have coarser texture that reflect their larger crown size. The adjacent *Q. kelloggii* yields a somewhat redder signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 890 -- 1824 m (2919 -- 5984 ft) Shape – slightly concave to slightly convex Slope position – mid to upper Steepness – moderate to steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• California Black Oak Forest Alliance (2020)

$\mathbf{6022}$ – OREGON WHITE OAK-BIRCHLEAF MOUNTAIN MAHOGANY SHRUBLAND ASSOCIATION

Quercus garryana var. breweri-Cercocarpus montanus var. glaber Shrubland Association





DISTRIBUTION:



DESCRIPTION:

The Quercus garryana var. breweri/Cercocarpus montanus var. glaber shrubland association is mapped on moderate to steep slopes of northwest facing aspect between 890 – 1824 m (2919 – 5984 ft). The shrub canopy is dominated by a mixture of Quercus garryana var. breweri and Cercocarpus montanus var. glaber (C. betuloides sensu Hickman). Other shrubs present (and which can sometimes co-dominate) include Arctostaphylos viscida, Chamaebatia foliolosa, and Prunus subcordata. Emergent conifers, such as Abies concolor and Calocedrus decurrens may be present, as well as individuals of Quercus kelloggii. The herbaceous layer is characteristically quite sparse. The hydrology is upland; soils are moderately well drained loams.

PHOTO INTERPRETATION SIGNATURE:

The signature of this type alternates with the browns of the *Cercocarpus montanus var. glaber* and pink to red signature of the *Quercus garryana var. breweri*. The texture is smooth and a bit coarser than pure stands of *Q. garryana var. breweri*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 890 – 1824 m (2919 – 5984 ft) Shape – convex Slope position – midslope Steepness – moderate to steep

ASPECT:


- TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:
 Canyon Live Oak/Birchleaf Mountain Mahogany Forest Mapping Unit (1021)
 California Black Oak/Greenleaf Manzanita Forest Association (2021)
 California Black Oak/Indian Manzanita-Mountain Misery Forest Association (2026)





California Grape Association





DISTRIBUTION:



DESCRIPTION:

The *Vitis californica* association is mapped on moderate to steep foothill slopes of varying aspect between 511 -- 1122 m (1677 -- 3681 ft). Stands of this mapping unit are dominated by the deciduous woody vine *Vitis californica*, which can form large draping patches either over other woody vegetation (such as *Quercus wislizeni var. wislizeni*) or as a sole constituent. The hydrology is upland.

PHOTO INTERPRETATION SIGNATURE:

This signature generally reflects a bright red to deep red signature. It is limited in extent and generally below minimum mapping unit.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – submesic Elevation – 511 -- 1122 m (1677 -- 3681 ft) Shape – convex, concave Slope position – low slope, midslope Steepness – moderate to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Willow spp./Meadow Shrubland Mapping Unit (6500) •
- Willow spp. Riparian Shrubland Mapping Unit (6600)
 Willow spp. Talus Shrubland Mapping Unit (6700)

SIERRA WILLOW/SWAMP ONION SEASONALLY FLOODED SHRUBLAND ALLIANCE



SEKI.0019_23

Sierra Willow/Swamp Onion Seasonally Flooded Shrubland

6110 – SIERRA WILLOW/SWAMP ONION SEASONALLY FLOODED SHRUBLAND ALLIANCE

Salix orestera/Allium validum Seasonally Flooded Shrubland Alliance



MOWI_SW

DISTRIBUTION:



DESCRIPTION:

The Salix orestera/Allium validum seasonally flooded shrubland alliance is mapped on gentle to moderately steep slopes of varying aspect between 2649 -- 3786 m (8691 -- 12421 ft). The open to moderately dense shrub canopy is dominated by Salix orestera. A sub-shrub layer composed of Kalmia polifolia, Ledum glandulosum, Phyllodoce breweri, Vaccinium caespitosum, or V. uliginosum ssp. occidentale may also be present. The moderately open to dense herbaceous layer is dominated by Allium validum and Carex spp., with Dodecatheon jeffreyi, Senecio triangularis, and Veratrum californicum var. californicum often important. The hydrology is palustrine. Soils are somewhat poorly drained silty clay loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The key to separating this type out from associated meadows with similar infrared signatures is to pay attention to the higher amount of texture present on the imagery. *Salix orestera* can be quite small, making it difficult to delineate from adjacent meadow areas. The color is generally bright red. *Salix orestera* is inferred from elevation and drainage characteristics rather than a species specific signature.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – seasonally flooded Elevation – 2649 -- 3786 m (8691 -- 12421 ft) Shape – concave, undulating Slope position – low slope, midslope Steepness – gentle to moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Talus Slope (0100) •
- Alpine Scree Slope (0200) •
- Mesic Rock Outcrop (0500) ٠
- •
- Quaking Aspen Forest Alliance (2010) Whitebark Pine Woodland Alliance (3140) •
- Whitebark Pine/Davidson Penstemon association (3142) •
- Willow spp./Meadow Shrubland Mapping Unit (6500) •
- Willow spp. Riparian Shrubland Mapping Unit (6600) •
- Willow spp. Talus Shrubland Mapping Unit (6700) •
- Intermittently to Seasonally Flooded Meadow (8000) ٠
- Semi-permanently to Permanently Flooded Meadow (9000) ٠

OCEANSPRAY SHRUBLAND ALLIANCE



SEKI.0075_81

Oceanspray Shrubland



6210 – OCEANSPRAY SHRUBLAND ALLIANCE Holodiscus discolor Shrubland Alliance

LODG_NE

DISTRIBUTION:



DESCRIPTION:

The Holodiscus discolor shrubland alliance is mapped on moderately steep to steep rocky slopes of varying aspect between 2593 -- 3691 m (8506 -- 12108 ft). The intermittent shrub canopy is dominated by Holodiscus discolor (Holodiscus microphyllus sensu Hickman 1993), but may also include Artemisia tridentata, Chrysolepis sempervirens, Ribes spp., or Sambucus racemosa var. microbotrys. A sub-shrub layer of Eriogonum wrightii or Phyllodoce breweri may also be present. The herbaceous layer is typically sparse, but most frequently includes Carex exserta, C. rossii, and Juncus parryi. Sites are characterized by upland hydrology and rapidly drained sands.

PHOTO INTERPRETATION SIGNATURE:

This type can be generally observed in extremely sparse settings on top of rock. Shrubs are hard to detect and yield little color infrared signature. The presence of *Holodiscus discolor* is modeled by photo interpreters where it is noted on dry steep rocky environments. This distinguishes it from other subalpine species that may occur more frequently on talus or scree-like settings.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 2593 -- 3691 m (8506 -- 12108 ft) Shape – convex Slope position – low slope, midslope Steepness – moderately steep to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• Sparsely Vegetated to Non-vegetated Exposed Rock (0961)

BITTER CHERRY SHRUBLAND ALLIANCE



SEKI.0011_03

Bitter Cherry Shrubland

- 6300 BITTER CHERRY SHRUBLAND ALLIANCE Prunus emarginata Shrubland Alliance

DISTRIBUTION:



DESCRIPTION:

The *Prunus emarginata* shrubland alliance is mapped on moderately steep to steep slopes of varying aspect between 1488 -- 3189 m (4882 -- 10461 ft). The dense shrub canopy is dominated by *Prunus emarginata*. Other shrub species present may include *Acer glabrum, Arctostaphylos patula, Artemisia tridentata, Ceanothus cordulatus, Chrysolepis sempervirens, Ribes cereum,* or *Sambucus racemosa var. microbotrys.* Emergent trees may include *Abies concolor, A. magnifica, Calocedrus decurrens, Pinus jeffreyi, P. lambertiana, P. ponderosa,* or *Quercus kelloggii.* The herbaceous layer is characteristically sparse, with *Angelica lineariloba, Apocynum androsaemifolium, Artemisia douglasiana, Eriogonum nudum, Monardella odoratissima,* and *Pteridium aquilinum* among the most frequently encountered species. The hydrology is upland. Soils are moderately well drained sandy loams. *Prunus emarginata* is a generally shade intolerant species of sparse woods, riparian sites, and open areas where there is often evidence of past disturbance, such as fire or avalanche. *P. emarginata* sprouts vigorously following fire and reaches pre-fire densities in approximate 30 40 years. (Esser 1995, NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Pure stands of *Prunus emarginata* are often noted on lower talus slopes just above woodlands, especially above the Kern River. The color trends reddish brown and is over a white talus background. Stand densities vary from sparse to dense.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate - submesic

Elevation – 1488 -- 3189 m (4882 -- 10461 ft) Shape – convex, concave, undulating Slope position – low slope, midslope, high slope Steepness – moderately steep to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen Forest Alliance (2010)
- Quaking Aspen/Willow spp. Forest Mapping Unit (2013)
- Chaparral Whitethorn Shrubland Alliance (5060)
- Whitethorn Ceanothus Shrubland Alliance (5110)
- Water Birch Shrubland Alliance (5300)
- Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland Mapping Unit (5530)
- Deerbrush Shrubland Alliance (6010)
- California Grape Association (6030)
- Willow spp./Meadow Shrubland Mapping Unit (6500)
- Willow spp. Riparian Shrubland Mapping Unit (6600)
- Willow spp. Talus Shrubland Mapping Unit (6700)
- Mesic Post Fire Herbaceous Mapping Unit (7702)
- Intermittently to Seasonally Flooded Meadow (8000)

WILLOW SHRUBLAND MAPPING UNITS



SEKI.1505_484

Willow Spp. Riparian Shrubland



6500 – WILLOW SPP./MEADOW SHRUBLAND MAPPING UNIT Salix spp./Meadow Shrubland Mapping Unit

MUGR_SE

DISTRIBUTION:



DESCRIPTION:

The Salix spp./meadow shrubland mapping unit includes any of the Salix dominated alliances that occur over meadow vegetation. It is mapped on gentle to steep slopes of varying aspect between 1518 -- 3515 m (4979 -- 11531 ft). The open to dense shrub canopy is dominated by any of several species of Salix, including S. eastwoodiae, S. exigua, S. lasiolepis, S. lemmonii, S.ligulifolia, S. lucida ssp. lasiandra, S. orestera or S. planifolia. Other shrubs present may include Cornus sericea ssp. occidentalis, Ribes inerme var. inerme, and Vaccinium caespitosum. The composition of the moderately open to dense herbaceous layer varies widely with elevation and local habitat conditions, but is typically dominated by wet meadow graminoid and forb species. The hydrology is palustrine. Soils are somewhat poorly drained silty clay loams and sandy clay loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

The key to differentiating between a Salix component and a wet meadow is examining the texture visible on the photography. Usually, the color of the willows is a bit darker, and texture from the willow mottles the overall signature of the meadow.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 1518 -- 3515 m (4979 -- 11531 ft) Shape – concave, flat, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to steep





TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen Forest Alliance (2010)
- Quaking Aspen/Willow spp. Forest Mapping Unit (2013)
- Quaking Aspen/Willow spp. Talus Mapping Unit (2014)
- Black Cottonwood Temporarily Flooded Forest Alliance (2050)
- Black Cottonwood Forest Association (2053)
- Sierra Lodgepole Pine-Quaking Aspen/(Kentucky Bluegrass) Forest Mapping Unit (3012)
- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022)
- Water Birch Shrubland Alliance (5300)
- Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland Mapping Unit (5530)
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110)
- Bitter Cherry Shrubland Alliance (6300)
- Willow spp. Riparian Shrubland Mapping Unit (6600)
- Willow spp. Talus Shrubland Mapping Unit (6700)



6600 – WILLOW SPP. RIPARIAN SHRUBLAND MAPPING UNIT Salix spp. Riparian Shrubland Mapping Unit

MOBR_SE

DISTRIBUTION:



DESCRIPTION:

The Salix spp. riparian shrubland mapping unit includes any of the Salix dominated alliances that occur alongside rivers and streams. It is mapped on gentle to steep slopes of varying aspect between 491 -- 3592 m (1610 -- 11785 ft). Sites are characterized by palustrine or riverine hydrology and somewhat poorly drained sands or silt loams. The open to dense shrub canopy is dominated by any of several species of Salix, including S. drummondii, S.eastwoodiae, S. geyeriana, S. goodingii, S. lasiandra, S. lemmonii, S. jepsonii, S. melanopsis, S. orestera or S. planifolia, with S. orestera and S. jepsonii the most frequently encountered species. The composition of the moderately open to dense herbaceous layer varies widely with elevation and local habitat conditions, but is typically dominated by wet meadow and riparian graminoid and forb species, such as Allium validum, Artemisia douglasiana, Carex spp., Castilleja miniata ssp. miniata, Epilobium angustifolium, Pteridium aquilinum, Senecio triangularis, and Veratrum californicum var. californicum.

PHOTO INTERPRETATION SIGNATURE:

The signature of Salix is typically bright red in color, especially when it occurs as narrow bands along streams in rocky settings. In forest settings, such narrow bands can be difficult to detect under the nearby forest canopy.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 491 -- 3592 m (1610 -- 11785 ft) Shape – concave, convex, flat, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to very steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen Forest Alliance (2010)
- Quaking Aspen/Willow spp. Forest Mapping Unit (2013)
- Quaking Aspen/Meadow Mapping Unit (2017)
- Black Cottonwood Temporarily Flooded Forest Alliance (2050)
- Black Cottonwood Forest Association (2053)
- Sierra Lodgepole Pine-Quaking Aspen/(Kentucky Bluegrass) Forest Mapping Unit (3012)
- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022)
- Water Birch Shrubland Alliance (5300)
- Bitter Cherry Shrubland Alliance (6300)
- Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland Mapping Unit (5530)
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110)
- Shrub Willow Meadow Setting mapping unit (6500)
- Willow spp. Talus Shrubland Mapping Unit (6700)

6700 – WILLOW SPP. TALUS SHRUBLAND MAPPING UNIT Salix spp. Talus Shrubland Mapping Unit



LODG_NE

DISTRIBUTION:



DESCRIPTION:

The Salix spp. talus shrubland mapping unit includes any of the Salix dominated alliances that occur associated with talus fields. It is mapped on moderate to very steep slopes of varying aspect between 2069 -- 3552 m (6789 -- 11653 ft). The open to dense shrub canopy is dominated by any of several species of Salix, with *S. eastwoodiae* and *S. orestera* the most frequently encountered species. The composition of the moderately open to dense herbaceous layer varies widely with elevation and local habitat conditions, but is typically dominated by mesic graminoid and forb species, such as *Calamagrostis breweri, Carex exserta, Carex spp., Epilobium angustifolium, Penstemon heterodoxus, Pteridium aquilinum, Potentilla drummondii, Senecio triangularis, and Vaccinium caespitosum.* The hydrology is upland or palustrine. Soils are somewhat poorly drained sandy loams and sandy clay loams.

PHOTO INTERPRETATION SIGNATURE:

The bright red signature of the *Salix* is especially evident against the rocky talus setting but may be confused with other shrubs that typically yield less color infrared signature, such as *Prunus emarginata* or *Chrysolepis sempervirens*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 2069 -- 3552 m (6789 -- 11653 ft) Shape – concave, convex, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – moderate to very steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Quaking Aspen/Willow spp. Talus Mapping Unit (2014)
- Quaking Aspen/Big Sagebrush Forest Superassociation (2016)
- Bush Chinquapin Shrubland Alliance (5080)
- Water Birch Shrubland Alliance (5300)
- Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland Mapping Unit (5530)
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110)
- Bitter Cherry Shrubland Alliance (6300)
- Willow spp./Meadow Shrubland Mapping Unit (6500)
- Willow spp. Riparian Shrubland Mapping Unit (6600)







DISTRIBUTION:



DESCRIPTION:

The upland herbaceous mapping class includes a diverse range of herbaceous dominated communities that occur in a wide variety of habitats. It is mapped on gentle to steep slopes between 613 -- 3982 m (2012 -- 13063 ft). The hydrology is upland. The alliances and mapping units included in this class are largely dominated by graminoid vegetation, with composition varying with elevation and local site conditions.

PHOTO INTERPRETATION SIGNATURE:

The signature of this type varies from dull browns to yellow and occasionally off-white depending on elevation and growth conditions of the herbaceous vegetation. Higher elevation dry meadows tend to have a cream color to light pink color, while lower elevation grasses often show up as gray to blue-gray with no color infrared reflectance.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to submesic Elevation – 613 -- 3982 m (2012 -- 13063 ft) Shape – convex, flat, undulating Slope position – low slope, midslope, high slope Steepness – gentle to steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Fell-field (0400) ٠
- Mesic Rock Outcrop (0500) •
- Sparsely Vegetated Undifferentiated (0940) ٠
- •
- Sparsely Vegetated to Non-vegetated Exposed Rock (0961) Sierra Lodgepole Pine-Quaking Aspen/(Kentucky Bluegrass) Forest Mapping Unit (3012)
- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022)
- Big Sagebrush Shrubland Alliance (5160)
- Timberline Sagebrush Shrubland Alliance (5200) •
- Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland Mapping Unit (5530) •
- Shorthair Sedge Herbaceous Alliance (7120) •
- California Annual Grassland/Herbland Superalliance (7260) •
- Intermittently to Seasonally Flooded Meadow (8000) •

SHORTHAIR SEDGE HERBACEOUS ALLIANCE



SEKI.0175_156

Shorthair Sedge Association

7120 – SHORTHAIR SEDGE HERBACEOUS ALLIANCE Carex exserta Herbaceous Alliance



MOBR_SE

DISTRIBUTION:



DESCRIPTION:

The Carex exserta herbaceous alliance is mapped on gentle to moderately steep slopes of varying aspect between 2595 -- 3797 m (8514 -- 12458 ft). This alliance is dominated by Carex exserta (Carex filifolia var. erostrata sensu Hickman 1993) in the herbaceous layer. Other herbs may include Achillea millefolium var. occidentalis. Calamagrostis breweri, Cistanthe umbellata var. umbellata, Erigeron algidus, Juncus mertensianus, Oreostemma alpigenum (Aster alpigenus sensu Hickman 1993), Penstemon heterodoxus, Potentilla spp., Ptilagrostis kingii, Saxifraga aprica, and Trisetum spicatum. Emergent subshrubs may include Eriogonum incanum and Eriogonum nudum. This alliance forms the characteristic dryland meadow type of the subalpine and alpine and often intergrades with other meadow, forest, and woodland alliances. The hydrology is upland. Soils are well drained sands and sandy loams. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

This type is often mapped adjacent to wetter subalpine or alpine meadows. The signature of the *Carex exserta* herbaceous alliance is variable depending on the moisture status of the sedge vegetation. Drier stands generally have already died back and yield a very light signature trending towards off-white to yellow on the aerial photography. This alliance is easily confused with dense stands of other dry-land herbaceous types at similar elevations including *Ptilagrostis kingji* and *Juncus parryi*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric to submesic Elevation – 2595 -- 3797 m (8514 -- 12458 ft) Shape – convex, flat, undulating Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to moderately steep

ASPECT:



TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

- Alpine Fell-field (0400)
- •
- Mesic Rock Outcrop (0500) Sparsely Vegetated to Non-vegetated Exposed Rock (0961) Big Sagebrush Shrubland Alliance (5160) ٠
- •
- •
- Upland Herbaceous (7000) Intermittently to Seasonally Flooded Meadow (8000) •



7260 – CALIFORNIA ANNUAL GRASSLAND/HERBLAND SUPERALLIANCE California Annual Grassland/Herbland Superalliance

SHMO_NE

DISTRIBUTION:



DESCRIPTION:

The California annual grassland/herbland superalliance is mapped on gentle to moderate south to southwest facing slopes between 506 -- 1712 m (1659 -- 5617 ft). The herbaceous layer is composed of a diverse mix of annual grasses and forbs that form the characteristic annual grassland of the Sierran foothills. Dominant species include Avena barbata, A. fatua, Bromus diandrus, B. hordeaceous, B. madritensis, Chorizanthe membranacea, Daucus pusillus, a variety of Trifolium spp., and the late blooming summer annual Holocarpha heermannii. Associations within this alliance typically form the understory beneath Quercus douglasii and Q. wislizeni var. wislizeni dominated woodlands. Sites are characterized by upland hydrology and well developed soils. (NatureServe October 2006).

PHOTO INTERPRETATION SIGNATURE:

Most stands of this type yield very little color infrared signature on the aerial photography since they have long since died back following the early spring growing season. Protected settings sometimes yield some light yellow or pink hues.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 506 -- 1712 m (1659 -- 5617 ft) Shape – convex, flat, undulating Slope position – low slope Steepness – gentle to moderate




TYPES WITH SIMILAR PHOTO INTERPRETATION SIGNATURES:

• Upland Herbaceous (7000)



7702 – MESIC POST FIRE HERBACEOUS MAPPING UNIT Mesic Post Fire Herbaceous Mapping Unit

DISTRIBUTION:



DESCRIPTION:

The mesic post fire herbaceous mapping unit is mapped on gentle to steep slopes of varying aspects between 633 -- 3053 m (2078 -- 10016 ft. Vegetation is generally herbaceous but may contain some shrubs such as *ribes* or *Ceanothus;* individual species depend highly on elevation and adjacent or nearby vegetation.

PHOTO INTERPRETATION SIGNATURE:

The photo signature is widely variable depending on density and duration after the disturbance event. It is occasionally found in forest openings or in post avalanche settings.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 633 -- 3053 m (2078 -- 10016 ft) Shape – convex, undulating Slope position – midslope Steepness – gentle to steep

ASPECT:



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- Whitethorn Ceanothus Shrubland Alliance (5110)
- Winterform Ceanorities Sindoland Alliance (S110)
 Mountain Misery Dwarf-shrubland Alliance (5130)
 Deerbrush Shrubland Alliance (6010)
 Bitter Cherry Shrubland Alliance (6300)

- Post Fire Shrub/Herbaceous Mapping Unit (7703)



7703 – POST FIRE SHRUB/HERBACEOUS MAPPING UNIT Post Fire Shrub/Herbaceous Mapping Unit

TDPE_SW

DISTRIBUTION:



DESCRIPTION:

The post fire shrub/ herbaceous mapping unit is mapped on moderately steep south to southwest facing slopes between 634 -- 3312 m (2080 -- 10866 ft) Any species of chaparral may dominate the stand depending on elevations, *Ceanothus* is by far the most common however. Recent post fire events may be strictly herbaceous grasses and forbs; less recent fire may show up as having a young conifer component.

PHOTO INTERPRETATION SIGNATURE:

The photo signature is widely variable depending on species and age of shrub in early seral settings. It's found exclusively in post fire settings.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – xeric Elevation – 634 -- 3312 m (2080 -- 10866 ft) Shape – convex Slope position – low slope, midslope, high slope Steepness – moderately steep

ASPECT:



- Whitethorn Ceanothus Shrubland Alliance (5110)
- Mountain Misery Dwarf-shrubland Alliance (5130)
- Deerbrush Shrubland Alliance (6010)
- Mesic Post Fire Herbaceous Mapping Unit (7702)



8000 – INTERMITTENTLY TO SEASONALLY FLOODED MEADOW Intermittently to Seasonally Flooded Meadow

MUGR_SW

DISTRIBUTION:



DESCRIPTION:

Intermittently to seasonally flooded meadows are mapped on gentle to moderate concavities of varying aspect between 625 -- 3965 m (2049 -- 13010 ft). Associations included in this type are dominated by dense herbaceous vegetation that is generally characterized by a mixture of graminoid and forb species. A sparse shrub layer composed of emergent wetland species such as *Cornus sericea, Salix spp*, or *Vaccinium spp*. may be present. Emergent trees generally reflect the composition of the surrounding upland vegetation. The hydrology is palustrine. Wetlands included in this mapping unit have standing water present during the early part of the growing season, but generally exhibit some drying during the latter part of the season.

PHOTO INTERPRETATION SIGNATURE:

The photo signature of intermittently to seasonally flooded meadows varies depending on wetness and species composition, but generally color infrared reflectance is high and yields bright orange to red signatures. The texture is always smooth but may be a bit coarser with presence of larger plants such as *Veratrum californicum*.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 625 -- 3965 m (2049 -- 13010 ft) Shape – concave, flat Slope position – canyon bottom, low slope, midslope, high slope Steepness – gentle to moderate





- Alpine Snow Patch Communities (0300)
- Mesic Rock Outcrop (0500)
- Sierra Lodgepole Pine-Quaking Aspen/(Kentucky Bluegrass) Forest Mapping Unit (3012)
- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022)
- Bitter Cherry-Gooseberry spp.-(Mountain Maple) Shrubland Mapping Unit (5530)
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110)
- Bitter Cherry Shrubland Alliance (6300)
- Upland Herbaceous (7000)
- Shorthair Sedge Herbaceous Alliance (7120)
- Semi-permanently to Permanently Flooded Meadow (9000)







DISTRIBUTION:



DESCRIPTION:

Semi-permanent to permanently flooded meadows are mapped on gentle to moderate concavities of varying aspect between 1948 -- 3844 m (6390 -- 12611 ft). Associations included in this type are dominated by dense herbaceous vegetation that is generally characterized by a mixture of graminoid and forb species. The hydrology is palustrine. These wetland associations generally have standing water present for the duration of the growing season.

PHOTO INTERPRETATION SIGNATURE:

The presence of standing water either interspersed with or as a part of a bright red meadow signature is used in mapping to this category. Water signature may affect the brightness of the actual vegetation's reflectance.

ENVIRONMENTAL CHARACTERISTICS:

Microclimate – mesic Elevation – 1948 -- 3844 m (6390 -- 12611 ft) Shape – neutral Slope position – depressions and concavities Steepness – level to gently sloping

ASPECT:



- Alpine Snow Patch Communities (0300)
- Water (0980)
- Sierra Lodgepole Pine-Quaking Aspen/(Kentucky Bluegrass) Forest Mapping Unit (3012)
- Sierra Lodgepole Pine/(Bog Blueberry) Forest Mapping Unit (3022)
- Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance (6110)
- Intermittently to Seasonally Flooded Meadow (8000)

APPENDIX C

REFERENCE TABLE FOR SEQUOIA AND KINGS CANYON NATIONAL PARKS DIGITAL ORTHOPHOTO QUARTER QUADRANGLES (DOQQ)

DOQ Name	DOQ Abbreviation	DOQQ Abbreviation (includes ordinal directions)		
DOQ Name Aberdeen Blackcap Mountain Case Mountain Cedar Grove Chagoopa Falls Chickencoop Canyon Cirque Peak Dennison Peak General Grant Grove Giant Forest Hume Johnson Peak Kaweah Kearsarge Peak Kern Peak Lodgepole Marion Peak Mineral King Moses Mountain Mount Brewer Mount Clarence King Mount Darwin Mount Goddard Mount Henry Mount Kaweah Mount Langley Mount Silliman Mount Thompson Mount Whitney	ABER BLMT CAMT CEGR CHFA CHCA CIPE DEPE GEGR GIFO HUME JOPE KAWE KEPE LODG MAPE MIKI MOMT MTBR MTCL MTDA MTGO MTHE MTKA MTLA MTLA MTSI MTTH MTWH	DOQQ Abbreviation (includes ordinal directions) ABER_NW, ABER_NE, ABER_SW, ABER_SE BLMT_NW, BLMT_NE, BLMT_SW, BLMT_SE CAMT_NW, CAMT_NE, CAMT_SW, CAMT_SE CEGR_NW, CEGR_NE, CEGR_SW, CEGR_SE CHFA_NW, CHFA_NE, CHFA_SW, CHFA_SE CHCA_NW, CHFA_NE, CHFA_SW, CHFA_SE GEGR_NW, GEGR_NE, GEGR_SW, GEGR_SE GIFO_NW, GIFO_NE, GIFO_SW, GIFO_SE HUME_NW, HUME_NE, HUME_SW, HUME_SE JOPE_NW, JOPE_NE, JOPE_SW, JOPE_SE KAWE_NW, KAWE_NE, KAWE_SW, KAWE_SE KEPE_NW, KEPE_NE, KEPE_SW, KEPE_SE KEPE_NW, KEPE_NE, KEPE_SW, KEPE_SE KEPE_NW, KEPA_NE, KELA_SW, KELA_SE KEPE_NW, KEPA_NE, MAPE_SW, MAPE_SE MOMT_NW, MAPE_NE, MAPE_SW, MAPE_SE MIKI_NW, MIKI_NE, MIKI_SW, MIKI_SE MOMT_NW, MTBR_NE, MTBR_SW, MTBR_SE MTCL_NW, MTCL_NE, MTCL_SW, MTCL_SE MTGO_NW, MTKA_NE, MTKA_SW, MTKA_SE MTKA_NW, MTKA_NE, MTKA_SW, MTKA_SE MTHA_NW, MTLA_NE, MTFL_SW, MTAL_SE MTI_NW, MTLA_NE, MTFL_SW, MTAL_SE MTH_NW, MTLA_NE, MTFL_SW, MTSL_SE MTH_NW, MTH_NE, MTFL_SW, MTSL_SE MTH_NW, MTH_NE, MTFL_SW, MTSL_SE MTH_NW, MTHA_NE, MTFL_SW, MTSL_SE MTH_NW, MTHA_NE, MTFL_SW, MTSL_SE MTH_NW, MTH_NE, MTFL_SW, MTSL_SE MTH_NW, MTH_NE, MTFL_SW, MTSL_SE MTH_NW, MTH_NE, MTSL_SW, MTSL_SE MTH_NW, MTHH_NE, MTTH_SW, MTH_SE MTWH_NW, MTWH_NE, MTWH_SW, MTWH SW		
Mount Williamson Muir Grove North Palisade Quinn Peak Rough Spur Shadeouarter Mountain	MTWI MUGR NOPA QUPE ROSP SHMT	MTWI_NW, MTWI_NE, MTWI_SW, MTWI_SE MUGR_NW, MUGR_NE, MUGR_SW, MUGR_S NOPA_NW, NOPA_NE, NOPA_SW, NOPA_SE QUPE_NW, QUPE_NE, QUPE_SW, QUPE_SE ROSP_NW, ROSP_NE, ROSP_SW, ROSP_SE SHMT_NW, SHMT_NE, SHMT_SW, SHMT_SE	ε	
Silver City Silver City Splite Bluffs Sphinx Lakes Split Mountain Tehipite Dome The Sphinx Triple Divide Peak Wren Peak	SICI SLBL SPLA SPMT TEDO THSP TRDI WRPE	SICI_NW, SICI_NE, SICI_SW, SINMSL SICI_NW, SICI_NE, SICI_SW, SICI_SE SLBL_NW, SICI_NE, SLBL_SW, SLBL_SE SPLA_NW, SPLA_NE, SPLA_SW, SPLA_SE SPMT_NW, SPMT_NE, SPMT_SW, SPMT_SE TEDO_NW, TEDO_NE, TEDO_SW, TEDO_SE THSP_NW, THSP_NE, THSP_SW, THSP_SE TRDI_NW, TRDI_NE, TRDI_SW, TRDI_SE WRPE_NW, WRPE_NE, WRPE_SW, WRPE_SI	E	

Ordinal Direction Ordinal Direction Abbreviation

Northeast	NE
Northwest	NW
Southeast	SE
Southwest	SW

The digital orthophoto quadrangles are broken into digital orthophoto quarter quadrangles for the mapping of SEKI. The abbreviations for the DOQQ are comprised of the DOQ abbreviation and an underscore and the corresponding ordinal direction. An example of the DOQQ abbreviation is MUGR_NE for the northeast section of the Muir Grove DOQ.

APPENDIX D

FIELDS IN THE FINAL COVERAGE

Field structure of the polygon attribute table

COLUMN	FIELD NAME	WIDTH	OUTPUT WIDTH	TYPE	N.DEC
1	AREA	8	18	F	5
9	PERIMETER	8	18	F	5
17	SEKI#	4	5	В	-
21	SEKI-ID	4	5	В	-
25	PI	4	4	Z	0
29	DENSITY	1	1	Z	0
30	LANDUSE	3	3	N	0
33	AIS_ID	4	10	В	-
37	PIORIGINAL	4	4	N	0

F = Floating B = Binary

N = Numeric

APPENDIX E

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