



United States Department of Agriculture
US Forest Service
Natural Resource Manager (NRM)



FSVeg Common Stand Exam User Guide Region 5 Appendices

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APPENDIX A: ADMINISTRATIVE AND PROCLAIMED FOREST CODES

Table 1: Region 5 codes

Admin Number	Administrative Forest Name	Proclaimed Number	Proclaimed Forest Name
01	Angeles	01	Angeles
02	Cleveland	02	Cleveland
03	Eldorado	03	Eldorado
04	Inyo	04	Inyo
05	Klamath	05	Klamath
06	Lassen	06	Lassen
07	Los Padres	07	Los Padres
08	Mendocino	08	Mendocino
09	Modoc	09	Modoc
10	Six Rivers	10	Six Rivers
11	Plumas	11	Plumas
12	San Bernadino	12	San Bernadino
13	Sequoia	13	Sequoia
14	Shasta – Trinity	14	Shasta
14	Shasta – Trinity	18	Trinity
15	Sierra	15	Sierra
16	Stanislaus	16	Stanislaus
17	Tahoe	17	Tahoe
19	Lake Tahoe Basin	19	Lake Tahoe Basin

APPENDIX B: DISTRICT CODES

Table 2: Region 5 codes

Forest	Code	District
Angeles	51	Los Angeles River
Angeles	52	San Gabriel River
Angeles	53	Anta Calrita/Mojave R.
Cleveland	52	Trabuco
Cleveland	53	Palomar
Cleveland	54	Descanso
Eldorado	51	Amador
Eldorado	53	Georgetown
Eldorado	55	Pacific
Eldorado	56	Placerville
Eldorado	57	Placerville Nursery & Forest Genetics
Inyo	51	Mono Lake
Inyo	52	Mammoth
Inyo	53	White Mountain
Inyo	54	Mt. Whitney
Klamath	51	Oak Knoll
Klamath	52	Happy Camp
Klamath	54	Salmon River
Klamath	55	Scott River
Klamath	57	Goosenest
Lake Tahoe Basin	53	Eldorado
Lake Tahoe Basin	54	Toiyabe

Forest	Code	District
Lake Tahoe Basin	57	Tahoe
Lassen	51	Almanor
Lassen	53	Hat Creek
Lassen	58	Eagle Lake
Los Padres	51	Monterey
Los Padres	53	Santa Lucia
Los Padres	54	Santa Barbara
Los Padres	55	Ojai
Los Padres	57	Mt. Pinos
Mendocina	52	Chico Tree Imp.
Mendocina	53	Grindstone
Mendocina	54	Upper Lake
Mendocina	56	Covelo
Modoc	53	Warner Mt.
Modoc	54	Big Valley
Modoc	55	Devil's Garden
Modoc	56	Doublehead
Plumas	1	Beckworth
Plumas	2	Mount Hough
Plumas	3	Feather River
San Bernadino	51	Mountain Top
San Bernadino	53	Front Country
San Bernadino	55	San Jacinto
Sequoia	51	Hume Lake
Sequoia	53	Tule River/Hotsprings

Forest	Code	District
Sequoia	54	Greenhorn
Sequoia	56	Cannell Meadow
Shasta – Trinity	51	Yolla Bolla/Hayfork
Shasta – Trinity	54	Big Bear/Weaverville
Shasta – Trinity	58	Shasta Lake
Shasta – Trinity	59	Mt. Shasta/McCloud
Sierra	51	Bass Lake
Sierra	52	High Sierra
Sierra	56	San Joaquin Exp. Range
Six Rivers	51	Gasquet/Smith River NRA
Six Rivers	52	Orleans
Six Rivers	53	Lower Trinity
Six Rivers	54	Mad River
Stanislaus	51	Mi-Wok
Stanislaus	52	Calaveras
Stanislaus	53	Summit
Stanislaus	54	Groveland
Tahoe	53	Downieville
Tahoe	54	American River
Tahoe	56	Sierraville
Tahoe	57	Truckee

APPENDIX C: STATE CODES

Table 3: Region 5 codes

Code	State
CA	California
OR	Oregon
NV	Nevada

APPENDIX D: COUNTY CODES

Table 4: California County codes

Code	County
1	Alameda
3	Alpine
5	Amador
7	Butte
9	Calaveras
11	Colusa
13	Contra Costa
15	Del Norte
17	El Dorado
19	Fresno
21	Glenn
23	Humboldt
25	Imperial
27	Inyo
29	Kern

Code	County
31	Kings
33	Lake
35	Lassen
37	Los Angeles
39	Madera
41	Marin
43	Mariposa
45	Mendocino
47	Merced
49	Modoc
51	Mono
53	Monterey
55	Napa
57	Nevada
59	Orange
61	Placer
63	Plumas
65	Riverside
67	Sacramento
69	San Benito
71	San Bernardino
73	San Diego
75	San Francisco
77	San Joaquin
79	San Luis Obispo

Code	County
81	San Mateo
83	Santa Barbara
85	Santa Clara
87	Santa Cruz
89	Shasta
91	Sierra
93	Siskiyou
95	Solano
97	Sonoma
99	Stanislaus
101	Sutter
103	Tehama
105	Trinity
107	Tulare
109	Tuolumne
111	Ventura
113	Yolo
115	Yuba

Table 5: Nevada County codes

Code	County
5	Douglas
9	Esmeralda
21	Mineral
31	Washoe
51	Carson City

Table 6: Oregon County codes

Code	County
29	Jackson

APPENDIX E: EXISTING VEGETATION REFERENCES & CODES

Table 7: Existing Vegetation References

Code	Name	Author
CAL	Forest Inventory and Analysis User Guide. USDA Forest Service, Pacific Southwest Region. May 1997	USDA Forest Service

Table 8: California Vegetation codes (CAL)

Code	Description
AB	Santa Lucia fir
AC	Alpine cushion plant
AD	White bursage
AG	Agriculture
AK	Alkaline flats
AN	Mendocino manzanita
AX	Mixed alpine scrub
BA	Barren
BB	Bitterbrush
BC	Saltbush
BG	Greasewood
BI	Littleleaf mountain mahogany
BL	Low sagebrush
BM	Curleaf mountain mahogany

Code	Description
BP	Bristlecone pine
BQ	Basin mixed scrub
BR	Rabbitbrush
BS	Basin sagebrush
BT	Big tree (giant sequoia)
BX	High desert – montane chaparral transition
BZ	Basin – desert transition scrub
C1	Ultramafic mixed shrub
CA	Chamise
CB	Salal – California huckleberry shrub
CC	Ceanothus mixed chaparral
CD	Southern mixed chaparral
CE	Mountain misery
CG	Greenleaf manzanita
CH	Huckleberry oak
CI	Deerbrush
CJ	Brewer oak
CK	Coyote brush
CL	Wedgeleaf ceanothus
CM	Upper mountain mixed shrub
CN	Pinemat manzanita
CP	Bush chinquapin
CQ	Lower montane mixed chaparral
CR	Red Shanks chaparral
CS	Scrub oak

Code	Description
CT	Tucker/Muller scrub oak
CV	Snowbrush
CW	Whiteleaf manzanita
CX	Upper montane mixed chaparral
CY	Mountain whitethorn
CZ	Semi-desert chaparral
DA	Blackbush
DB	Desert buckwheat
DC	Cholla
DD	Croton
DE	Arrowweed
DF	Pacific Douglas-fir
DG	Douglas-fir – grand fir
DI	Indigo bush
DJ	Spiny Menodora
DL	Creosote bush
DM	Bigcone Douglas-fir
DO	Ocotillo
DP	Douglas-fir – ponderosa pine
DQ	Douglas-fir – canyon live oak
DS	Shadscale
DT	Douglas-fir – tanoak
DU	Dune
DV	Mixed desert succulent shrub
DW	Douglas-fir – white fir

Code	Description
DX	Mixed desert shrub
EA	Englemann spruce
EP	Eastside pine
EX	Coastal mixed hardwood
FD	Ephedra
FM	Curleaff mountain mahogany (tree)
FO	Water birch
FP	Foxtail pine
GF	Grand fir
GR	Unknown dry grass / forbs legacy
HA	Alkaline mixed grass / forbs
HC	Pickleweed – cord grass
HD	Unknown hardwood legacy
HG	Annual grass / forbs
HJ	Wet meadows grass / sedge / rush
HM	Perennial grass / forbs
HS	Cheesebush
HT	Tule – cattail
IA	Non-native / invasive grass
IC	Non-native / ornamental conifer
IG	Non-native / ornamental grass
IH	Non-native / ornamental hardwood
IM	Non-native / ornamental conifer / hardwood
IS	Non-native / ornamental shrub
JC	California juniper (shrub)

Code	Description
JP	Jeffrey pine
JT	California juniper (tree)
JU	Utah juniper
KP	Knobcone pine
LP	Lodgepole pine
LS	Scalebroom
MB	Mixed conifer – giant sequoia
MC	Cuyamaca cypress
MD	Incense cedar
MF	Mixed conifer – fir
MG	Gowen cypress
MH	Mountain hemlock
MI	Plute cypress
MK	Klamath mixed conifer
ML	Baccharis (riparian)
MM	Monterey cypress
MN	McNab cypress
MO	Baker cypress
MP	Mixed conifer – pine
MS	Sargent cypress
MT	Tecate cypress
MU	Ultramafic mixed conifer
MY	Pygmy cypress
MZ	Santa Cruz cypress
NA	Alkaline mixed scrub

Code	Description
NB	Missed desert wash shrub
NC	North coast mixed shrub
NM	Riparian mixed shrub
NQ	High desert mixed shrub
NR	Mixed riparian hardwoods
NX	Mixed hardwoods (non-productive)
PB	Brewer spruce
PC	Coulter pine
PD	Gray pine
PJ	Singleleaf pinyon pine
PL	Limber pine
PM	Bishop pine
PO	Port Orchard cedar
PP	Ponderosa pine
PQ	Fourneedle pinyonpine
PR	Monterey pine
PS	Shore pine
PT	Torrey pine
PW	Ponderosa pine – white fir
Q1	Live oak – madrone
QA	Coast live oak
QB	California bay
QC	Canyon live oak
QD	Blue oak
QE	White alder

Code	Description
QF	Fremont cottonwood
QG	Oregon white oak
QH	Madrone
QI	California buckeye
QJ	Cottonwood – alder
QK	Black oak
QL	Valley oak
QM	Bigleaf maple
QN	Englemann oak
QO	Willow
QP	California sycamore
QQ	Quaking aspen
QR	Red alder
QS	Willow – aspen
QT	Tanoak (madrone)
QV	California Walnut
QW	Interior live oak
QX	Black cottonwood
QY	Willow – alder
QZ	Eucalyptus
RD	Redwood – Douglas-fir
RF	Red fir
RS	Alluvial fan sage scrub
RW	Redwood
SA	Subalpine conifers

Code	Description
SB	Buckwheat
SC	Blueblossom ceanothus
SD	Manzanita Chaparral
SE	Encelia scrub
SG	Sitka spruce – grand fir
SH	Coastal bluff scrub
SI	Bladderpod
SK	Sitka spruce
SL	Coastal lupine
SM	Sumac shrub
SN	Snow/ice
SO	Coastal cactus
SP	Sage (Salvai spp.)
SQ	Mixed soft scrub chaparral
SR	Sitka spruce – redwood
SS	California sagebrush
SY	Chaparral yucca
TA	Mountain alder
TB	Bitterbrush – sagebrush
TC	Tree chinquapin
TM	Horsebrush
TN	Black sagebrush
TR	Rothrock sagebrush
TS	Snowberry
TT	Big basin sagebrush

Code	Description
TV	Mountain sagebrush
TW	Wyoming sagebrush
TX	Montane mixed hardwoods
UB	Urban/developed
UD	Desert willow
UI	Desert ironwood
UJ	Joshua Tree
UL	Catclaw acacia
UM	Mesquite
UP	Palo Verde
UT	Tamarisk
UW	Fan Palm
UX	Smoke tree
WA	Water
WB	Whitebark pine
WD	Dogwood
WF	White fir
WJ	Western juniper
WL	Willow (shrub)
WM	Birchleaf mountain mahogany
WP	Washoe pine
WW	Western white pine
XC	Unknown conifer
XG	Unknown dry grass/forbs
XH	Unknown hardwood

Code	Description
XI	Unknown non-native/ornamental
XJ	Unknown wet grass/forbs
XS	Unknown shrub
XX	Not yet mapped
XZ	Unknown barren

CALVEG DESCRIPTIONS

Central Coast and Montane Ecological Province

Conifer Forest/Woodland

RW Redwood Series

Redwood (*Sequoia sempervirens*) is distributed in moist coastal areas generally below 2000 ft (610 m) from southern Oregon to the Santa Lucia Mtns. (Los Padres NF), where the series has been mapped. Isolated stands may occur near springs, seeps and sheltered moist locations up to about 3200 ft (976 m) but Redwood often occurs in mixed hardwood forest stands at those elevations. Those hardwood associates include Tanoak (*Lithocarpus densiflorus*), Madrone (*Arbutus menziesii*), Canyon Live Oak (*Quercus chrysolepis*), Coast Live Oak (*Q. agrifolia*) and California Bay (*Umbellularia californica*). At lower elevations, shrub associates such as Blue Blossom (*Ceanothus thyrsiflorus*) and Chamise (*Adenostoma fasciculatum*) commonly occur.

DF Pacific Douglas-Fir Series

Pacific Douglas Fir (*Pseudotsuga menziesii*) is generally limited to northern, central and eastern California but occurs in scattered stands south to the Santa Ynez Mtns. (Los Padres NF) close to the coast. The series has been mapped in the Santa Lucia Range south of the Ventana Wilderness (Los Padres NF) in a limited area below about 3300 ft (1010 m). Conifer associates in this area are Redwood (*Sequoia sempervirens*) and Ponderosa Pine (*Pinus ponderosa*). Tanoak (*Lithocarpus densiflorus*), Madrone (*Arbutus menziesii*), and Canyon Live Oak (*Quercus chrysolepis*) usually are the main hardwood associates.

DM Big Cone Douglas-Fir Series

Bigcone Douglas Fir (*Pseudotsuga macrocarpa*) stands are found in the South Coast, Transverse and Peninsular Ranges from the Mt. Pinos region south and westward into the Central Coast area. This Series occurs very sparsely in the Central Coast area. On protected, mesic canyon slopes, Bigcone Douglas Fir is locally dominant with Canyon Live Oak (*Quercus chrysolepis*) as an associate at elevations as low as 1000 ft (305 m) or less up to 7000 ft (2135 m) or more over its range. It occurs intermingled with trees of the Mixed Conifer - Fir Series in its higher elevations such as Ponderosa Pine (*P. ponderosa*) and White Fir (*Abies concolor*).

KP Knobcone Pine Series

The Knobcone Pine (*Pinus attenuata*) Series occurs in both the Santa Cruz Mountains and the Santa Lucia Range. This closed cone species normally occurs in small, dense stands on xeric, shallow or serpentine soils. Individual trees or small groves representing xeric sites may occur within almost any pine or cypress Series, or the Canyon Live Oak Series or with chaparral species. This Series is a result of past disturbances (usually fire) and is mixed with Canyon Live Oak (*Quercus chrysolepis*), Black Oak (*Q. kelloggii*) and Gray Pine (*P. sabiniana*). Associated shrubs include Whiteleaf Manzanita (*Arctostaphylos viscida*), Shrub Interior Live Oak (*Q. wislizenii* var. *frutescens*), Wedgeleaf Ceanothus (*Ceanothus cuneatus*), Toyon (*Heteromeles arbutifolia*) and Manzanita (*Arctostaphylos* spp.).

PP Ponderosa Pine Series

The Ponderosa Pine (*Pinus ponderosa*) Series occurs only within the Santa Lucia Range in the Southern Coast Province. Other conifers may be present but Ponderosa Pine is clearly dominant. It is confined to mesic slopes above chaparral species, but may occur within one-half mile of the coast. Ponderosa Pine mixes with Coulter Pine (*P. coulteri*) on these slopes. Other associates include Black Oak (*Quercus kelloggii*) and Canyon Live Oak (*Q. chrysolepis*). Occasionally, Jeffrey Pine (*P. jeffreyi*) and Sugar Pine (*P. lambertiana*) mix as individual trees among the Ponderosa Pine Series within the Santa Lucia Mountains.

PM Bishop Pine Series

Bishop Pine (*Pinus muricata*) can be found along the coast of San Luis Obispo and Santa Barbara Counties, as well as in the Channel Islands and coastal areas further north. This closed cone pine grows in a maritime climate from the immediate coast to 1200 ft (350 m) elevation, generally on shallow, poorly drained and often-boggy soils. It occurs in pockets, especially on north-facing slopes, within the Annual Grass, Wet Meadows and Coastal Sage Scrub Series. Pygmy Cypress (*Cupressus goveniana* var. *pigmaea*) and Shore Pine (*P. contorta* var. *contorta*) may be important associates within the Bishop Pine Series.

PR Monterey Pine Series

This Series, dominated by Monterey Pine (*Pinus radiata*), occurs naturally in three locations along the coast: Ano Nuevo Point, Monterey, and Cambria, although it has been planted throughout the world. It mixes with Coast Live Oak (*Quercus agrifolia*) and Pacific Douglas Fir (*Pseudotsuga menziesii*). Knobcone Pine (*P. attenuata*) and Madrone (*Arbutus menziesii*) may also be associated. Understory species include Bedstraw (*Galium* spp.) and Shaggy Barked Manzanita (*Arctostaphylos tomentosa*). Monterey Pine occurs in almost pure stands of even age due to regeneration and site dominance after fire.

PC Coulter Pine Series

Scattered Coulter Pine (*Pinus coulteri*) stands can be found throughout the Santa Lucia Mountains, and in interior areas from Santa Barbara County to San Francisco Bay. Open, woodland like stands with a shrub understory develop in this Series at elevations as low as 1500 ft (460 m) in the Santa Lucia Mtns. On xeric slopes, Coulter Pine mixes with Canyon Live Oak (*Quercus chrysolepis*), and on serpentine soils with Jeffrey Pine (*P. jeffreyi*). Coulter Pine has not been identified in the Santa Cruz Mountains.

MZ Santa Cruz Cypress Series

Santa Cruz Cypress (*Cupressus abramsiana*) grows primarily in the Santa Cruz Mountains. It associates with chaparral species on non-serpentine soils but Ponderosa Pine (*Pinus ponderosa*) and Knobcone Pine (*P. attenuata*) may also be present on these sites. Its elevational range is from 1000 to 2200 ft (300 – 670 m) above coastal summer fog.

MG Gowen Cypress Series

This Series is dominated by Gowen Cypress (Cupressus goveniana). It grows in disjunct groves on mesic soils just south of Monterey Bay at elevations below 1000 ft (305 m). Major groves of Gowen Cypress occur inland on the western slopes of Huckleberry Hill and in San Jose Creek (Monterey County).

MM Monterey Cypress Series

This Series occurs between Cypress Point and Pescadero Point and near Point Lobos in Monterey County. Monterey Cypress (Cupressus macrocarpa), the dominant species, often associates with Salal (Gaultheria shallon) and Rhododendron spp., representing cool, moist climate and mesic soils. It has been extensively planted outside of its natural range.

MS Sargent Cypress Series

Sargent Cypress (Cupressus sargentii) has a more extensive distribution than many Cypress species in California. In the Central Coast and Montane Zone groves of Sargent Cypress are restricted to serpentine, rocky or shallow ultrabasic soils, especially in the Santa Lucia Range. It is commonly found along creeks below about 2000 ft (610m) adjacent to other conifer and chaparral series. In burned areas, this Cypress may form dense thickets. Associated species are Gray Pine (Pinus sabiniana) and scattered Ponderosa Pine (P. ponderosa) individuals. Understory species are Wedgeleaf Ceanothus (Ceanothus cuneatus), Leather Oak (Quercus durata) and Scrub Oak (Q. berberidifolia, formerly Q. dumosa).

AB Santa Lucia Fir Series

Santa Lucia Fir (Abies bracteata) is found only in the Santa Lucia Range (Los Padres NF) as a narrow endemic species, usually within 15 miles (24 km) of the coast. It is most common near the crest of the mountains and towards the north. It often associates with Canyon Live Oak (Quercus chrysolepis), and other hardwoods in droughty summit sites, on rocky slopes or in protected ravines. Slopes are usually steep and less fire-prone than other mixed hardwood areas of the forest. Elevation ranges are in the order 2000 - 5000 ft (610 - 1525 m). This Fir is the dominant conifer in this Series but it also occurs as scattered individuals or clumps of trees within the Mixed Conifer areas.

MF Mixed Conifer - Fir Series

This Series is extensive in many areas of the state and usually consists of a mixture of conifer species in which White Fir (Abies concolor) usually forms a conspicuous component. This Series generally occurs within an elevational range of 3800 - 6700 ft (1150 - 2000 m) or higher. It is rare in the Central Coast Province, but has been mapped in a limited area of the Los Padres NF where White Fir occurs. The lower elevations of this Series are primarily dominated by White Fir and Sugar Pine (Pinus lambertiana) with Black Oak (Quercus kelloggii) as an important hardwood associate.

PJ Pinyon - Juniper Series

One-leaved Pinyon Pine (Pinus monophylla) dominates the higher elevations of this semi-arid open woodland series. The shrub California Juniper (Juniperus californica) occupies sites in this Series at lower elevations and often on gentle slopes or alluvium. The taller Sierra or Mountain Juniper (J. occidentalis var. australis) may also occur in this Series. It has been mapped in transmontane, arid regions of the Los Padres NF of the Central Coast Province such as those in the rain shadow of the San Rafael Mtns. Elevations are generally of the order 4000 - 8000 ft (1220 - 1950 m). Understories may include Bitterbrush (Purshia tridentata) and Tucker or Palmer Oak (Quercus john-tuckeri, Q. palmeri).

PD Gray Pine Series

Gray Pine (*Pinus sabiniana*) reaches its southernmost extent in the Santa Ynez Mtns. (Los Padres NF) and northwestern areas of the Angeles NF close to the San Joaquin Valley. The Series is usually an open woodlands type with a diverse mixture of hardwoods such as Valley Oak (*Quercus lobata*), Blue Oak (*Q. douglasii*) and Canyon Live Oak (*Q. chrysolepis*) and low-elevation chaparral shrubs with Gray Pine as the only conifer. It has been mapped in locations below 3000 ft (980 m) very sparsely in the La Panza and Santa Lucia Ranges (Los Padres NF of the Central Coast Province).

Hardwood Forest/Woodland

QT Tanoak - Madrone Series

Tanoak (*Lithocarpus densiflorus*), widely distributed in coastal regions of northern and central California, reaches its southernmost extent in the Santa Ynez Mtns. (Los Padres NF). Its range overlaps with that of Madrone (*Arbutus menziesii*) in this area and further north in the Santa Lucia Range of the Los Padres NF, where the series has been mapped in cismontane elevations below 3000 ft (915 m). Tanoak or Madrone may occur alone or in combination as dominant hardwoods of this Series. Madrone is prominent in the Coast Live Oak Series and is often found on deep, well-drained mesic soils. Tanoak may occur in pure stands on western mesic slopes since it sprouts quickly and is an invader species within the Pacific Douglas-Fir Series. Associates in this area include Coastal Sage Scrub species such as Sages (*Salvia* spp.) and Coastal Sagebrush (*Artemisia californica*), low elevation chaparral species such as Wedgeleaf Ceanothus (*Ceanothus cuneatus*), conifers such as Ponderosa Pine (*Pinus ponderosa*), Redwood (*Sequoia sempervirens*) and Pacific Douglas-Fir (*Pseudotsuga menziesii*), and other hardwoods such as Canyon Live Oak (*Quercus chrysolepis*).

QA Coast Live Oak Series

This Series, dominated by Coast Live Oak (*Quercus agrifolia*), occurs throughout the Southern Coast Ranges. It readily is found in pure stands in valleys and slopes generally below 4000 ft (1220 m) elevation, associating with Monterey Pine (*Pinus radiata*), Madrone (*Arbutus menziesii*) and Interior Live Oak (*Q. wislizenii*). Southern California Walnut (*Juglans californica*) associates with Coast Live Oak on north slopes. Canyon Live Oak (*Q. chrysolepis*) is often present and abundant in this Series. Coast Live Oak generally occurs on deep, mesic soils on near-coastal slopes where it forms denser forests and on alluvial terraces in more interior slopes, where it may form open savanna-like grasslands. It intergrades with the more interior Blue Oak Series in the Santa Lucia Mtns. of the Central Coast region.

QC Canyon Live Oak Series

Canyon Live Oak (*Quercus chrysolepis*) can be found throughout the Central and Southern Coast Ranges as the dominant hardwood of this Series. It is frequently found on steep, rocky canyon slopes up to an elevation of about 8500 ft (2600 m) in southern California. In sheltered slopes and in mesic ravines closer to the coast, its hardwood associates include Tanoak (*Lithocarpus densiflorus*), Madrone (*Arbutus menziesii*), Bigleaf Maple (*Acer macrophyllum*), and California Bay (*Umbellularia californica*). Pacific Douglas-Fir (*Pseudotsuga menziesii*) and Coast Live Oak (*Q. agrifolia*), also are associated with this Series. Canyon Live Oak may assume a shrub form (*Q. c.* var. *nana*) on rocky summits and more exposed sites. Coulter Pine (*Pinus coulteri*) may become an important associate on very dry sites with flatter slope gradients. Ponderosa Pine (*P. ponderosa*) and Sugar Pine (*P. lambertiana*) are also occasionally present in this Series.

QK Black Oak Series

Black Oak (Quercus kelloggii) is scattered throughout the Central Coast west of the Salinas River and north to San Francisco Bay. It generally occurs with Ponderosa Pine (Pinus ponderosa) on dry slopes and is often a component of the Mixed Conifer and Coulter Pine Series. It also occurs in pure stands in this Series on mesic slopes at low to mid-montane elevations up to about 7900 ft (2400 m). These stands often develop because of intensive fires or other disturbance such as logging of conifers. They vary greatly in canopy closure from very dense to savanna-like. Soils are usually well drained and have loamy textures. In addition to the conifers, other common associates in this series are Birchleaf Mountain Mahogany (Cercocarpus betuloides), Eastwood Manzanita (A. glandulosa), Interior Live Oak (Quercus wislizenii), Scrub Oak (Q. berberidifolia or Q. dumosa) and Canyon Live Oak (Q. chrysolepis). Black Oak may hybridize with Interior Live Oak (Q. wislizenii) and Coast Live Oak (Q. agrifolia) where the species associate.

QW Interior Live Oak Series

The Interior Live Oak (Quercus wislizenii) Series occurs in both interior valleys and seaward sides of the Coast Ranges, but generally is found in pure stands inland from the Coast Live Oak Series. Within the Santa Lucia Range and the Santa Cruz Mountains, Interior Live Oak also is an important understory species in the Redwood Series. Within interior valleys, Interior Live Oak associates with Valley Oak (Q. lobata) and Gray Pine (Pinus sabiniana) in savanna-like stands.

QD Blue Oak Series

Blue Oak (Quercus douglasii) forms open savanna-like woodlands on well-drained soils in low elevation sites throughout interior California. In both the Santa Lucia Range and interior savannas, it is a dominant hardwood in areas below about 3000 ft (915 m). It is often adjacent to or intermixed with the Coast Live Oak (Q. agrifolia) Series and usually occupies somewhat lower elevations than does the Gray Pine (Pinus sabiniana) Series where the trees occur in the same area. Blue Oak also occurs with and readily hybridizes with Valley Oak (Q. lobata) in the Central Coast region.

QL Valley Oak Series

Valley Oak (Quercus lobata) occurs in pure stands on low-elevation areas of the Central Coast Province as open woodlands with an understory of dry grasslands. The Series is often found on alluvial terraces or other sites that may retain more summer moisture than Blue Oak woodlands. It has been mapped in scattered stands in this area in the La Panza, Santa Lucia and Garcia Mtns. (Los Padres NF). These elevations are usually below 2000 ft (610 m), but Valley Oak may also occur on broad rounded ridgetops up to 5000 ft (1520 m) elevation. Valley Oak associates with Gray Pine (Pinus sabiniana) and Canyon Live Oak (Q. chrysolepis) near the coast in Monterey County and with Blue Oak (Q. douglasii) over its range.

QI California Buckeye Series

Distribution of this Series, dominated by the hardwood California Buckeye (Aesculus californica), is centered in Monterey, San Benito, Santa Clara, Contra Costa, and Merced Counties. Buckeye may occur in shrub and tree form, and is often found on steep, north facing mesic, dry or coastal sites. Forming dense stands on hillsides, it often associates with Coast Live Oak (Quercus agrifolia) and Black Oak (Q. kelloggii) in Monterey County. California Buckeye also occurs with Blue Oak (Q. douglasii), Gray Pine (P. sabiniana), Interior Live Oak (Q. wislizenii), California Bay (Umbellularia californica) and the shrub Hollyleaf Cherry (Prunus ilicifolia).

QF Fremont Cottonwood Series

This often mixed species riparian Series is dominated by Fremont Cottonwood (Populus fremontii) and occurs in steeper montane canyon sites of the Central Coast region. Fremont Cottonwood may be found in pure stands along most streams and seeps below about 6500 ft (1982 m) or may mix with abundant Sycamore (Platanus racemosa) in this area. White Alder (Alnus rhombifolia), Boxelder (Acer negundo), shrubby Willows (Salix spp.), Seep Willow (Baccharis viminea), Douglas Baccharis (B. Douglasii) and other riparian species may occur less frequently. Black Cottonwood (Populus trichocarpa) replaces Fremont Cottonwood on the Carmel River. Bigleaf Maple (Acer macrophyllum) and Coast Live Oak (Quercus agrifolia) may occur within this Series further upslope from the riparian floodplains. Red Alder (A. rubra) may also be associated in coastal locations of Monterey, Santa Cruz, and San Mateo Counties. The Series grades into the Willow-Alder and Willow Series where riparian gradients are variable along the same streambed.

QY Willow - Alder Series

This mixed riparian Series describes the low elevation mixture of Willows (Salix spp.) and White Alder (Alnus rhombifolia). These species occur in moist areas and adjacent to stream courses in coastal areas and throughout the Central Coast mountains where stream gradients are variable. Willows and alders are also found in foothill canyon bottoms adjacent to inland valleys. Red Alder (A. rubra) may be a prominent component along the coast north of San Luis Obispo County. Boxelder (Acer negundo), Dogwood (Cornus spp.) and Sycamore (Platanus racemosa) also may be present in the Series. In the Santa Cruz, Santa Ynez, and Santa Lucia Ranges, the Willow - Alder Series occurs on coarse, gravelly soils below about 5000 ft (1520m). This Series includes smaller landscape units in which White Alder occurs in pure stands.

QO Willow Series

This Series is dominated by Willows, most commonly the tree-like shrub Arroyo Willow (S. lasiolepis), the trees Red and Pacific Willow (Salix laevigata, S. lasiandra) and other shrub Willows (S. coulteri, S. hindsiana, S. melanopsis, S. scouleriana) in the Central Coast region. It usually occurs on low-gradient stream reaches near the coast from Monterey southward. Associates in the broader area of this stringer-like Series include Red Osier Dogwood (Cornus occidentalis), Wild Rose (Rosa californica), Alders (Alnus spp.) and Black Cottonwood (Populus trichocarpa).

Q1 Live Oak - Madrone Series

This mixed hardwood type consists of two or three species. Canyon Live Oak (Quercus chrysolepis) and/or Coast Live Oak (Q. agrifolia) dominate the mixture along with the less prominent hardwood Madrone (Arbutus menziesii). Tanoak (Lithocarpus densiflorus) is generally absent. Other hardwood associates include California Bay (Umbellularia californica), California Black Oak (Quercus kelloggii) and California Buckeye (Aesculus californica). The series has been mapped abundantly on low to moderate elevation slopes of the Santa Lucia, and San Rafael Ranges (Los Padres NF) in this area.

Scrub and Chaparral

CC Ceanothus Chaparral Series

Chaparral in this region is occasionally dominated in small areas by species of Ceanothus in contrast to the more extensively occurring mixed chaparrals. This coastal to mid elevation shrub Series is identified by any of the following dominant species: Blue Blossom (Ceanothus thyrsiflorus), Bigpod (C. megacarpus), Wedgeleaf (C. cuneatus), Greenbark (C. spinosus), Carmel (C. griseus), Wavyleaf (C. foliosus), Wartleaf (C. papillosus), Glory Mat

(*C. gloriosus*), Santa Barbara (*C. impressus*), Chaparral Whitethorn (*C. leucodermis*) or Hairyleaf Ceanothus (*C. oliganthus*) alone or in combination. Chamise (*Adenostoma fasciculatum*) occurs throughout this area and is commonly associated with these species. The Series typically occurs on cismontane slopes having mesic soils below about 5000 ft (1525 m). Silk-tassel (*Garrya fremontii*) and Birchleaf Mountain Mahogany (*Cercocarpus betuloides*) may also be present in minor amounts.

CA Chamise Series

Relatively pure areas of Chamise (*Adenostoma fasciculatum*) often develop on sites that are harsher in terms of having shallow soils, more xeric or sunnier environments (e.g., south-facing slopes) than the adjacent Northern Mixed Chaparral Series. Chamise may also dominate a site after disturbances such as intense, warm-season fires and is usually a dominant chaparral species on serpentine soils. Chamise stands exist in the Coast Range from San Mateo to Ventura County. The Series has been mapped in interior locations of the Santa Lucia and La Panza Ranges (Los Padres NF). The elevation of the Series is generally < 4000 ft (1220 m), but may reach 5500 ft (1680 m) or more in interior sites such as transmontane slopes of the San Rafael and adjacent highlands (Los Padres NF). Very little other vegetation is found on these sites but Chaparral Yucca (*Yucca whipplei*) often occurs on sites that are more open. Minor amounts of common chaparral species such as Manzanita (*Arctostaphylos* spp.) and *Ceanothus* spp. may also be present.

CX Montane Mixed Chaparral Series

This Series contains a mixture of chaparral species existing at intermediate elevation levels, generally above about 5000 ft (1525 m) in the coniferous areas. These sites are often steep and south facing or have rocky, shallow soils that are unfavorable to good conifer growth. No single shrub species is dominant in the mixture. Chamise (*Adenostoma fasciculatum*) is generally absent. Shrubs such as Mountain Whitethorn (*Ceanothus cordulatus*), Deerbrush (*Ceanothus integerrimus*), Bush Chinquapin (*Castanopsis sempervirens*), Currants (*Ribes* spp.) and Mexican or Eastwood Manzanita (*Arctostaphylos pungens*, *A. glandulosa*) may occur in the mixture.

CS Scrub Oak Series

Scrub Oak (*Quercus berberidifolia*, formerly *Q. dumosa*) or other species of shrubby oaks may become dominant shrubs on steep, mesic slopes at low to moderate elevations in the Central Coast area. In addition to Scrub Oak, any combination of shrub Interior Live Oak (*Q. wislizenii* var. *frutescens*), Leather Oak (*Q. durata*), and shrub Canyon Live Oak (*Q. chrysolepis* var. *nana*) may be abundant in the Series. These oaks may fully re-occupy a site after intense fire due to their vigorous stump-sprouting ability. Other common chaparral associates may be present in minor amounts, including the shrubs Chamise (*Adenostoma fasciculatum*), Birchleaf Mountain Mahogany (*Cercocarpus betuloides*), Toyon (*Heteromeles arbutifolia*), Poison Oak (*Toxicodendron diversilobum*) and vines such as Cucumber Vine (*Marah macrocarpus*) and Honeysuckle (*Lonicera* spp.). This Series occurs at elevations generally below about 5000 ft (1525 m) and grades into the Northern Mixed Chaparral Series. Shrub oaks on very dry sites are usually in the Tucker Desert Scrub Oak Series.

CT Tucker Desert Scrub Oak Series

A drought-tolerant scrub oak type (the former *Quercus turbinella* group) has been separated into several species in the new Jepson California taxonomy. Tucker Desert Scrub Oak (*Quercus john-tuckeri*) occurs in interior western regions of central California in very open semi-arid transmontane stands at moderate to high elevations. Palmer Desert Oak (*Q. palmeri*), another shrubby oak, may also be present in this Series. Tucker Desert Scrub Oak Series has been mapped in the northeastern rainshadow area of the Sierra Madre and

San Rafael Mtns. (Los Padres NF) at elevations below about 5600 ft (1710 m). This series is adjacent to and shares elements of the Pinyon-Juniper Series, the Northern Mixed Chaparral Series and the Buckwheat - White Sage Series. Birchleaf Mountain Mahogany (Cercocarpus betuloides) is often present in these areas in addition to Scrub Oak (Quercus berberidifolia or Q. dumosa) and California Buckwheat (Eriogonum fasciculatum).

CQ Northern Mixed Chaparral Series

The mixed shrub series occurs extensively on cismontane low to moderate elevation slopes in the Central Coast area. Species composition varies according to climate, environment and geographic position but no one species is clearly dominant. Chamise (Adenostoma fasciculatum) is very common in the mixture as are species of Ceanothus, Manzanita (Arctostaphylos spp.), Oak (especially Quercus berberidifolia or Q. dumosa), Sumacs (such as Sugar Bush, Rhus ovata), Cherry (especially Hollyleaf Cherry, Prunus ilicifolia) and Redberry (Rhamnus ilicifolia or R. crocea). It is usually found lower than the Montane Mixed Chaparral Series and at elevations similar to or slightly higher than the Chamise Series.

CZ Semi-Desert Chaparral Series

This transitional type develops on interior (transmontane) slopes of the Central Coast, at elevations of 2000 - 7000 ft (610 - 2135 m). Sites are open and have an abundant mixture of common chaparral shrubs such as Chamise (Adenostoma fasciculatum), Birchleaf Mountain Mahogany (Cercocarpus betuloides), Bigberry Manzanita (Arctostaphylos glauca) and sub-shrubs such as California Buckwheat (Eriogonum fasciculatum) with no dominant shrub species. In addition, at least one desert or semi-desert species is prominent in this Series, such as Flannel Bush (Fremontodendron californicum), Bitterbrush (Purshia tridentata), Tucker or Palmer Scrub Oak (Quercus john-tuckeri, Q. palmeri), Rabbitbrush (Chrysothamnus spp.), Prickly Pear (Opuntia sp.), Creosote Bush (Larrea tridentata) Desert Apricot (Prunus fasciculata), or Great Basin Sagebrush (Artemisia tridentata).

Soft Chaparral

SS California Sagebrush Series

California or Coastal Sagebrush (Artemisia californica) is generally found as a dominant shrub in low elevation coastal foothills and valleys in association with Black Sage (Salvia mellifera) in this region. It is present from San Francisco Bay southward and the Series commonly occurs on cismontane slopes of the Santa Lucia Range between Monterey and Pt. Conception at elevations usually below about 2000 ft (610 m). These sites are often exposed and south facing, having rocky, shallow soils. Other species in this Series include Coyote Brush (Baccharis pilularis), Monkey Flower (Mimulus aurantiacus), Mock Heather and Sawtooth Goldenbush (Happlopappus ericoides, H. squarrosus), species of Coffeeberry (Rhamnus spp.), Lupines (Lupinus spp.), Poison Oak (Toxicodendron diversilobum), California Encelia (Encelia californica), Chaparral Yucca (Y. whipplei) and, at lower elevations, Coast Buckwheat (Eriogonum latifolium). Some of these near-coastal sandy sites may have such rare species as Monterey, Morro or Sandmat Manzanitas (Arctostaphylos montereyensis, A. morroensis, A. pumila).

Herbaceous

HG Annual Grass - Forb Series

Low to mid-montane areas of central California may develop extensive or restricted areas of dry grasslands. These grasses and forbs generally occur beneath Blue Oaks (Quercus douglasii) and Valley Oaks (Q. lobata), but may occur as extensive stands without an overstory in otherwise well-vegetated shrub, hardwood or coniferous regions. Conditions

that restrict the the growth and maintenance of species of the surrounding vegetation include the occurrence of pockets of fine-textured (clayey) soils, a frequent fire regime, and ground-disturbing activities such as grazing and mining. Many exotic grasses are characteristic of this type, including species of wild oats (Avena spp.), various Bromes (Bromus spp.), Foxtail Fescue (Vulpia myuros), and Kentucky Bluegrass (Poa pratensis). This series also includes perennial grasses that develop on coarse, well-drained soils occurring within sunny openings of Ponderosa Pine savannas. In addition to species mentioned above, savannas may also include more native Sedges (Carex spp.) and Melic Grass (Melica spp.)

HJ Wet Meadows (Grass - Sedge - Rush) Series

Sedges and rushes occur within valleys on wet meadows and small, wet alluvial fans of lower montane areas. Although a range of hydric conditions (dry to saturated) usually occurs within the same meadow, wet and mountain meadows are characterized by the permanency of the water source at their lowest topographic levels. Many Sedges and most Rushes (Carex spp. and Juncus spp.) require a year-round moisture source. When present along the coast, this Series occurs in swales but sufficiently upslope to be away from saline deposits in coastal salt marsh areas.

Central Valley Ecological Province

Hardwood Forest/Woodland

QD Blue Oak Series

This Series is dominated by Blue Oak (Quercus douglasii), which naturally occurs in an oak-grass association on well-drained, gentle slopes. Blue Oak and Gray Pine (Pinus sabiniana) are the major trees in this hillside Series. It occurs on the fringes of the Central Valley from Redding to Bakersfield. Within this fringe, Blue Oak may be the only hardwood species, although Interior Live Oak (Q. wislizenii), Valley Oak (Q. lobata) and/or Buckeye (Aesculus californica) may also be present. Non-stump sprouting chaparral shrubs such as Wedgeleaf Ceanothus (Ceanothus cuneatus), Manzanitas (Arctostaphylos spp.), Coffeeberry (Rhamnus spp.) and Poison Oak (Toxicodendron diversilobum) may also be present throughout this Series. The understory of the Blue Oak Series is dominated by annual grasses such as Wild Oats (Avena spp.), Cheatgrass (Bromus spp.) and Needlegrass (Stipa spp.).

QL Valley Oak Series

This riparian Series is dominated by Valley Oak (Quercus lobata). This declining species formerly occurred in pure stands of large trees with no woody understory. These stands appeared similar in structure on valley bottoms and in rolling slopes over a range of elevations, generally below 2000 ft (610 m). Valley Oak generally occurs along major stream courses and on their alluvial deposits. It is an indicator of deep, rich loamy soils of alluvial terraces where the water table is less than 35 ft (10 m). A few scattered Interior Live Oaks (Q. wislizenii) can be found throughout this Series.

QW Interior Live Oak Series

This Interior Live Oak (Quercus wislizenii) dominated Series occurs throughout the Central Valley on recent alluvial terraces, older terraces and rolling hills. It is in semi-open or closed stands or may associate with the Canyon Live Oak (Q. chrysolepis) Series at higher elevations. Gray Pine (Pinus sabiniana) and Buckeye (Aesculus californica) are associated species. This Series is located above the Blue Oak Series, generally 500 - 2000 ft (152 - 610 m). When in association with the Blue Oak Series, Interior Live Oak occurs on deeper, better-drained soils than does Blue Oak (Q. douglasii). On north aspects and with increased

elevation, Interior Live Oak becomes increasingly dominant and forms a continuous band in the foothills of the Sierra Nevada adjacent to the Central Valley. Cottonwood (Populus spp.) is the associated riparian species with minor amounts of White Alder (Alnus rhombifolia).

QF Fremont Cottonwood Series

Fremont Cottonwood (Populus fremontii) occurs adjacent to stream courses within the Central Valley. It exists in relic stands in riparian areas below 2500 ft (762 m). This Series, where the Cottonwood is the dominant hardwood, occurs in stringers adjacent to the Blue Oak and Valley Oak Series. White Alder (Alnus rhombifolia) and California Black Walnut (Juglans hindsii) are occasional associates of this open woodland Series. Understory species, which commonly occur, include Blackberry (Rubus spp.), Blue Elderberry (Sambucus mexicana), Wild Cucumber (Marah fabaceus) and Poison Oak (Toxicodendron diversilobum). Other occasional associates within the Fremont Cottonwood Series may be Sandbar Willow (Salix hindsii), Western Sycamore (Platanus racemosa) and Valley Oak (Quercus lobata).

QZ Eucalyptus Series

This Series (Eucalyptus spp.) occurs in pure stands in the area from Davis to Vacaville. Usually these Eucalyptus stands are very dense and reproduce naturally through sprouting. Understory species are usually absent. The ground cover is dominated by litter from the hardwoods. These stands were planted, became naturalized, and subsequently have dominated the valley sites.

Chaparral

CC Sierran Mixed Chaparral Series

This Series is a mixture of low-elevation chaparral species such as Whiteleaf, Hoary and Common Manzanitas (Arctostaphylos viscida, A. canescens, A. manzanita), Wedgeleaf and Lemmon Ceanothus (Ceanothus cuneatus, C. lemmonii), Chamise (Adenostoma fasciculatum), Silk-tassel (Garrya fremontii), Western Mountain Mahogany (Cercocarpus betuloides) and other more interior species below coniferous and hardwood sites. The distinction between this Series and the Northern Mixed Chaparral Series often found further west is not clearly defined in this area, since some species with coastal affinities such as Toyon (Heteromeles arbutifolia) may occur.

Sagebrush Shrub

BC Saltbush Series

This Series occurs as a combination of several Atriplex species, usually Spiny Saltbush (Atriplex confertifolia), Fourwing Saltbush (A. canescens) and other Saltbush species (Atriplex spp.). It is identified by alkali-tolerant species located within and adjacent to sinks and alkali flats. Adjacent to these saline soils on somewhat better drained soils, All-Scale (Atriplex polycarpa), is the dominant species. Located within highly saline soils are Iodine Bush (Allenrolfea spp.), Green Molly (Kochia californica), Pickleweed (Salicornia subterminalis), Saltgrass (Distichlis spicata), Barley (Hordeum depressum) and Dropseed (Sporobolus airoides). Associates include Greasewood (Sarcobatus vermiculatus), various Sagebrush species (Artemisia spp.), Creosote (Larrea divaricata) and grasses.

Herbaceous

HG Annual Grass - Forb Series

Annual grasslands form a ring around the Central Valley generally between urban/agricultural developments and the foothill woodlands. Dominant species in this Series include Needlegrass (*Stipa* spp.), Cheatgrass (*Bromus* spp.), Owl's Clover (*Orthocarpus purpurascens*), Filaree (*Erodium* spp.), Wild Oats (*Avena* spp.) and Fiddleneck (*Amsinckia douglasiana*). Annual grasses extend from Redding to Bakersfield throughout the Central Valley. Vernal pools (small depressions often containing hard pan soil layers) occur throughout the Annual Grass - Forb Series. Species within these vernal pools include Downingia (*Downingia cuspidata*), Meadowfoam (*Limnanthes douglasii*), Goldfields (*Lasthenia chrysostoma*), Water Starwort (*Callitriche marginata*), Popcorn Flower (*Plagiobothrys* spp.), Johnny-Tuck (*Orthocarpus erianthus*), Bur Medic (*Medicago hispida*) and Linanthus (*Linthus* spp.).

HM Perennial Grass Series

This Series is dominated by Saltgrass (*Distichlis spicata*) and occurs on alkaline and saline soils within the Central Valley. Its major distribution is from Kern County to Lassen County. Saltgrass may occur in pure stands excluding other species or may contain alkali tolerant species such as Iodine Bush (*Allenrolfea occidentalis*), Pickleweed (*Salicornia subterminalis*), Barley (*Hordeum depressum*) and Dropseed (*Sporobolus airoides*). Saltgrass is indicative of alkali sinks, which may contain a lime-carbonate substrate and usually have impervious hardpans.

HT Cattail - Sedge Series

Within the Central Valley, generally around San Francisco Bay, Tule marshes occur adjacent to brackish waters. Dominant species include Tule (*Scirpus* spp.), Cattail (*Typha* spp.), Lythrum (*Lythrum hyssopifolia*) and Spike Rush (*Heleocharis palustris*). A number of other species associate with this Series depending on the geographic area. Past drainage activities have significantly reduced the total area once covered by these species.

North Coast and Montane Ecological Province

Conifer Forest/Woodland

RW Redwood Series

Coast Redwood (*Sequoia sempervirens*) occurs on alluvial flats and colluvial slopes within a narrow coastal strip, generally below 2000 ft (610 m) elevation. Old-growth Redwood groves are mostly contained in National Parks, State Parks, and Nature Conservancy Preserves. Soils within these Redwood groves are often a result of sediment deposition from continuous river flooding. Redwood Sorrel (*Oxalis oregana*) and Western Swordfern (*Polystichum munitum*) are typical understory herbs in undisturbed groves. Other common associates are Pacific Douglas-Fir (*Pseudotsuga menziesii*), Salal (*Gaultheria shallon*), Tanoak (*Lithocarpus densiflorus*), Western Hemlock (*Tsuga heterophylla*), California Hazelnut (*Corylus cornuta* var. *californica*) and California Rose-Bay (*Rhododendron macrophyllum*). The Coast Redwood groves are geographically located in the coastal fog belt and are adjacent to the Sitka Spruce-Grand Fir, Bishop Pine and Annual Grass Series.

RD Redwood - Douglas-Fir Series

This mixture of Redwood (*Sequoia sempervirens*) and Pacific Douglas-Fir (*Pseudotsuga menziesii*) occurs within about 30 miles (48 km) of the coast, usually in protected canyon bottoms up to 2200 ft (670 m) elevation. The longitudinal extent of the Redwood - Douglas-Fir Series is associated with a constant temperature and moisture regime that defines the Redwood fog belt. The eastern limit of this Series is determined by

environments having more variable temperatures, lower humidity, and moisture regimes than Redwood requires for its maintenance. Associated coastal conifers within the Redwood - Douglas-Fir Series include Grand Fir (Abies grandis), Sitka Spruce (Picea sitchensis) and Western Hemlock (Tsuga heterophylla). Port Orford Cedar (Chamaecyparis lawsoniana), a moist site conifer, may also be present. The hardwoods Tanoak (Lithocarpus densiflorus var. densiflorus), Red Alder (Alnus rubra), and Madrone (Arbutus menziesii) are often associated. California Hazelnut (Corylus cornuta var. californica) also occurs as an understory shrub in this Series.

DF Pacific Douglas-Fir Series

Douglas-Fir (Pseudotsuga menziesii) is the dominant overstory conifer over a large area in the western Klamath Mountains and northern to central North Coast Ranges. These stands may be adjacent to the Douglas-Fir - Pine, Douglas-Fir - White Fir, Douglas-Fir - Tanoak and Douglas-Fir - Canyon Live Oak Series and occur in patches throughout the area. Elevations are usually below about 5000 ft (1525 m) in the south area and below about 4500 ft (1372 m) in the northern area. Sugar Pine (Pinus lambertiana) is a common associate. Black Oak (Quercus kelloggii) may often associate with the conifer but usually is not abundant. Any of the following tree species may be sparsely present in this Series: Ponderosa Pine (Pinus ponderosa), White Fir (Abies concolor), Tanoak (Lithocarpus densiflorus var. densiflorus), Canyon Live Oak (Quercus chrysolepis), Oregon White Oak (Quercus garryana), Bigleaf Maple (Acer macrophyllum), California Bay (Umbellifera californica), Giant Chinquapin (Chrysolepis chrysophylla) and Pacific Madrone (Arbutus menziesii). The shrub understory may also be quite diverse, including Huckleberry Oak (Quercus vaccinifolia), Shrub Tanoak (Lithocarpus densiflorus var. echinoides), California Hazelnut (Corylus cornuta var. californica), Poison Oak (Toxicodendron diversilobum), Oceanspray (Holodiscus discolor) and Hairy Honeysuckle (Lonicera hispidula var. vacillans).

DT Douglas-Fir - Tanoak Series

Douglas-Fir (Pseudotsuga menziesii) is very commonly found with an abundant Tanoak (Lithocarpus densiflorus var. densiflorus) overstory and/or understory component on mesic soils in a broad area from Marin County to the Oregon border. Pacific Madrone (Arbutus menziesii) is a conspicuous but scattered member of the Series. The elevational band is below the Mixed Conifer Series to the east and above the Redwood - Douglas-Fir zone to the west, generally occurring from 1000 - 4000 ft (300 - 1220 m). On steep slopes Canyon Live Oak (Quercus chrysolepis) becomes a dominant understory species below scattered Douglas-Fir. In canyon bottoms, Port Orford Cedar (Chamaecyparis lawsoniana) occurs as the primary associate. Black Oak (Q. kelloggii) and Tree Chinquapin (Castanopsis chrysophylla) occur on drier slopes with Sugar Pine (Pinus lambertiana) becoming more prominent on south facing slopes. Within the North Coast forests, a scattered overstory of Douglas-Fir often exists over a continuous Tanoak understory with occasional Madrones. Where Douglas-Fir becomes a closed-crowned overstory, Tanoak may occur in its shrub form (L. d. var. echinoides). Understory shrub species range from California Rose Bay (Rhododendron macrophyllum), Salal (Gaultheria shallon), and California Huckleberry (Vaccinium ovatum) in the west, to California Hazelnut (Corylus cornuta), Pacific Dogwood (Cornus nuttallii), California Honeysuckle (Lonicera hispidula), and Dwarf Oregon Grape (Berberis nervosa) in the east.

DP Douglas-Fir - Pine Series

Douglas-Fir (Pseudotsuga menziesii) shares canopy dominance with Ponderosa Pine (Pinus ponderosa) at elevations between about 2000 - 5500 ft (610 - 1670 m) in drier sites of the Klamath Mountains and North Coast Ranges Sections. Incense Cedar (Calocedrus decurrens), Sugar Pine (Pinus lambertiana) and White Fir (Abies concolor) may occasionally be present as minor elements of the overstory. Pacific Madrone (Arbutus menziesii),

California Black Oak (Quercus kelloggii), Canyon Live Oak (Quercus chrysolepis) and Bigleaf Maple (Acer macrophyllum) are often present in the understory, while Tanoak (Lithocarpus densiflorus var. densiflorus) is usually absent. The Series may grade into the Mixed Conifer - Ponderosa Pine Series in the interior North Coast Ranges as site conditions become more mesic or disturbance factors less significant in the landscape. It is less prominent in the moister, outermost Klamath Mountains area where it intermixes with the Pacific Douglas-Fir Series.

DQ Douglas-Fir - Canyon Live Oak Series

Canyon Live Oak (Quercus chrysolepis) usually becomes more prominent on steeper slopes, drier sites or sites with rocky or shallow soils within the range of Douglas-Fir (Pseudotsuga menziesii) to an elevation of about 4600 ft (1400 m). The Series occurs in small and widely scattered areas of the North Coast Ranges such as near Lake Pillsbury. It is less common in the southwestern Klamath Mountains but is sometimes found in the Mad and Trinity River watersheds. Typical minor associated conifer species include Ponderosa Pine (Pinus ponderosa) and Sugar Pine (P. lambertiana). Shrub Interior Live Oak (Quercus wisizenii var. frutescens), and shrubs of the low- to mid-elevation ranges such as Deerbrush (Ceanothus integerrimus), Greenleaf Manzanita (Arctostaphylos patula), Redbud (Cercis occidentalis), Poison Oak (Toxicodendron diversilobum), Hairy Honeysuckle (Lonicera hispidula var. vacillans), and Whiteleaf Manzanita (A. viscida) often occur. Madrone (Arbutus menziesii) may be an occasional hardwood associate, as may Black Oak (Quercus kelloggii) on better sites. Tanoak (Lithocarpus densiflorus) may become an associate in far western regions on northwest to northeast-facing aspects, indicating better site conditions. The Series intergrades with the Douglas-Fir dominated series, Mixed Conifer - Pine Series and with the Canyon Live Oak Series.

MF Mixed Conifer - Fir Series

White Fir (Abies concolor) forms an important but not dominant part of the the overstory canopy in this Series at elevations between about 4000 - 7000 ft (1220 - 2135 m). The Series grades imperceptibly into the Douglas-Fir - White Fir, Mixed Conifer - Pine and Ultramafic Mixed Conifer Series. The lower elevations of this type generally have more conifers common to the Mixed Conifer-Pine Series such as Douglas-Fir (Pseudotsuga menziesii), Ponderosa Pine (Pinus ponderosa) and Sugar Pine (Pinus lambertiana). White Fir gradually replaces Ponderosa Pine in abundance in this mixture as elevation increases, but Douglas-Fir may remain prominent. Upper elevation mixtures (e.g., those greater than about 5500 ft or 1678 m) often have more abundant Jeffrey Pine (Pinus jeffreyi), Western White Pine (Pinus monticola), Lodgepole Pine (Pinus contorta var. murrayana) and Red Fir (Abies magnifica) components. Incense Cedar (Calocedrus decurrens) may be present to the upper elevations of the series, at least in those areas where weathered ultramafic bedrock occurs such as in the southern Trinity Mountains. Few if any hardwoods occur, although Canyon Live Oak (Quercus chrysolepis) may be present at the lowest elevations. Pinemat Manzanita (Arctostaphylos nevadensis), Mahala Mat (Ceanothus prostratus) and Huckleberry Oak (Quercus vaccinifolia) are typical shrubs in this type. The Series occurs adjacent to and below the White Fir Series in the Yolla Bolly Mountains and elsewhere.

WF White Fir Series

Sites dominated by White Fir (Abies concolor) in the conifer overstory and understory occurs broadly in the Klamath Mountains Section. Elevations are usually below 7000 ft (170 m). The Series occupies a narrow elevational band below the Red Fir Series and above the Mixed Conifer - True Fir Series. Ponderosa Pine (Pinus ponderosa) and Red Fir (Abies magnifica) may be common associates at lower and upper elevations of this zone, respectively. Understory shrubs and hardwoods are uncommon due to the density of these stands. However, Sadler Oak (Quercus sadleriana) and Tree Chinquapin (Castoanopsis chrysophylla)

may occur in the extreme western areas of this region. Shrubs of the Montane Mixed Shrub Series may occasionally be present in forest openings, including Huckleberry Oak (Quercus vaccinifolia), Pinemat Manzanita (Arctostaphylos nevadensis), Bush Chinquapin (Castanopsis sempervirens), Greenleaf Manzanita (Arctostaphylos patula) and Bitter Cherry (Prunus emarginata). Shade tolerant shrubs such as Serviceberry (Amelanchier spp.), Snowberry (Symphoricarpus mollis) and Sticky Currant (Ribes viscosissimum) occur under denser canopy.

JP Jeffrey Pine Series

Jeffrey Pine (Pinus jeffreyi) is adapted to a variety of dry, nutrient-poor habitats in the North Coast and Montane region. The Series identifies stands dominated by this pine, but a variety of other species will occur depending on substate, elevation and climate. Stunted Jeffrey Pine stands are found at low to middle elevations (usually below 5000 ft (1525 m)) on strongly serpentinized peridotite sites in the outer Klamath Mountains such as in the Smith River area. This mixture often includes scattered Douglas-Fir (Pseudotsuga menziesii), Ponderosa Pine (Pinus ponderosa), Incense Cedar (Calocedrus decurrens), Sugar Pine (Pinus lambertiana), Lodgepole Pine (Pinus contorta var. murrayana) or Western White Pine (Pinus monticola) with few if any hardwood species. Associated shrubs on serpentinized substrates include Shrub Canyon Live Oak (Quercus chrysolepis var. nana), Wedgeleaf Ceanothus (Ceanothus cuneatus), serpentine Macroneuma (Happolpappus orphitidis) and Huckleberry Oak (Quercus vaccinifolia). Where the species become more mixed, this Series grades into the Mixed Ultramafic Conifer Series. The Series has also been identified further inland in ultramafic areas of the Rattlesnake Creek, Upper Scott Mountains, Trinity Alps and Eastern Klamath Mountains Subsections of the Klamath Mountains Section at elevations up to about 7000 ft (2170 m). These open sites also have a variety of montane conifers, including White Fir (Abies concolor). Shrubs such as the above and Pinemat Manzanita (Arctostaphylos nevadensis) may occur. In addition, relatively high-elevation Jeffrey Pine areas occur in small open stands in non-serpentinized areas of the North Coast Ranges such as in the Yolla Bolly Mountains. They are usually found above 5000 ft (1525 m) in these upper montane areas in association with trees such as Sugar Pine and White Fir and the shrubs Pinemat Manzanita and Huckleberry Oak.

RF Red Fir Series

Red and Shasta Fir (Abies magnifica var. magnifica and var. shastensis) sites occur in nearly pure stands at elevations above about 4400 ft (1342 m) in the higher montane areas of the Klamath Mountains and Northern California Coast Ranges Sections. Higher elevation conifers such as Mountain Hemlock (Tsuga mertensiana), Brewer Spruce (Picea breweriana), Western White Pine (Pinus monticola) and Whitebark Pine (Pinus albicaulis) may be found in association with Red Fir above 7000 ft (2170 m). At lower elevations, Red Fir mixes more with White Fir. Red Fir hybridizes and associates with Noble Fir (Abies procera) in the Siskiyou and Klamath Mtns. Understory shrub species in this Series include Huckleberry Oak (Quercus vaccinifolia), Bush Chinquapin (Castanopsis sempervirens) and Snowberry (Symphoricarpus mollis). Moist locations have more Mountain Maple (Acer glabrum) and Dogwood (Cornus spp.) but shrubs, especially in dense Red Fir stands, rarely occur in this Series. Pinemat Manzanita (Arctostaphylos nevadensis), Greenleaf Manzanita (Arctostaphylos patula), Snowbrush (Ceanothus velutinus), and Sadler Oak (Quercus sadleriana) may be present on more open sites, especially toward the northwest.

FP Foxtail Pine Series

Foxtail Pine (Pinus balfouriana var. austrina) forms almost pure open stands on higher elevation serpentine soils in Trinity County and southern Siskiyou County of the Klamath Mountains Section. On these slopes, Western White Pine (P. monticola) is a common associate with an occasional Red Fir (Abies magnifica) and Jeffrey Pine (P. jeffreyi).

Understory species on these serpentine soils include Pinemat Manzanita (Arctostaphylos nevadensis), Huckleberry Oak (Quercus vaccinifolia), and numerous forbs. Elevation range is about 7000 - 8500 ft (2134 - 2590 m). The Series also is represented by this small stature pine in the northern Northern Coast Ranges Section on sandstone, metavolcanic and schist parent materials in similar elevation ranges. Hardwood and shrub understory species are usually infrequent.

MH Mountain Hemlock Series

Mountain Hemlock (Tsuga mertensiana) becomes a dominant conifer of subalpine areas and those at or just below timberline in limited areas of the Trinity Alps (this region) and on Mt. Shasta (North Interior Ecological Province). The Series is often found on steep, north-facing, concave slopes that retain late-lasting snow. Its elevation range is near 6500 - 8500 ft (1982 - 2592 m). The most common associates are Huckleberry Oak (Quercus vaccinifolia), Mountain Heather (Phyllodoce empetriformis), and Bush Chinquapin (Castanopsis sempervirens) with Thinleaf Huckleberry (Vaccinium membranaceum) at the lower sites. Mountain Hemlock mixes with Red Fir (Abies magnifica) on warmer sites and is often identified in the Subalpine Conifer Series.

EA Engelmann Spruce - Subalpine Fir Series

This Series identifies one of the common Rocky Mountain conifers, Engelmann Spruce (Picea engelmannii). In this region, it occurs only in the Salmon, Scott and Pit River watersheds. Subalpine Fir (Abies lasiocarpa), its usual associate further east, accompanies it in streamside terraces and moist slopes near Russian Peak in the Marble Mountains. This Series often is adjacent to Red Fir (A. magnifica), Mountain Hemlock (Tsuga mertensiana), and Western White Pine (Pinus monticola) stands.

PO Port Orford Cedar Series

Port Orford Cedar (Chamaecyparis lawsoniana) is an endemic of the Klamath Mountains of California and Oregon. It is often found on ultramafic soils, especially those derived from serpentinite or periodotite and in mixed conifer-hardwood stands. The highest elevations of Port Orford Cedar occurrences in the area are about 5200 ft (1586 m) in the Siskiyou Mountains. At these altitudes, it associates with White Fir (Abies concolor), Western White Pine (Pinus monticola), Huckleberry Oak (Quercus vaccinifolia) and Pinemat Manzanita (Arctostaphylos nevadensis). At lower elevations (below about 3000 ft or 915 m), Tanoak (Lithocarpus densiflorus), Douglas-Fir (Pseudotsuga menziesii), Pacific Yew (Taxus brevifolia), California Rose-Bay (Rhododendron macrophyllum) and Salal (Gaultheria shallon) often are present in this Series. Middle elevations of the range of this Series may have Incense Cedar (Calocecdrus decurrens), White Alder (Alnus rhombifolia), Western Azalea (Rhododendron occidentale) or species of Huckleberry (Vaccinium spp.) present.

LP Lodgepole Pine Series

Lodgepole Pine (Pinus contorta var. murrayana) occurs in isolated pure stands or as an occasional associate in the Marble Mountains and the eastern Siskiyou and elsewhere in the Klamath Mountains Section. These elevations are in the range 4500 - 8000 ft (1395 - 2480 m). Pine is often confined to gentle slopes, in areas of waterlogged soils, or high water tables near meadows and occasionally will occur in basin sites that permit cold-air pockets to accumulate. In contrast to the Rocky Mountain variety (P. c. var. latifolia), this pine is not associated with fire disturbances. Lodgepole Pine often associates with Red and Shasta Red Fir (Abies magnifica var. magnifica and var. shastensis) at its upper limits and White Fir (Abies concolor) at its lower elevations. Western Serviceberry (Amelanchier pallida) or Bitterbrush (Purshia tridentata) may occasionally be found in forest openings.

PB Brewer Spruce Series

The Brewer Spruce (*Picea breweriana*) Series occurs in areas with low fire incidence, usually north facing slopes, cold air basins, or rocky ridges. It can occur in small, dense stands within the Siskiyou, Marble and Salmon Mountains and the Trinity Alps of the Klamath Mountains Section. Brewer Spruce grows on a variety of substrates including ultrabasics. Elevations are in the range 4600-7500 ft (1400 - 2288 m). Red Fir (*Abies magnifica*), Noble Fir (*A. procera*), and especially White Fir (*A. concolor*) occur in this Series. In the Russian Peak area, Brewer Spruce occurs in an extensive stand associated with Red Fir, Huckleberry Oak (*Quercus vaccinifolia*) and Twin Flower (*Linnaea borealis*).

MP Mixed Conifer - Pine Series

No one conifer dominates the overstory of this extensively occurring mixed conifer series. It occurs on non-serpentinized or slightly serpentinized soils at elevations between about 4000 - 6000 ft (1220 - 1830 m) in the North Coast and Montane region. Ponderosa Pine (*Pinus ponderosa*) and/or Sugar Pine (*Pinus lambertiana*) are prominent in this mixture. Douglas-Fir (*Pseudotsuga menziesii*) often occurs and may be an important component of the mixture in some areas of the west. Incense Cedar (*Calocedrus decurrens*) is a common associate and White Fir (*Abies concolor*) occurs less commonly. California Black Oak (*Quercus kelloggii*) and the shrub Greenleaf Manzanita (*Arctostaphylos patula*) typically associate on better sites, while Oregon White Oak (*Quercus garryana*), Canyon Live Oak (*Quercus chrysolepis*) and the shrub Whiteleaf Manzanita (*Arctostaphylos viscida*) often occur on harsher sites. Other shrub associates include Poison Oak (*Toxicodendron diversiloba*), Western Redbud (*Cercis occidentalis*), Mountain Whitethorn (*Ceanothus cordulatus*) and California Honeysuckle (*Lonicera hispidula*).

KP Knobcone Pine Series

Knobcone Pine (*Pinus attenuata*) forms pure and often even-aged dense stands in burned or nutrient-poor areas of low to moderate elevations in the North Coast and Montane region. The Series is usually found below 4800 ft (1464 m) within chaparral, or lower coniferous areas, but may occur above 5000 ft (1525 m) in the eastern regions. Knobcone Pine may also be found on ultramafic or other infertile or dry soils. In these areas, it is associated with California Black Oak (*Quercus kelloggii*), Pacific Madrone (*Arbutus menziesii*) and shrubs such as Shrub Interior Live Oak (*Quercus wislizenii* var. *frutescens*), Greenleaf Manzanita (*Arctostaphylos patula*), Shrub Canyon Live Oak (*Quercus chrysolepis* var. *nana*), and Poison Oak (*Toxicodendron diversilobum*). Associates in the outer Klamath Ranges in Knobcone Pine stands include Tanoak as a tree (*Lithocarpus densiflorus* var. *densiflorus*) or shrub (*L. d.* var. *echinoides*), and Douglas-Fir (*Pseudotsuga menziesii*).

PP Ponderosa Pine Series

Pure to nearly pure Ponderosa Pine (*Pinus ponderosa*) stands occur in a narrow elevational band below the Mixed Conifer - Ponderosa Pine and above the Northern Mixed Chaparral Series of this region. The Douglas-Fir - Ponderosa Pine Series may also be in the same vicinity as this one. Ponderosa Pine may become a dominant conifer on well-drained, often droughty, non-serpentinized soils, such as coarse-textured alluvial sites and southwest-facing or steep slopes. This Series is more common in the North Coast Ranges at elevations of 2500 - 5200 ft (762 - 1586 m). The many minor associates in these open stands include Tanoak (*Lithocarpus densiflorus* var. *densiflorus*) and Pacific Madrone (*Arbutus menziesii*) in the northern area and California Black Oak (*Quercus kelloggii*), Canyon Live Oak (*Quercus chrysolepis*), Douglas-Fir (*Pseudotsuga menziesii*) and White Fir (*Abies concolor*) in various regions. Whiteleaf Manzanita (*Arctostaphylos viscida*) and annual grasses such as *Bromus* spp. may associate with it on alluvial soils. Jeffrey Pine (*Pinus jeffreyi*) appears to hybridize

with Ponderosa Pine in areas of weakly or moderately serpentized rock where the two species co-mingle.

MS Sargent Cypress Series

Sargent Cypress (Cupressus sargentii) is the most widespread Cypress in California, historically occurring in numerous scattered groves along creeks and ravines, slopes and ridges from Mendocino to Santa Barbara Counties up to an elevation of about 3300 ft (1000 m). In the North Coast Section, it is often associated with stream locations. The Series may be associated with individuals of California Bay (Umbellularia californica), McNab Cypress (C. macnabiana), Gray Pine (Pinus sabiniana), Knobcone Pine (P. attenuata), Oregon White Oak (Q. garryana) and Interior Live Oak (Q. wislizenii), common chaparral shrubs such as Coffeeberry (Rhamnus californica) and Deerbrush (Ceanothus integerrimus) and numerous others on these sites. In burned areas, this Cypress may form dense thickets.

MN McNab Cypress Series

McNab Cypress (Cupressus macnabiana) occurs mainly in the Northern California Coast Ranges Section of this region as well as in the Southern Cascades Section and the foothills of the Northern Sierra Nevada up an elevation of about 2800 ft (850 m). In the North Coast Ranges it is usually found growing in numerous scattered groves in upper slope positions. These sites often are derived from non-granitic substrates, such as shallow ultrabasics. On xeric sites, McNab Cypress tends to associate in small groves with Gray Pine (Pinus sabiniana), Jeffrey Pine (P. jeffreyi), and Knobcone Pine (P. attenuata), as well as Leather Oak (Quercus durata), Oregon White Oak (Q. garryana), and Interior Live Oak (Q. wislizenii). This Cypress also occurs with many chaparral species, including Whiteleaf Manzanita (Arctostaphylos viscida) and Chamise (Adenostoma fasciculatum).

MY Pygmy (Mendocino) Cypress Series

Pygmy Cypress (Cupressus goveniana var. pigmaea) is mostly confined to a marine terrace between Albion and Fort Bragg in Mendocino County and scattered stands south to the central Sonoma County coast. It occurs up to an elevation of about 1650 ft (500 m). This dwarf Cypress is confined to poorly-drained acid soils derived from sandstones and which are often underlain by an iron hardpan. Bolander Pine (Pinus contorta var. bolanderi), Bishop Pine (P. muricata) and ericaceous shrubs such as Salal (Gaultheria shallon), Coast Labrador Tea (Ledum glandulosum spp. columbianum), and Hairy and Glossy-leaf Manzanita (Arctostaphylos columbiana, A. nummularia) are common associates of this Series.

MO Baker (Modoc) Cypress Series

Isolated groves of Baker or Modoc Cypress (Cupressus bakeri) exist in the Klamath Mountains Section of this area in addition to those in the Southern Cascades and (northern) Sierra Nevada Sections in an elevation band of about 3600 - 5900 ft (1100 - 1800 m). The Siskiyou Cypress subspecies (C. b. ssp. matthewsii) occurs in the western areas and is generally limited to volcanic flow outcrops or serpentinitic sites. It is associated with the Ponderosa Pine Series.

GF Grand Fir Series

This is the southern counterpart of the Grand Fir - Sitka Spruce Series. It occurs below 2300 ft (700 m) adjacent to the coast on shallow soils in Sonoma and Mendocino Counties north of the Russian River. Grand Fir (Abies grandis) is often geographically associated with the Redwood - Douglas-fir, Douglas-Fir - Tanoak and Bishop Pine Series. This species produces hybrids with White Fir (A. concolor) in the northeastern North Coast Ranges and northwestern Klamath Mountains Sections but is usually geographically separated.

Associated hardwoods and conifers in the Grand Fir Series include Red Alder (*Alnus rubra*), Sitka Spruce (*Picea sitchensis*), Western Hemlock (*Tsuga heterophylla*), Douglas-fir (*Pseudotsuga menziesii*), Bishop Pine (*Pinus muricata*), Tanoak (*Lithocarpus densiflorus*), and Redwood (*Sequoia sempervirens*).

SG Sitka Spruce - Grand Fir Series

This Series of mixed conifers occurs where Sitka Spruce (*Picea sitchensis*), Grand Fir (*Abies grandis*) and Douglas-Fir (*Pseudotsuga menziesii*) occur in the same coastal areas of California. These species will occur adjacent to Redwood (*Sequoia sempervirens*) groves where coastal salt spray depositions preclude vigorous Redwood growth. They intermingle within ten miles (16 km) of the coast in Humboldt and Del Norte Counties. Grand Fir continues as a single dominant conifer in the Grand Fir Series in Mendocino and Sonoma counties to the south. This aggregate of conifer species usually occurs on coastal terraces, alluvial soils, or sandy benches adjacent to streams. The Sitka Spruce - Grand Fir Series intergrades with the Western Hemlock Series. Associated riparian hardwoods include Black Cottonwood (*Populus trichocarpa*), Bigleaf Maple (*Acer macrophyllum*) and Red Alder (*Alnus rubra*). Trillium (*Trillium ovatum*) and Salal (*Gaultheria shallon*) also are common.

PM Bishop Pine Series

Bishop Pine (*Pinus muricata*) occurs discontinuously along the coast from Humboldt County south to San Francisco at elevations below about 980 ft (300 m). It is abundant in Mendocino and Sonoma Counties. Stands also exist in San Luis Obispo and Santa Barbara Counties and the Channel Islands. This Series indicates the species dominance and commonly occurs on shallow, acidic or often poorly drained soils. Very dense, even-aged stands may follow fires after the release of seeds in this closed-cone pine. Understory herbaceous species such as Bracken Fern (*Pteridium aquilinum*) and Sword Fern (*Polystichum munitum*) and shrubs such as Coffeeberry (*Rhamnus californica*) and California Huckleberry (*Vaccinium ovatum*) are common in the Series. Associated trees in the North Coast and Montane region include Douglas-Fir (*Pseudotsuga menziesii*), Bolander Pine (*P. contorta* ssp. *bolanderi*), Pygmy Cypress (*Cupressus goveniana* ssp. *pigmaea*), Madrone (*Arbutus menziesii*), Beach Pine (*P. contorta* ssp. *contorta*) and Redwood (*Sequoia sempervirens*).

WJ Western Juniper Series

Areas in which Western Juniper (*Juniperus occidentalis* var. *occidentalis*) is dominant in the Northern Coast and Montane region occur sparsely in the northeastern Klamath Mountains Section. As its main distribution is within the North Interior zone, this Series is limited to Siskiyou County with a small occurrence in the southern Yolla Bolla Mountains. Mountain Mahogany (*Cercocarpus* spp.) is an occasional associate. Associated shrubs include Bitterbrush (*Purshia tridentata*), Rabbitbrush (*Chrysothamnus* spp.), Wedgeleaf Ceanothus (*Ceanothus cuneatus*), and Serviceberry (*Amelanchier* spp.).

PD Gray Pine Series

Gray Pine (*Pinus sabiniana*) reaches its northernmost distribution in the Klamath Mountains and southern Cascades Mountain Sections of California. It is more commonly found on the eastern edges of the outer North Coast Ranges in this region up to an elevation of about 4200 ft (1280 m) in steep, drier canyons or low-elevation foothills. Stands where it is the dominant emergent conifer are typically diverse and very open, with a mixture of hardwoods such as Blue Oak (*Quercus douglasii*), Oregon White Oak (*Quercus garryana* var. *garryana*), Canyon Live Oak (*Quercus chrysolepis*), Pacific Madrone (*Arbutus menziesii*) and low-elevation chaparral shrubs such as Whiteleaf and Common Manzanita (*Arctostaphylos viscida*, *A. manzanita*) in addition to Wedgeleaf Ceanothus (*Ceanothus cuneatus*). Annual

grasslands are sometimes found adjacent to Gray Pine stands. This Series is often associated with ultramafic soils such as in the South Fork of the Salmon River where Jeffrey Pine (*P. jeffreyi*), and Leather Oak (*Q. durata*) may also be present.

DW Douglas-Fir - White Fir Series

Upper elevations of the Douglas-Fir (*Pseudotsuga menziesii*) distribution often contain abundant but not dominant White Fir (*Abies concolor*) in the upper canopy, but not enough species diversity to support a mixed conifer type. The Series in which both conifers dominant the conifer overstory is generally found between about 2500 - 5400 ft (760 - 1645 m) in the North Coast and Klamath Mountains Sections. Sugar Pine (*P. lambertiana*) is often present in minor amounts and Tree Chinquapin (*Castanopsis chrysophylla*) and Bigleaf Maple (*Acer macrophyllum*) are often understory hardwoods. Shrub or Tree Tanoak (*Lithocarpus densiflorus* var. *echinoides* or var. *densiflorus*) may be present in the western areas along with Sadler Oak (*Q. sadleriana*). The shrubs California Hazelnut (*Corylus cornuta* var. *californica*) and Pacific Dogwood (*Cornus nuttallii*) are often present as well as an occasional Black or Canyon Live Oak (*Quercus kelloggii*, *Q. chrysolepis*) in this Series. The type grades into the Douglas-Fir, Mixed Conifer - Pine and White Fir Series.

MK Klamath Mixed Conifer Series

Local stands with an especially diverse mixture of conifer species occur in the Siskiyou, Salmon, Marble, Trinity and Scott Mountains of the Klamath Mountains Section. Elevations of this Series are in the range of about 4900 - 7200 ft (1500 - 2200 m). High moisture factors coupled with high topographic relief and a variety of rock and soil types provide conditions for the maintenance of disjunct species in one general area. These include conifers with their primary distribution along the coast or northward in the Cascades such as Alaska Yellow Cedar, Noble Fir and Pacific Silver Fir (*Chamaecyparis nootkatensis*, *Abies procera*, *A. amabilis*), Engelmann Spruce and Subalpine Fir in the northern and central Rocky Mountains (*Picea engelmannii*, *Abies lasiocarpa*) and those in the Sierra Nevada region such as Mountain Hemlock and Foxtail Pine (*Tsuga mertensiana*, *Pinus balfouriana*). Species endemic to this general area of California include Brewer Spruce (*Picea breweriana*) and Port Orford Cedar (*Chamaecyparis lawsoniana*). Douglas-Fir (*Pseudotsuga menziesii*), White Fir (*Abies concolor*), Jeffrey Pine (*Pinus jeffreyi*), Western White Pine (*P. monticola*), Incense Cedar (*Calocedrus decurrens*), Sugar Pine (*P. lambertiana*), Ponderosa Pine (*P. ponderosa*) and Red Fir (*Abies magnifica*) also occur commonly in this Series. Understory shrubs and herbs are usually well developed on moist sites, including Huckleberry Oak (*Quercus vaccinifolia*), Greenleaf Manzanita (*Arctostaphylos patula*), Mahala Mat (*Ceanothus prostratus*), Pinemat Manzanita (*Arctostaphylos nevadensis*), Currant (*Ribes* spp.) and Barberry (*Berberis* spp.). Many grasses and forbs occur in the understory as well.

MU Ultramafic Mixed Conifer Series

Low to moderate elevations in ultramafic and serpentized areas in the western Klamath Mountains, Northern California Coast and Northern California Coast Ranges Sections often produce soils low in essential minerals such as calcium and potassium or have excessive accumulations of heavy metals such as nickel and chromium. These sites vary widely in the degree of serpentization and effects on their overlying plant communities. Small stunted Western White Pine (*Pinus monticola*), Lodgepole Pine (*Pinus contorta* ssp. *murrayana*) and Jeffrey Pine (*Pinus jeffreyi*) occur in combinations or in nearly pure open stands on Trinity ophiolite areas of the Upper and Lower Scott Mountains and Eastern Klamath Mtns. Subsections, especially on the less-weathered Josephine ophiolite of the Gasquet Mtns. Ultramafic Subsection and elsewhere in the Klamath Mountains Section. Other common tree associates on ultramafics include Douglas-Fir (*Pseudotsuga menziesii*), Sugar Pine (*Pinus lambertiana*), Incense Cedar (*Calocedrus decurrens*) and Port Orford Cedar (*Chamaecyparis lawsoniana*). Hardwoods are often sparse, but Pacific Madrone (*Arbutus*

menziesii) and California Bay (Umbellularia californica) may also occupy these sites, in addition to more abundant shrubs such as Pinemat and Whiteleaf Manzanita (Arctostaphylos nevadensis, A. viscida), the shrubs Huckleberry and Brewer Oak (Quercus vaccinifolia, Q. garrayana var. breweri), California Coffeeberry (Rhamnus californica), Shrub Tanoak (Lithocarpus densiflorus var. echinoides), Western Azalea (Rhododendron occidentale), Boxleaf Silktassel (Garrya buxifolia) and Siskiyou Mat (Ceanothus pumilus).

SA Subalpine Conifer Series

A mixture of conifers may be found at the higher elevations, commonly above 6500 ft (1982 m) in the general region. No single species is dominant. These occur in the Trinity Alps and Upper Scott Mountains Subsections of the Klamath Mountains Section. Combinations of Mountain Hemlock (Tsuga mertensiana), Foxtail Pine (Pinus balfouriana), Red or Shasta Fir (Abies magnifica var. magnifica and var. shastensis), Western White Pine (Pinus monticola), Lodgepole Pine (Pinus contorta var. murrayana) and Whitebark Pine (Pinus albicaulis) are in the conifer mixture. Stands are often open with shrub associates such as Pinemat Manzanita (Arctostaphylos nevadensis), Huckleberry Oak (Quercus vaccinifolia), Curleaf Mtn. Mahogany (Cercocarpus ledifolius) in the east and Bush Chinquapin (Castanopsis sempervirens) on the drier sites. Mesic sites have more Mountain Maple (Acer glabrum) and Thinleaf Huckleberry (Vaccinium membranaceum) at the lower elevations.

WB Whitebark Pine Series

In this region, Whitebark Pine (Pinus albicaulis) becomes the primary frostline (upper timberline) conifer of exposed, often northerly ridges near 7800 - 9000 ft (2380 - 2745 m). These areas occur in the Trinity Alps, Marble Mtns., Scott Mtns., China Mtns., and the Eddies on usually very open rocky sites having little other Vegetation Composition. Red Fir (Abies magnifica) and Jeffrey Pine (Pinus jeffreyi) may occasionally be found at the lower elevations of this type. The series grades into the Subalpine Conifer Series where greater species diversity exists.

WW Western White Pine Series

The Series in which Western White Pine (Pinus monticola) becomes dominant is often found on rocky, south-facing upper montane elevations near 6000 - 7000 ft (1830 - 2135 m) in the Trinity Alps. Pinemat Manzanita (Arctostaphylos nevadensis) is a common shrub associate. This pine also occurs sparsely at lower elevations (vicinity of 4500 ft or 1372 m and above) on ultramafic soils, but tends to be less dominant and mixed with species such as Jeffrey Pine (P. jeffreyi), White Fir (Abies concolor) and Incense Cedar (Calocedrus decurrens).

EP Eastside Pine Series

The Eastside Pine Series is dominated by Ponderosa Pine (Pinus ponderosa) or occasionally by Jeffrey Pine (P. jeffreyi). It occurs sparsely in the eastern edges of the Klamath Mountains Section, having its main distribution in the Southern Cascades Section. Precipitation is usually low and Great Basin species commonly occur, especially in the northern areas of volcanic extrusives. Undergrowth varies depending on site conditions, but typically may include one or more of the following shrubs: Basin Sagebrush (Artemisia tridentata), Bitterbrush (Purshia tridentata), Manzanita (Arctostaphylos spp.), Ceanothus spp., Rabbitbrush (Chrysothamnus spp.), Curleaf Mountain Mahogany (Cercocarpus ledifolius) and Snowberry (Symphoricarpos spp.). Western Juniper (Juniperus occidentalis) may form an understory.

PW Ponderosa Pine - White Fir Series

Middle montane elevations (4000 - 6000 ft or 1220 - 1830 m) of the Southern Cascades Section (North Interior Ecological Province) often have sites in which Ponderosa Pine (*Pinus ponderosa*) and White Fir (*Abies concolor*) become the two dominant conifers. Some of these areas occur in the eastern Klamath Mountains Section, but sparsely. These sites were usually pine-dominated in the past but White Fir is regenerating well due to relatively recent management practices. This Series intergrades with the Mixed Conifer - Pine and Ponderosa Pine Series. The landscape is often of gentle gradient and slope aspects typically are south facing or west facing. Other conifers commonly associated at low canopy cover values include Incense Cedar (*Calocedrus decurrens*), Pacific Douglas-Fir (*Pseudotsuga menziesii*), Sugar Pine (*Pinus lambertiana*) and Red or Shasta Fir (*Abies magnifica*). California Black Oak (*Quercus kelloggii*) is an occasional hardwood associate. Shrubs are generally sparse due to dense canopy closure; Greenleaf Manzanita (*Arctostaphylos patula*), Western Serviceberry (*Amelanchier pallida*), Snowbrush (*Ceanothus velutinus*), Bloomer Goldenbush (*Happlopappus bloomeri*) and Creeping Snowberry (*Symphoricarpus mollis*) occasionally occur.

Hardwood Forest/Woodland

QR Red Alder Series

Seasonally flooded or permanently saturated soils may develop stands dominated by Red Alder (*Alnus rubra*) in alluvial or upland positions of the western Klamath Mountains region. The Series occurs in dense stands on mesic slopes in Humboldt and Del Norte Counties within fifteen miles (24km) of the coast. It is found mainly in the Smith, Trinity and Klamath River watersheds to an elevation of about 3000 ft (915 m). Temporary Red Alder stands may also occur after low-elevation logging operations in Douglas-Fir (*Pseudotsuga menziesii*) or Redwood (*Sequoia sempervirens*) sites. These pure stands are intermingled with the Redwood - Douglas-Fir and Sitka Spruce - Grand Fir Series. Trees such as Bigleaf Maple (*Acer macrophyllum*) and Oregon Ash (*Fraxinus latifolia*) are often present. Shrubs and non-woody species such as Chain Fern (*Woodwardia fimbriata*), Spikenard (*Aralia californica*), Western Burning Bush (*Euonymus occidentalis*), American Dogwood (*Cornus sericea*) and Vine Maple (*Acer circinatum*) are occasionally also found. White Alder (*Alnus rhombifolia*) mixes with or replaces Red Alder at inland sites.

QT Tanoak Series

The Tanoak Series is an association of Tanoak (*Lithocarpus densiflorus*) and Madrone (*Arbutus menziesii*) occurring separately or in combination. It occurs in the North Coast and Montane zone at elevations from about 500 - 3600 ft (152 - 1098 m) where soils and climate are sufficiently but not excessively moist. Tanoak forms extensive, nearly pure closed-crown hardwood forests in the western, moister regions of the Klamath Mountains up to an elevation of about 2000 ft (915 m). Madrone becomes dominant in eastern and higher regions up to an elevation of 3600 ft (1098 m) or more. This type is adjacent to the Douglas-Fir and Douglas-Fir - Tanoak Series in the west and the Mixed Conifer - Pine Series in the eastern areas. Canyon Live Oak (*Quercus chrysolepis*) is a common hardwood associate. Douglas-Fir (*Pseudotsuga menziesii*) and Pacific Madrone (*Arbutus menziesii*) are commonly associated and Tree Chinquapin (*Chrysolepis chrysophylla*) may occur at higher elevations. Other trees and shrubs that are often present in this widely-spread Series include Canyon Live Oak (*Quercus chrysolepis*), Pacific Dogwood (*Cornus nuttallii*), Bigleaf Maple (*Acer macrophyllum*), California Black Oak (*Quercus kelloggii*), California Bay (*Umbellularia californica*), Red Alder (*Alnus rubra*), Port Orford Cedar (*Chamaecyparis lawsoniana*), and Sugar Pine (*Pinus lambertiana*). The rich shrub layer on these sites may include Salal (*Gaultheria shallon*), Poison Oak (*Toxicodendron diversilobum*), California Huckleberry (*Vaccinium ovatum*), California Hazelnut (*Corylus cornuta* var. *californica*),

Rhododendron spp., Huckleberry Oak (Quercus vaccinifolia), Rose (Rosa spp.), Honeysuckle (Lonicera spp.), Creeping Snowberry (Symphoricarpus mollis), Blackberry (Rubus spp.), and Oceanspray (Holodiscus discolor). However, the shrub and herbaceous layers tend to be depauperate due to the dense Tanoak canopy.

QA Coast Live Oak Series

This Series, dominated by Coast Live Oak (Quercus agrifolia), can be found on low elevation dry coastal or mesic inland slopes south of Mendocino County. It usually exists in pure stands and is often adjacent to the Tanoak Series towards the west, where Madrone becomes an associate hardwood species. The Coast Live Oak Series also is found near the Blue Oak (Quercus douglasii) Series west of the Central Valley. It forms a zonal band between Blue Oak on mesic savannas and chaparral species on xeric slopes.

QC Canyon Live Oak Series

Canyon Live Oak (Quercus chrysolepis) may develop relatively pure tree (Q. c. var. chrysolepis) or shrubby (Q. c. var. nana) stands on very steep and rocky montane slopes. Elevations of the Series range up to about 4500 ft (1372 m). Slopes are often south facing or southwest facing. The commonly occurring tree and shrub associates are Shrub Interior Live Oak (Quercus wislizenii var. frutescens), Douglas-Fir (Pseudotsuga menziesii), Pacific Madrone (Arbutus menziesii), Gray Pine (Pinus sabiniana), Birchleaf Mountain Mahogany (Cercocarpus betuloides) as well as other mid-elevation conifers in those associated Series. Tree Chinquapin (Castanopsis chrysophylla) and Tanoak (Lithocarpus densiflorus) may be occasional associates in areas nearest the coast and under more mesic conditions. Canyon Live Oak is widely scattered over this region and often occurs as a dominant understory tree beneath occasional old-growth Douglas-Fir stands and in proximity to the California Black Oak, Oregon White Oak, Mixed Conifer - Pine, Ponderosa Pine, Douglas-Fir, Douglas-Fir - Pine and Douglas-Fir - Tanoak Series. This oak is sometimes found above 5000 ft (1525 m) within the conifer understory.

QM Bigleaf Maple Series

Bigleaf Maple (Acer macrophyllum) is found in limited, moist areas in association with the shrubs Pacific Dogwood (Cornus nuttallii) and California Hazelnut (Corylus cornuta). Boxelder (Acer negundo), White Alder (Alnus rhombifolia) and Black Cottonwood (Populus trichocarpa) are sometimes found in the Bigleaf Maple Series as well. These either well-shaded or riparian areas maintain moisture during the warm season. Elevations are in the low to moderate elevation ranges: below about 5200 ft (1586 m) in the southern regions and below about 4000 ft (1220 m) in the northern Klamath Mountains. The Series may develop on extremely gravelly or rocky soils in high moisture areas.

QK California Black Oak Series

California Black Oak (Quercus kelloggii) occurs extensively but in scattered sites of the North Coast Ranges of this area in an elevation range of about 2000 - 5000 ft (610 - 1525 m). It may develop into relatively pure stands on moderately steep slopes or may associate with Oregon White Oak (Quercus garryana var. garryana) on drier sites. This Series is commonly found within or below the Douglas-Fir, Mixed Conifer - Ponderosa Pine and Ponderosa Pine Series, often as a result of fire or other disturbance, especially in Douglas-Fir areas. Black Oak commonly is a major understory hardwood in these series and typically grows on better soils than those of the Canyon Live Oak Series. Commonly associated vegetation includes Ponderosa Pine (Pinus ponderosa), Douglas-Fir (Pseudotsuga menziesii), various Manzanitas (Arctostaphylos spp.), Poison Oak (Toxicodendron diversilobum), Bigleaf Maple (Acer macrophyllum) and California Buckeye (Aesculus californica) with Canyon Live Oak (Quercus chrysolepis) often present on poorer sites.

QX Black Cottonwood Series

Black Cottonwood (Populus trichocarpa, or P. balsamifera spp. trichocarpa) dominates certain riparian areas in the North Coast Ranges and Klamath Mountains Sections, particularly along the Eel River drainage. Over its broad range in California, it may occur at elevations up to about 9000 ft (2800 m). Being shade intolerant, it requires freshly deposited alluvial materials for its maintenance and stands are often even-aged because of episodic flood events. Tree Willows (Salix spp.), Oregon Ash (Fraxinus latifolia) and Red Alder (Alnus rubra) are often present in this Series. Very old stands may become dominated by shade tolerant coastal conifers such as Sitka Spruce (Picea sitchensis), Grand Fir (Abies grandis) or Western Hemlock (Tsuga heterophylla). Shrubs such as Vine Maple (Acer circinatum), Hawthorn (Crataegus spp.) and herbaceous plants such as Coast Nettle (Urtica californica) may be present as well. Black Cottonwood is replaced by Fremont Cottonwood (P. fremontii) in this region towards the south and east. At higher elevations, Black Cottonwood may be present in association with Quaking Aspen (P. tremuloides) and White Alder (Alnus rhombifolia).

QQ Quaking Aspen Series

Quaking or Trembling Aspen (Populus tremuloides) occurs westward of its Rocky Mountain distribution in relict, scattered stands in this region. Within the Klamath Mountains Section, it may occur in high-elevation riparian or moist upland habitats within the Red Fir, Mountain Hemlock, Whitebark Pine or Subalpine Conifer Series elevation ranges, generally above 6000 ft (1830 m). It is especially prevalent in the Trinity Alps, Marble Mountains and Klamath Mountains. Willow (Salix spp.), Mountain Alder (Alnus tenuifolia), and Lodgepole Pine (Pinus contorta var. murrayana) are common associates. The understory often includes numerous grasses and forbs such as Kentucky Bluegrass (Poa pratensis), Redtop (Agrostis spp.), Timothy (Phleum pratense), Clover (Trifolium spp.), Cinquefoil (Potentilla), and a variety of Sedges (Carex spp.).

QG Oregon White Oak Series

The tree form of Oregon White Oak (Quercus garryana var. garryana) becomes a local canopy dominant in woodlands of the North Coast Ranges from the Oregon border to Marin County. This species readily mixes with Black Oak in this area. It typically occurs at lower montane elevations of 2000 - 4400 ft (610 - 1342 m) and seldom occurs in pure stands, although it may dominate local sites. It often develops on poor, exposed or droughty soils such as in inland valleys, foothills or rocky ridges, but also occurs in poorly drained areas having occasional standing water or next to stream terraces. On better sites, it is usually out-competed by species such as Douglas-Fir (Pseudotsuga menziesii) and California Black Oak (Quercus kelloggii). Other associated species include Canyon Live Oak (Quercus chrysolepis), Wedgeleaf Ceanothus (Ceanothus cuneatus), Whiteleaf Manzanita (Arctostaphylos viscida), Poison Oak (Toxicodendron diversilobum), Western Redbud (Cercis occidentalis) and especially in recently burned areas, Deer Brush (Ceanothus integerrimus). The shrub form, Brewer Oak (Quercus garryana var. breweri), occupies higher elevations on shallow soils (see Brewer Oak Series).

QD Blue Oak Series

Blue Oak (Quercus douglasii) dominates this low elevation hardwood series. It occurs very sparsely in this area, generally below about 2700 ft (820 m). The Series is found on the western slopes of the Central Valley and in Lake, Sonoma, and Napa Counties on rocky and often shallow soils. It grades into the Gray Pine Series at its higher elevations. Other tree and shrub associates include Interior Live Oak (Quercus wislizenii), Oregon White Oak (Quercus garryana), California Black Oak (Quercus kelloggii), annual and perennial grasses and Manzanitas (Arctostaphylos spp.).

QW Interior Live Oak Series

The Interior Live Oak (Quercus wislizenii) Series occurs mainly in southern areas of the Northern California Coast and Klamath Mountains Sections and northern sectors of the Northern California Coast Ranges Section in this region of the state. It is usually found on often shallow or well-drained soils to the north and east of the Coast Live Oak (Quercus agrifolia) distribution. This Series occurs at low elevations in humid areas and in an elevational band adjacent to and above the Blue Oak (Quercus douglasii) Series. Further inland, the species may occur at elevations up to 4600 ft (1400 m). The shrubby form (Q. w. var. frutescens) may also dominate a site in this Series, especially in areas of frequent fires, and may occur up to an elevation of about 6500 ft (1982 m). The Series often contains stringers of Gray Pine (Pinus sabiniana) as well as trees and shrubs such as Canyon Live Oak (Q. chrysolepis), California Buckeye (Aesculus californica), California Bay (Umbellularia californica) and Ponderosa Pine (Pinus ponderosa). Interior Live Oak also associates with many chaparral species, including Birchleaf Mountain Mahogany (Cercocarpus betuloides) and Coffeeberry (Rhamnus californica) and may be adjacent to the Tanoak (Lithocarpus densiflorus) Series in Mendocino County. It is known to hybridize with California Black Oak (Q. kelloggii) and Coast Live Oak (Q. agrifolia). It often indicates xeric or rocky sites when associated with other Series.

QL Valley Oak Series

Valley Oak (Quercus lobata) occurs in scattered occurrences in the foothill woodlands, valleys and floodplains west of the Sacramento River and on gentle, low elevation montane slopes from Marin and Napa Counties to Mendocino County in the Northern Coast and Montane Ecological Province. It occurs in California up to 5600 ft (1700 m) elevation, but is considered a species of concern due to habitat loss and specific germination requirements. Associated species in this Series include Blue Oak (Q. douglasii), Coast Live Oak (Q. agrifolia), Black Oak (Q. kelloggii), Interior Live Oak (Q. wislizenii), and annual grasses. On steeper slopes, Gray Pine (Pinus sabiniana) and California Buckeye (Aesculus californica) are the primary associated species.

QB California Bay Series

This woodland Series is almost completely composed of California Bay (Umbellularia californica) with some associated California Buckeye (Aesculus californica). The Series occurs in scattered and small stands, generally away from the immediate coast on exposed slopes and ridges from the Oregon border southward below about 3000 ft (915m). This species also is adapted to seawinds of coastal environments, especially south of this region. The California Bay Series is found adjacent to the Redwood and Tanoak Series on moist slopes and canyons, and Northern Mixed Chaparral on dry or rocky slopes. Other associated species include Tree Chinquapin (Castanopsis chrysophylla), Berries (Rubus spp.), and species of Ceanothus.

TC Tree Chinquapin Series

This Series occurs at elevations below 6500 ft (2000 m) within the White Fir (Abies concolor) and Douglas-Fir (Pseudotsuga menziesii) distributions of this region. This type may also be found adjacent to the Mixed Conifer - Fir, Mixed Conifer - Pine and Douglas-Fir - Tanoak Series. Tree Chinquapin (Castanopsis chrysophylla) may become a dominant tree in small local areas closer to the coast, but it often does not dominate a site on inland locations. In that case, it is a major component of a mixture of understory shrubs and small trees including Huckleberry Oak (Quercus vaccinifolia), Red Huckleberry (Vaccinium parvifolium), Deerbrush (Ceanothus integerrimus), Snowbrush (C. velutinus), Pacific Dogwood (Cornus nuttallii), and California Hazelnut (Corylus cornuta) and defines the inland Series.

QE *White Alder Series*

White Alder (*Alnus rhombifolia*) replaces Red Alder (*Alnus oregona* or *A. rubra*) on inland riparian sites of this region up to an elevation of about 5500 ft (1678 m). The Series mainly occurs in well-aerated, rapidly flowing perennial streams of incised, steep-sided canyons which usually have coarse-textured alluvial deposits. Other riparian or moist soil species such as Willows (*Salix* spp.), Bigleaf Maple (*Acer macrophyllum*) and Fremont or Black Cottonwood (*Populus fremontii*, *P. trichocarpa*) are less abundant in this Series than in other mixed riparian Series such as the Willow, Cottonwood - Alder or Willow - Alder types. Pacific Douglas-Fir (*Pseudotsuga menziesii*) may also occur as a minor component here. California Wild Rose (*Rosa californica*), Mule Fat (*Baccharis viminea*), Poison Oak (*Toxicodendron diversilobum*) and Snowberry (*Symphoricarpos* spp.) are likely to be present in White Alder stands. The Mountain or Thinleaf Alder Series usually dominates higher-elevation riparian or very wet areas.

QO *Willow Series*

This riparian stringer-like shrub series is dominated by shrub or tree-sized Willows of any species (*Salix* spp.) in riparian floodplains, seeps, springs, swamps or dry washes of the Klamath Mountains, North Coast Ranges and North Coast Mountain Ranges Sections in this area. The more species of this area include Nuttall (*S. scouleriana*), Arroyo (*S. lasiolepis*), Coastal (*S. hookeriana*), Brewer (*S. breweriana*), Sitka (*S. sitchensis*), Gooding's Black (*S. goodingii*), Yellow (*S. lasiandra*) and Narrow-leaved (*S. exigua*) Willows. Willows dominate these areas to the exclusion of other riparian species but other species such as Aspen or the Cottonwoods (*Populus* spp.), American Sycamore (*Platanus racemosa*) and White Alder (*Alnus rhombifolia*) may occur in small amounts. Species of Gooseberry and Currant (*Ribes* spp.), Blackberry and other edible berries (*Rubus* spp.), Wild Rose (*Rosa* spp.) and Poison Oak (*Toxicodendron diversilobum*) are associated with the Series, but not as obligate hydrophytes. The herbaceous layer is primarily Sedges (*Carex* spp.) and numerous grasses and forbs.

QY *Willow - Alder Series*

This series includes any species of Willow (*Salix* spp.) combined with White Alder (*Alnus rhombifolia*) occurring together in stream or seepage areas where neither is clearly dominant in the riparian mixture. It usually occurs in low-elevation scattered riparian areas. Common associates include species of Gooseberry and Currant (*Ribes* spp.), Blackberry and other edible berries (*Rubus* spp.), Wild Rose (*Rosa* spp.) and Poison Oak (*Toxicodendron diversilobum*) along with graminoids and forbs.

TA *Mountain (Thinleaf) Alder Series*

Mountain or Thinleaf Alder (*Alnus tenuifolia*) is a dominant high-elevation moist soil species, generally occurring in pure stands above 5500 ft (1678 m) in this region. The Series occurs in large perennial grass and forb meadows where stream courses and coarse shallow or gravelly soils exist. These saturated or seasonally flooded sites are sometimes adjacent to the Red Fir, Jeffrey Pine and Mountain Hemlock Series. Minor inclusions of tree or shrub Willows (*Salix* spp.) or Mountain Maple (*Acer glabrum*) occur in the Series, but the density of these stands prohibits the growth of other species aside from some aquatic graminoids and forbs.

QS *Willow - Aspen Series*

A combination of Willows (*Salix* spp.) and Quaking Aspen (*Populus tremuloides*) may be seen in very limited areas of the eastern Klamath Mountains Section. This Series occurs, for example, in the South Russian Creek drainage and elsewhere. Quaking Aspen occurs as scattered outliers of its main distribution in the Northern and Southern Sierra Provinces of

this state and the Rocky Mountain and Intermountain states. These high-elevation riparian sites also are occupied by Sedges (Carex spp.) and other hydrophytes.

Shrubs and Chaparral

CV *Snowbrush Series*

Snowbrush or Tobacco Brush (Ceanothus velutinus) may invade a site after fire, logging or other disturbance and establish its dominance within openings of the Mixed Conifer - Fir, Subalpine Conifer, White Fir or Red Fir Series, approximately in the elevation range 4000 - 8000 ft (1220 - 2440 m) in the Klamath Mountains Section. It occurs most commonly in the western Siskiyou Mountains of this region. Shrub associates in this Series include minor amounts of Greenleaf Manzanita (Arctostaphylos patula), California Huckleberry (Vaccinium ovatum), Bitter Cherry (Prunus emarginata) and Pinemat Manzanita (Arctostaphylos nevadensis).

CA *Chamise Series*

Pure stands of Chamise (Adenostoma fasciculatum) are very limited in this region, where it reaches its northernmost distribution range in Tehama County. Chamise may, however, locally dominate low-elevation, xeric sites in the North Coast and Montane zone that have had ground disturbances such as intense fires due to its vigorous crown-sprouting abilities. The Series is especially likely to be found on south-facing slopes below or adjacent to the Northern Mixed Chaparral Series. It is prominent on the east side of the Northern California Coast Ranges Section below about 3000 ft (915 m) elevation. Chaparral species such as Wedgeleaf Ceanothus (Ceanothus cuneatus), Shrub Canyon Live Oak (Quercus chrysolepis var. nana), and Manzanitas (Arctostaphylos spp.) may associate on steeper or more mesic locations.

CH *Huckleberry Oak Series*

Huckleberry Oak (Quercus vaccinifolia) and Pinemat Manzanita (Arctostaphylos nevadensis) occur in combination in this Series, but Pinemat Manzanita does not tend to dominate at the lower elevations. These relatively low-growing shrubs often occur together in montane, open, dry coniferous slopes and ridges in areas of poor soils. The Series usually occupies lower elevations in the western mountain areas, as low as 3000 ft (915 m) or even less in the Salmon and Siskiyou Mountains and areas further west. It rises to an elevation range of about 5000 - 7500 ft (1525 - 2288 m) in the Trinity Alps. This Series has less plant diversity than that of the Montane Mixed Shrub Series and most often occupies shallow and very coarse soils, especially those derived from ultrabasic and/or granitic lithology. Such conditions restrict the growth of conifers in self-perpetuating stands of this Series. Mountain Whitethorn (Ceanothus cordulatus) and Greenleaf Manzanita (Arctostaphylos patula) are often shrub associates in this Series in minor amounts.

CQ *Northern Mixed Chaparral Series*

This widespread low-elevation shrub Series usually is found below 4000 ft (1220 m) in this region. No single shrub species is dominant. Varying mixtures of Chamise (Adenostoma fasciculatum), Wedgeleaf and Lemmon Ceanothus (Ceanothus cuneatus, C. lemmonii), Common and Whiteleaf Manzanita (Arctostaphylos manzanita, A. viscida), shrubby California Buckeye (Aesculus californica), Birchleaf Mountain Mahogany (Cercocarpus betuloides), Huckleberry Oak (Quercus vaccinifolia) in the western Klamath Mtns., and other shrub oaks such as Scrub, Canyon Live and Sadler Oaks (Q. berberidifolia, Q. chrysolepis var. nana, Q. sadleriana), often occur in this Series. In western areas, it is sometimes found on poorer or ultramafic sites in proximity to the Chamise and Knobcone Pine Series. At higher elevations it is often adjacent to the Mixed Montane Chaparral Series. Redbud

(*Cercis occidentalis*), Toyon (*Heteromeles arbutifolia*), Mountain Whitethorn (*Ceanothus cordulatus*) and Gray Pine (*Pinus sabiniana*) are also likely to intermix with the other species, but in minor amounts.

CJ Brewer Oak Series

Dense Brewer Oak (*Quercus garryana* var. *breweri*) thickets commonly occur in summit areas of the southern portions of the outer North Coast Ranges. The Series occupies drier, steeper sites in areas of the inner North Coast Ranges further to the east and generally develops above 4000 ft (1220 m) elevation. In the Trinity Alps it is often found in an elevational band of about 5000 - 6000 ft (1525 - 1830 m) and is often found adjacent to dry grasslands and often above tree-sized Oregon White Oak (*Q. g.* var. *garryana*) areas. It grades into the Mixed Montane Chaparral Series on poorer, drier or lower elevation sites and into the Mixed Conifer - Pine Series on better sites. Other associated species in this Series are trees such as Ponderosa Pine (*Pinus ponderosa*) and White Fir (*Abies concolor*), shrubs such as Huckleberry Oak (*Quercus vaccinifolia*) towards the west, Mountain Whitethorn (*Ceanothus cordulatus*) and Greenleaf Manzanita (*Arctostaphylos patula*) and grasses such as California Fescue (*Festuca californica*).

CS Scrub Oak Series

Scattered areas of shrubby oak species (*Quercus* spp.) occur at elevations generally below 5000 ft (1525 m) where soils are sufficiently deep. On serpentine soils, patchy stands of Leather Oak (*Quercus durata*) may develop in chaparral sites of the North Coast Ranges such as in the Frenzel Creek area. Sadler Oak (*Quercus sadleriana*) may become established after fire and logging in montane areas of the Klamath Mountains such as in the Salmon Mountains. Other shrubby oaks such as Canyon Live Oak (*Quercus chrysolepis* var. *nana*) and Interior Live Oak (*Quercus wislizenii* var. *frutescens*) may also occur. True Scrub Oak (*Quercus berberidifolia* or *Q. dumosa*) is rare in this area, reaching its northern limit in eastern Tehama County. Associated species of this Series include minor amounts of Toyon (*Heteromeles arbutifolia*), Birchleaf Mountain Mahogany (*Cercocarpus betuloides*) and other mesic chaparral species.

CX Mixed Montane Chaparral Series

A mid-elevation mixed chaparral vegetation type occurs in the general elevation range of 3000 - 6000 ft (915 - 1830 m) in widely scattered areas of the Klamath Mountains and North Coast Ranges. A mixture of shrub species such as Greenleaf Manzanita (*Arctostaphylos patula*), an indicator species of this Series, Hoary Manzanita (*A. canescens*), Mountain Whitethorn (*Ceanothus cordulatus*), Snowbrush (*C. velutinus*), Deerbrush (*C. integerrimus*), Shrub Canyon Live Oak (*Quercus chrysolepis* var. *nana*), Bush Chinquapin (*Chrysolepis sempervirens*), and Fremont Silktassel (*Garrya fremontii*) may occur in varying combinations. The Series is especially prominent within conifer areas that are steep, southfacing, or are underlain by poorer soils (i.e., shallow, rocky or those derived from serpentinized rock). Stand-replacing fires and other forest disturbances encourage the establishment of this Series. Depending on past and present environmental and disturbance factors, several species may become locally dominant such as Snowbrush or Greenleaf Manzanita in this area. These species, including the associated Serviceberry (*Amelanchier* spp.), Gooseberry (*Ribes* spp.) and Snowberry (*Symphoricarpos* spp.) also occur as understory shrubs within the Ponderosa Pine, White Fir, Ponderosa Pine -White Fir, Mixed Conifer - Fir and Mixed Conifer - Pine Series.

C1 Mixed Ultramafic Shrub Series

Serpentine or ultramafic (i.e., unaltered peridotite, serpentinized peridotite or gabbro) areas of the Klamath Mountains, Northern California Coast Ranges and southern areas of the

Northern California Coast Sections may contain a mixture of shrubs and often rare herbaceous plants in low to moderately high montane elevations. These areas vary greatly in degree of barrenness and soil chemistry but typically cannot support open woodlands. The best examples of this Series are on the less altered Josephine ophiolite (a suite of parent materials, including the above) in the western Klamath Mtns. Endemic serpentine shrub and herbaceous plant communities also occur on the Trinity ophiolite, an older serpentinized unit in the southern end of the Klamath Mountains and small units of the North Coast Ranges. Dubakella, Weitchpec and other soil families underlay these communities. Sites are often adjacent to and the associated species may form an understory component of the more common Mixed Ultramafic Conifer Series woodlands. Species such as Wedgeleaf Ceanothus (Ceanothus cuneatus), Huckleberry Oak (Quercus vaccinifolia), California Coffeeberry (Rhamnus californica), Creeping Barberry (Berberis aquifolium var. repens), Dwarf Silktassel (Garrya buxifolia), and Siskiyou Mat (Ceanothus pumilus) are likely to be found in this Series.

CB *Salal Series*

Salal (Gaultheria shallon) occurs in the westernmost edges of the Klamath Mountains near the coast and in the Northern California Coast Sections at elevations below about 2600 ft (800 m). This Series usually develops a well-developed shrub layer on moist, productive soils associated with the Redwood - Douglas-Fir and Douglas-Fir - Tanoak Series. Salal may form a pure shrub layer when overstory conifers are removed, as in this Series. California Huckleberry (Vaccinium ovatum), Red Alder (Alnus rubra), Dwarf Oregon Grape (Berberis nervosa), California Rose-Bay (Rhododendron macrophyllum), various ferns, and Blackberry (Rubus spp.) are often associated with Salal.

CM *Montane Mixed Shrub Series*

This Series is a high-elevation shrub community that occurs in widely scattered conifer openings within the White Fir, Red Fir and Subalpine Conifer Series. These elevations are usually above 5000 ft (1525 m) in the west and at least 6000 ft (1830 m) or more in the east. In many cases, the species are a mixture of Pinemat Manzanita (Arctostaphylos nevadensis), Bush Chinquapin (Castanopsis sempervirens), Shrub Tanoak (Lithocarpus densiflorus var. echinoides) and Huckleberry Oak (Quercus vaccinifolia). Bitter Cherry (Prunus emarginata) and Rock Spiraea (Holodiscus microphyllus) may occasionally be associated. At the lower elevations, Greenleaf Manzanita (A. patula) and Snowbrush (Ceanothus velutinus) may also be present.

CN *Pinemat Manzanita Series*

This high-elevation shrub Series differs from similar types in its species composition and exposure. Pinemat Manzanita (Arctostaphylos nevadensis) occurs in a few monospecific patches on harsh, dry, exposed sites or those with rocky or shallow soils that restrict conifer growth. These sites often are present in conifer openings of the Red Fir, Jeffrey Pine, Mixed Conifer - Fir, Western White Pine and Subalpine Conifer Series. Elevations of the Series are typically from 5600 - 7500 ft (1708 - 2288 m) in the Trinity Alps and elsewhere in the Klamath Mountains Section. Soils are usually shallow or rocky.

CW *Whiteleaf Manzanita Series*

Whiteleaf Manzanita (Arctostaphylos viscida) is widespread in northwestern California up to an elevation of about 6000 ft (1850 m). It becomes a dominant shrub in previously fire disturbed, ultramafic, dry, polluted low elevation or south-facing foothills sites in this region, especially in southeastern areas of the Klamath Mountains Section. This Series is normally found adjacent to and below the Gray Pine, Ponderosa Pine and Douglas-Fir Series. It is present, for example, at elevations usually below 2000 ft (610 m) in the Shasta Lake area.

Associated shrubs there include Lemmon Ceanothus (C. lemmonii) and Redbud (Cercis occidentalis). In other areas, Greenleaf Manzanita (A. patula), Wedgeleaf Ceanothus (C. cuneatus), and, on serpentine, Leather Oak (Quercus durata) may be associated with this Series. Tree such as Canyon Live Oak (Q. chrysolepis) or Knobcone Pine (Pinus attenuata) may also occur.

CG Greenleaf Manzanita Series

Greenleaf Manzanita (Arctostaphylos patula) is typically found mixed with other shrubs of the Mixed Montane Chaparral Series at moderate to moderately high elevation ranges, but generally below about 7000 ft (2135 m). Some of these associates include Snowbrush (Ceanothus velutinus) and Deerbrush (C. integerrimus). It occasionally dominates a site, especially after intense fires in the eastern interior regions. In those situations it may be associated with minor amounts of species such as Bush Chinquapin (Castanopsis chrysophylla), Mountain Whitethorn Ceanothus cordulatus), Fremont Silktassel (Garrya fremontii) and Serviceberry (Amelanchier pallida). The Greenleaf Manzanita Series often occupies openings within the White Fir and Mixed Conifer - Fir Series.

CL Wedgeleaf Ceanothus Series

Wedgeleaf Ceanothus (C. cuneatus) is widely distributed throughout California on low elevation chaparral sites and is usually a major component of the Northern Mixed Chaparral Series. It becomes locally dominant in widespread areas of the Klamath Mountains Section below an elevation of about 3000 ft (915 m). These are usually disturbed or burned areas that indicate good tree growing conditions. It grades into the chaparral series as well as the Gray Pine and Douglas-Fir series. Shrub Interior Live Oak (Quercus wislizenii var. frutescens) and California Bay (Umbellularia californica) may be associates in the interior areas.

BM Curlleaf Mountain Mahogany Series

This Series, dominated by Curlleaf Mountain Mahogany (Cercocarpus ledifolius), occurs on rocky outcrops such as scarp offsets, rocky colluvial slopes, and rocky lava pressure ridges throughout the drier regions of California. It is commonly found in the Scott River watershed in the eastern Klamath Mountains Section of this area and more abundantly in areas further eastward. These shrubs are often seen as inclusions in the Eastside Pine and Western Juniper Series. Many of the stands are relatively old due to their location in less fire prone areas since the understory is very sparse or nonexistent and there is almost no soil development. The associated conifers of this Series are Jeffrey Pine (Pinus jeffreyi) and Western Juniper (Juniperus occidentalis vaf. occidentalis).

Alpine Dwarf Scrub

AC Cushion Plant Series

This alpine Series consists of perennial herbs or dwarf shrubs, including cushion-like forms. It forms a low turf on favorable sites but is more often scattered among the rocks and gravel above the tree frostline. This type is subject to severe winds and very low temperatures in winter and on windward slopes, which are often blown almost clear of snow. More protected slopes accumulate deep snowdrifts which may persist until midsummer or later. The substrate is rocky, with little soil formation and excellent drainage. The Series occurs above the Subalpine Conifer, Whitebark Pine, Foxtail Pine and Mountain Hemlock Series on the highest peaks of the Klamath Mountains Section (Trinity Alps and Salmon-Scott Mountains. Elevations are usually above 7500 ft (2286 m). Many of the plants have conspicuous flowers, including such species as White Heather (Cassiope mertensiana), Indian Paintbrush (Castilleja arachnoidea), Sierra Primrose (Primula

suffrutescens), species of Draba, and Fireweed (Epilobium spp.). Alumroot (Heuchera pringlei), Rock Spiraea (Holodiscus microphyllus), Buttercup (Ranunculus eschscholtzii), Mountain Sorrel (Oxyria digyna), Sibbaldia (Sibbaldia procumbens) and Saxifrage (Saxifraga fragarioides) also occur in this region.

Herbaceous

HG Annual Grass - Forb Series

Small areas of dry grasslands are found scattered at moderately low elevations in the western Klamath Mountains, especially on privately owned lands and in the western Trinity Alps area. In the North Coast Ranges, these areas become more extensive on private lands scattered throughout the project area. Oregon White Oak (Quercus garryana) stands are often found adjacent to these sites. These species include introduced and native annual grasses such as Brome (Bromus spp.), Bluegrass (Poa spp.), Wildoats (Avena spp.), Fescue (Vulpia spp.), Dogtail (Cynosurus spp.) and a variety of forbs such as Checker Mallow (Sidalcea spp.), Brodiaea (Brodiaea spp.), Wild Hyacinth (Dichelostemma spp.), Yampah (Perideridia spp.) and Mariposa Lily (Calochortus spp.).

HJ Wet Meadows (Grass - Sedge - Rush) Series

Perennially or seasonally wet meadows and grasslands occur on level or gently sloping areas adjacent to perennial streams, seeps, springs, and near lakes. They have been identified in the Siskiyou, North Trinity, Snow, and Yolla Bolly Mountains, in Plaskett Meadows and in the Eel River and Letts Creek watersheds, among other areas. These are usually small sites that are occupied by obligate hydrophytes such as Sedges (Carex spp.), Rushes (Juncus spp.), Bulrushes (Scirpus spp.) as well as perennial grasses such as Bluegrass (Poa spp.), Brome (Bromus spp.), Fescue (Festuca spp.), Oniongrass (Melica spp.), and Reedgrass (Calamagrostis spp.) These moist sites encourage the development of a rich herbaceous layer that includes such species as Lily (Lilium spp.), False Hellebore (Veratrum spp.), Shooting Star (Dodecatheon spp.), Gentian (Gentiana spp.) and Lousewort (Pedicularis spp.). Meadow edges often abruptly terminate in upper montane coniferous forest species such as Lodgepole Pine (Pinus contorta var. murrayana) and Jeffrey Pine (P. jeffreyi).

North Sierran Ecological Province

Conifer Forest/Woodland

MB Mixed Conifer with Giant Sequoia (Big Tree) Series

This Series is limited to one stand on the Tahoe National Forest in which the Giant Sequoia or Big Tree (Sequoiadendron giganteum) occurs. The mixed conifer overstory is dominated by White Fir (Abies concolor). Additional conifers occur in minor amounts, such as Sugar Pine (Pinus lambertiana) and Incense Cedar (Calocedrus decurrens). Groves of Giant Sequoia generally occur within an elevation band of 4000 - 6000 ft (1200 – 1800 m) in the Sierras. As it is not a drought tolerant species, these areas are limited to mesic soils with sufficient soil moisture during the dry summer period. Stability of these groves is maintained by frequent fires, which reduce competition by White Firs, reduce forest floor litter buildup and allow germination of the Sequoia seeds.

MF Mixed Conifer - Fir Series

This is the high elevation counterpart of the Mixed Conifer - Pine series. This series is within the elevational range of 5000 f- 7000 ft (1520 – 2130 m), on frigid soils, the major species include White Fir (Abies concolor), Red Fir (A. magnifica), Sugar Pine (Pinus lambertiana), and Jeffrey Pine (P. jeffreyi). The lower elevations within this range are primarily

dominated by White Fir and Jeffrey Pine. Red Fir becomes more dominant at higher elevations, but Jeffrey Pine and White Fir will continue to occur in decreasing amounts. Other associates are Douglas-Fir (Pseudotsuga menziesii), Lodgepole Pine (P. contorta var. murrayana) and Ponderosa Pine (P. ponderosa). Greenleaf Manzanita (Arctostaphylos patula), Huckleberry Oak (Quercus vaccinifolia), and Mountain Whitethorn (Ceanothus cordulatus) are the associated understory shrubs.

RF Red Fir Series

This Series generally occurs in dense, pure stands or as an inclusion in the Mixed Conifer - Fir Series. It is found on both east and west slopes in the Sierra Nevada from about 7000 - 9000 ft (2130 – 2740 m) on frigid soils. In dense Red Fir (Abies magnifica) stands with heavy litter accumulation, understory plants do not occur except for Pipsissewa (Chimaphila menziesii) and Wintergreen (Pyrola picta). In more open stands or where Red Fir intergrades with Mixed Conifer - Fir, Snow Brush (Ceanothus velutinus), Mountain Whitethorn (C. cordulatus), Pinemat Manzanita (Arctostaphylos nevadensis), and Greenleaf Manzanita (A. patula) are the dominant understory shrubs. Western White Pine (Pinus monticola) and Lodgepole Pine (P. contorta var. murrayana) are associated conifer species. Mountain Hemlock (Tsuga mertensiana) may occur as isolated trees in colder areas of the Red Fir Series.

MH Mountain Hemlock Series

Mountain Hemlock (Tsuga mertensiana), the dominant of this series, is representative of subalpine areas within the Sierra Nevada. It is generally found on north or east facing slopes where snow accumulation holds well into the summer months. It occurs as a dominant species in cold swales from 7000 - 9000 ft (2130 – 2740 m), and in almost pure open stands on ridgetops above 8500 ft (2590m) with Western White Pine (Pinus monticola). In moist areas, Willows (Salix spp.) and Mountain Alder (Alnus tenuifolia) are associated understory species.

LP Lodgepole Pine Series

This Series occurs intermingled with the Red Fir and Mixed Conifer Series at elevations from 5500 - 9000 ft (1680 m – 2740 m) or on cryic soils above 9000 ft. Lodgepole Pine (Pinus contorta var. murrayana) is found either in dense, pure stands in swales with abundant year around moisture or as scattered individual trees on very dry soils. Lodgepole is an invader species and as the microsite changes, it may be replaced by Red Fir (Abies magnifica) or Jeffrey Pine (P. jeffreyi). On the periphery of meadows, as the water table level drops, Lodgepole Pine will be invasive and replace the sedge and forb species. The occurrence of Lodgepole generally indicates environmental conditions outside the establishment and growth requirements of Red Fir or Jeffrey Pine.

MP Mixed Conifer - Pine Series

This Series dominates the western slopes of the North Sierran area at elevations of 2000 - 5500 ft (610 – 1680 m) on mesic soils. It includes several conifer species, including Ponderosa Pine (Pinus ponderosa), Incense Cedar (Libocedrus decurrens), Douglas-fir (Pseudotsuga menziesii), White Fir (Abies concolor), and Sugar Pine (P. lambertiana). Any one of these species may become locally dominant but dominance is generally shared by more than one species. At lower elevations, Gray Pine (P. sabiniana) and Black Oak (Quercus kelloggii) may be common associates. The pines normally dominate south and west facing slopes, Douglas-fir and White Fir north and east slopes, with Incense Cedar as a secondary component of all slopes. Understory shrubs within this Series include Deerbrush (Ceanothus integriramus), Manzanitas (Arctostaphylos spp.), Whiteleaf Manzanita (A. viscida), and at higher elevations Greenleaf Manzanita (A. patula). Knobcone Pine (Pinus

attenuata) may occur as an invader species on shallow, south facing slopes, or on areas of lava. Black Oak (Quercus kelloggii) may occur as a major component at lower elevations.

KP Knobcone Pine Series

Knobcone Pine (Pinus attenuata) occurs in small dense stands scattered throughout the Mixed Conifer - Pine and Canyon Live Oak Series. This series is a result of past disturbances (usually fire) and is mixed with Whiteleaf Manzanita (Arctostaphylos viscida). It usually occurs from 2000 - 3000 ft (610 – 910 m) on south or west facing slopes and is tolerant of ultrabasic parent materials.

PP Ponderosa Pine Series

This series, dominated by Ponderosa Pine (Pinus ponderosa), is found at 2000 - 5500 ft (610 – 1680 m) on mesic westside slopes above the foothill regions of the northern Sierra Nevada. Ponderosa Pine is also found as a major component of the Mixed Conifer - Pine Series. Relic stands of pure Ponderosa Pine occur in El Dorado and Amador Counties above 2000 ft. This series integrates with the Mixed Conifer - Pine, Black Oak, Tanoak and Sierran Foothill Chaparral Series. Associated understory species include Whiteleaf Manzanita (Arctostaphylos viscida), Manzanitas (Arctostaphylos spp.), Mountain Misery (Chamaebatia foliolosa), and on better sites Bitter Cherry (Prunus emarginata) and Deerbrush (Ceanothus integriramus).

WB Whitebark Pine Series

This treeline conifer (Pinus albicaulis) may occur in pure stands or with Red Fir (Abies magnifica), Western White Pine (P. monticola), and Lodgepole Pine (P. contorta var. murrayana) on ridgetops on high elevation cryic soils. It grades into the Subalpine Conifer Series and often assumes krummholtz forms on very exposed sites.

SA Subalpine Conifer Series

This is a mixed type, found at the higher elevations. Mixtures of Mountain Hemlock (Tsuga mertensiana) and Whitebark Pine (P. albicaulis) may dominate the subalpine forest on dry, shallow soils. These stands may be associated with scattered species such as Lodgepole Pine (P. contorta var. murrayana), Western White Pine (P. monticola), and Red Fir (Abies magnifica). The shrub understory and ground cover are better developed where this type adjoins moist areas, such as along riparian zones and montane meadows.

JP Jeffrey Pine Series

Jeffrey Pine (Pinus jeffreyi) dominated stands occur on lava flows, shallow glaciated or granitic soils above 5000 ft (1550 m) in the eastern sections of the northern Sierras. Other conifers that may occur in the Series in minor amounts include Ponderosa Pine (Pinus ponderosa), Incense Cedar (Calocedrus decurrens), Sugar Pine (Pinus lambertiana), Lodgepole Pine (Pinus contorta var. murrayana), Western Juniper (Juniperus occidentalis), White Fir (Abies concolor) and Western White Pine (Pinus monticola). Shrubs such as Shrub Canyon Live Oak (Quercus chrysolepis var. nana), Snow Brush (Ceanothus velutinus), Greenleaf Manzanita (Arctostaphylos patula) and Huckleberry Oak (Quercus vaccinifolia) are common associates. The Series may also have an understory of Great Basin species such as Basin Sagebrush (Artemisia tridentata), Bitterbrush (Purshia tridentata), Rabbitbrush (Chrysothamnus spp.), Curlleaf Mountain Mahogany (Cercocarpus ledifolius) and Snowberry (Symphoricarpos spp.). Forbs and grasses may include Mule Ears (Wyethia mollis), Arrowleaf Balsamroot (Balsamorhiza sagittata), Idaho fescue (Festuca idahoensis), Pinegrass (Calamagrostis spp.), Bluebunch Wheatgrass, (Agropyron spicata) and Squirreltail (Sitanion spp.).

WJ Western Juniper Series

Western Juniper (Juniperus occidentalis) predominantly occurs east of the Sierran crest, below 6000 ft (1830 m) on ridges and mountain slopes. This series may also occur west of the crest on dry rocky, shallow soils. Western Juniper usually occurs with Jeffrey Pine (Pinus jeffreyi), some Curlleaf Mountain Mahogany (Cercocarpus ledifolius) and Mule Ears (Wyethia spp.). Currant (Ribes spp.), Snow Brush (Ceanothus velutinus) and Snowberry (Symphoricarpos vaccinoides) occur on deep soils in north aspects as inclusions within the same general area as the Western Juniper Series. On lower, drier slopes, Western Juniper commonly associates with Bitterbrush (Purshia tridentata), Sagebrush (Artemisia spp.) and Rabbitbrush (Chrysothamnus spp.) as occasional scattered trees.

PD Gray Pine Series

This open series is primarily found in the foothills, front country and steep, drier canyons, generally below about 4200 ft (1280 m). The primary conifer is the sparsely leaved Gray Pine (Pinus sabiniana). These sites are typically diverse in structure, with a mixture of hardwoods such as Canyon Live Oak (Quercus chrysolepis), Interior Live Oak (Q. wislizenii) and Blue Oak (Q. douglasii) and low-elevation chaparral shrubs such as Wedgeleaf Ceanothus (C. cuneatus) and Whiteleaf and Common Manzanitas (Arctostaphylos viscida, A. manzanita). These components tend to be clumped, with interspersed patches of annual grasses.

PJ Singleleaf Pinyon Pine Series

Singleleaf Pinyon Pine (Pinus monophylla) is well represented in the northern Sierras of California only southeast of Lake Tahoe but is also found in dry isolated stands to the north of the lake. It may associate with Jeffrey Pine (Pinus jeffreyi), Ponderosa Pine (P. ponderosa), and chaparral or Great Basin desert shrub species such as Basin Sagebrush (Artemisia tridentata), Western Juniper (Juniperus occidentalis) and Bitterbrush (Purshia tridentata).

DP Douglas - Fir - Ponderosa Pine Series

Pacific Douglas - Fir (Pseudotsuga menziesii) is rarely found in pure stands in inland locations such as the northern Sierras. Ponderosa Pine (Pinus ponderosa) often occurs with it abundantly on more exposed, often moderately steep or steep open sites at moderate elevations, below about 4500 ft (1372 m). Sites at higher elevations or with more shading or moisture potential generally will be occupied by more of the typical mixed conifer species such as Incense Cedar (Calocedrus decurrens), Sugar Pine (Pinus lambertiana), or Black Oak (Quercus kelloggii). Canyon Live Oak (Quercus chrysolepis) may also be a low-elevation hardwood associate in this Series.

WF White Fir Series

Pure stands of White Fir (Abies concolor) occur in the extreme northeastern portion of the northern Sierras in the elevation zone 7400 - 8000 ft (2256 - 2440 m). These sites usually have less available atmospheric moisture than those further west, and are adjacent to the Mixed Conifer - Fir and the Upper Montane Mixed Shrub Series.

PW Ponderosa Pine - White Fir Series

Middle montane elevations (4000 - 6000 ft or 1220 - 1830 m) of this area often have sites in which Ponderosa Pine (Pinus ponderosa) and White Fir (Abies concolor) become the two dominant conifers. These sites were previously pine-dominated but White Fir is regenerating well due to relatively recent management practices or other disturbances. This series intergrades with the Mixed Conifer - Pine and Ponderosa Pine series. The landscape is often of gentle gradient and slope aspects typically are south facing or west

facing. Other conifers commonly associated at low canopy cover values include Incense Cedar (Calocedrus decurrens), Douglas-Fir (Pseudotsuga menziesii), Sugar Pine (Pinus lambertiana) and Red Fir (Abies magnifica). California Black Oak (Quercus kelloggii) is an occasional hardwood associate. Shrubs are generally sparse due to dense canopy closure; Greenleaf Manzanita (Arctostaphylos patula), Western Serviceberry (Amelanchier pallida), Snowbrush (Ceanothus velutinus), Bloomer Goldenbush (Happlopappus bloomeri) and Creeping Snowberry (Symphoricarpus mollis) occasionally occur.

MU Ultramafic Mixed Conifer

Small pockets of serpentinitic ultramafic parent materials exist in the Northern Sierra area, which affect tree density and distributions. These sites produce soils low in essential minerals such as calcium and potassium or have excessive accumulations of heavy metals such as nickel and chromium accompanied by alkaline pH levels. Combinations of Jeffrey Pine (Pinus jeffreyi), Lodgepole Pine (Pinus contorta var. murrayana) and Incense Cedar (Calocedrus decurrens) may occur at mid montane elevations (up to about 6000 ft or 1830 m). Other Mixed Conifer types such as Sugar Pine (Pinus lambertiana) and White Fir (Abies concolor) may also be present. Hardwoods tend to be sparse. Shrub associates may include Rabbitbrush (Chrysothamnus spp.).

Hardwood Forest/Woodland

QO Willow Series

This riparian series occurs in high elevation riparian areas, generally above 5500 ft (1680 m), on both western and eastern Sierran slopes. Species of tree and shrub willows (Salix spp.) dominate the hardwood mixture. It is generally located on streambanks and moist canyon bottoms adjacent to the Red Fir, Lodgepole Pine, Jeffrey Pine, and Quaking Aspen Series. This Series is also found in stringers adjacent to streamcourses, which meander through perennial grass meadows. White Alder (Alnus rhombifolia), Wild Rose (Rosa spp.) and Cottonwoods (Populus spp.) occur as occasional associates.

QT Tanoak - Madrone Series

This Series of Tanoak (Lithocarpus densiflorus) and Madrone (Arbutus menziesii) is commonly found associated with the Mixed Conifer - Pine Series. Tanoak and Madrone occur as codominants, or occasionally one dominates. Relic populations exist in the western Sierra Nevada below 3000 ft (910 m) from Butte County to Tuolumne County. The Tanoak - Madrone Series occurs generally on deep, well-drained mesic soils in association with scattered Black Oak (Quercus kelloggii), California Bay (Umbellularia californica) and Canyon Live Oak (Q. chrysolepis), but Madrone can occur on very dry granitics.

QC Canyon Live Oak Series

This Series is dominated by Canyon Live Oak (Quercus chrysolepis), and occurs on droughty sites, generally on shallow colluvial soils in steep canyons between about 2000- 4500 ft (610 – 1370 m). This hardwood is occasionally associated with the Mixed Conifer - Pine and Black Oak Series. Mixed shrubs such as Deerbrush (Ceanothus integerrimus) and Whiteleaf Manzanita (Arctostaphylos viscida) will occur in the understory, as will grasses. The tree form of California Bay (Umbellularia californica) and Gray Pine (Pinus sabiniana) may also occur as minor components.

QK Black Oak Series

Black Oak (Quercus kelloggii) occurs in pure stands or mixed with conifers of the Mixed Conifer - Pine Series, Manzanitas (Arctostaphylos spp.) and Deerbrush (Ceanothus integerrimus). The Black Oak Series can intermix with Canyon Live Oak (Q. chrysolepis)

with equal dominance, but Black Oak normally dominates the better sites and Canyon Live Oak will dominate the poorer sites where Black Oak does not compete well. In moist areas, Bigleaf Maple (Acer macrophyllum) and Pacific Dogwood (Cornus nuttallii) are the primary associates with White Alder (Alnus rhombifolia) and California Nutmeg (Torreya californica) as minor associates. The Black Oak Series occurs on mesic soils up to 5000 ft (1520 m) on the western slopes of the Sierra Nevada, generally mixed with the Mixed Conifer - Pine Series.

QQ Quaking Aspen Series

Quaking Aspen (Populus tremuloides) occurs in pure stands or as scattered individuals throughout the moist areas within the Red Fir and Mixed Conifer - Fir Series. Aspen occurs adjacent to meadows and streams associated with Willows (Salix spp.) and Lodgepole Pine (Pinus contorta var. murrayana). Quaking Aspen can also be located along streams in higher elevation conifer series on all aspects. Black Cottonwood (Populus trichocarpa) is a minor component.

QW Interior Live Oak Series

This Interior Live Oak (Quercus wislizenii) dominated Series occurs in semi-open or closed stands or may associate with the Canyon Live Oak Series at higher elevations. Gray Pine (Pinus sabiniana) and Buckeye (Aesculus californica) are associated species. This Series is located above the Blue Oak Series, generally at 500 - 2000 ft (150 – 610 m). Cottonwood (Populus spp.) is the associated riparian species with minor amounts of White Alder (Alnus rhombifolia).

QD Blue Oak - Gray Pine Series

This Series occurs on shallow upland soils in the foothills of the Sierra Nevada. Blue Oak (Quercus douglasii) and Gray Pine (Pinus sabiniana) are the major tree species in this hillside type. Interior Live Oak (Quercus wislizenii) may also be abundant, with Valley Oak (Quercus lobata) occurring on deep soils. Non-stump sprouting chaparral shrubs such as Wedgeleaf Ceanothus C. cuneatus, Manzanitas (Arctostaphylos spp.), Coffeeberry (Rhamnus spp.), and Poison Oak (Toxicodendron diversiloba) are scattered throughout this Series. Evergreen trees and shrubs occur with increasing density within the higher elevations of this series.

QL Valley Oak Series

This Series, dominated by Valley Oak (Quercus lobata), occurs on the deep soils of old alluvial terraces as pure stands of large trees with no woody understory. These stands appear similar in structure on valley bottoms and in rolling slopes over a range of elevations, generally below 2000 ft (610 m). A few scattered Interior Live Oaks (Q. wislizenii) can be found throughout this Series.

QF Cottonwood Series

This Series is dominated by Fremont Cottonwood (Populus fremontii), which occurs in relic stands along stream courses below 2500 ft (760 m). It grows in stringers adjacent to the Blue Oak and Valley Oak Series. Sycamore (Platanus racemosa), White Alder (Alnus rhombifolia), and Willows (Salix spp.) occur in this Series as associated species.

Shrubs and Chaparral

CV Snowbrush Series

Snowbrush (Ceanothus velutinus) is the dominant brush species in this series and generally occurs below 8000 ft (2440 m) on the eastern slopes of the Sierra Nevada. These brushfields occur in the elevational range of the Mixed Conifer-Fir Series. This chaparral Series is typically found on frigid soils on all aspects. Snowbrush can occur in pure stands, or as individual plants in the understory of the Mixed Conifer - Fir Series or in associations with the shrubs Greenleaf Manzanita (Arctostaphylos patula), Choke Cherry (Prunus virginiana) and Bitter Cherry (P. emarginata). This type may invade deep, well-drained soils after fire or logging.

CA Chamise Series

This is a fire adapted Series, dominated by Chamise (Adenostoma fasciculatum). It grows on mesic and thermic soils, mainly in El Dorado, Amador and Calaveras Counties. In the foothills, this Series is found on steep slopes from 1000 - 2000 ft (300 – 610 m). Associated species include Redbud (Cercis occidentalis), Manzanitas (Arctostaphylos spp.), Mountain Whitethorn (Ceanothus cordulatus), Leather Oak (Quercus durata), Huckleberry Oak (Q. vaccinifolia), Ceanothus spp. and Bush Chinquapin (Castanopsis sempervirens).

CH Huckleberry Oak Series

Huckleberry Oak (Quercus vaccinifolia) occurs with Pinemat Manzanita (Arctostaphylos nevadensis) on shallow ultrabasic soils and very shallow stoney or gravelly soils on other geologies at elevations between 3000 - 7000 ft (910 – 2130 m) and above. The Series represents an edaphic habitat of shallow soils and identifies poor conifer production sites. Greenleaf Manzanita (A. patula), Bush Chinquapin (Castanopsis sempervirens), Mountain Whitethorn (Ceanothus cordulatus), Bitter Cherry (Prunus emarginata) and Hoary Manzanita (A. canescens) are associated shrub species. Conifer species, if present, are Jeffrey Pine (Pinus jeffreyi), Red Fir (Abies magnifica) and Western White Pine (P. monticola).

CX Montane Mixed Chaparral Series

This is a mixed shrub type that occurs at moderate elevations of the Northern Sierras, typically at 2000 - 6000 ft (610 - 1830 m). The Montane Mixed Chaparral Series contains chaparral species such as Greenleaf Manzanita (Arctostaphylos patula), Mountain Whitethorn (Ceanothus cordulatus), Snow Brush (C. velutinus) and Deerbrush (C. integriramus). Deerbrush is found extensively on deep mesic soils of the westside of the Sierra Nevada and Snow Brush typically is found on eastern slopes. Greenleaf Manzanita, a stump-sprouter, generally occurs on south and west facing Sierran slopes above about 2000 ft (610 m). Mountain Whitethorn occurs on dry, open flats and slopes above about 3000 ft (910 m). On east Sierran slopes, Basin Sagebrush (Artemisia tridentata) and Squirreltail (Sitanion hystrix) may occur as associated species of this Series. Whiteleaf Manzanita (A. viscida) may be present in this Series at lower elevations.

CC Sierran Foothill Mixed Chaparral Series

This low-elevation mixed shrub Series occurs in foothills areas to the west of the higher mountains of the northern Sierra Nevada. The Series is a floristically rich type that changes species composition with respect to precepitation, aspect and soil type. It includes a mixture of Whiteleaf, Hoary and Common Manzanitas (Arctostaphylos viscida, A. canescens, A. manzanita), Wedgeleaf Ceanothus (Ceanothus cuneatus), Chamise (Adenostoma fasciculatum), Fremont Silk-tassel (Garrya fremontii), Birchleaf Mountain Mahogany (Cercocarpus betuloides), Poison Oak (Toxicodendron diversiloba), shrub Oaks (Quercus

spp.) and other more interior species below coniferous and hardwood sites. Individual sites may support pure stands of these shrubs such as in the Wedgeleaf Ceanothus Series.

BM Curleaf Mountain Mahogany Series

This series occurs on gently to steeply sloping mountain uplands and ridgetops usually in association with rocky outcrops or lava flows. On these xeric sites Curleaf Mountain Mahogany (*Cercocarpus ledifolius*) occurs as the dominant species in association with Idaho Fescue (*Festuca idahoensis*), Squirreltail (*Sitanion hystrix*), and a few other grasses and forbs. On more mesic sites, associates include scattered Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*) and Junipers (*Juniperus* spp.).

CM Upper Montane Mixed Shrub Series

This mixed shrub Series occurs in upper montane positions on harsh sites such as exposed ridge tops or under excessively drained soils conditions. Elevations typically are between 6000 - 9000 ft (1860 – 2790 m) within the Red Fir, Lodgepole Pine, White Fir and Jeffrey Pine Series. Major shrub species include Huckleberry Oak (*Quercus vaccinifolia*), Snowberry (*Symphoricarpus* spp.), Pinemat Manzanita (*Arctostaphylos nevadensis*) and Bush Chinquapin (*Castanopsis sempervirens*). Minor associates include Greenleaf Manzanita (*A. patula*), Bitter Cherry (*Prunus emarginata*) and Mountain Whitethorn (*Ceanothus cordulatus*) towards the west. Species of Currants or Gooseberry (*Ribes* spp.) often occur in this Series. Basin Sagebrush (*Artemisia tridentata*), Bitterbrush (*Purshia tridentata*), and Mountain or Parish's Snowberry (*Symphoricarpus vaccinioides* or *S. parishii*) may occur on more xeric east side upper montane habitats. Deerbrush (*Ceanothus integerrimus*) is present in the lower elevations of this Series where it grades into the Montane Mixed Chaparral Series.

Sagebrush Shrub

BS Basin Sagebrush Series

Basin or Big Sagebrush (*Artemisia tridentata*) generally occurs on dry slopes and plains from 4000 - 10,600 ft (1220 – 3230 m) east of the Sierran crest. Basin Sagebrush is usually found on frigid, coarse-grained soils with a lack of soil profile development, although soils may be deep. Bitterbrush (*Purshia tridentata*) may also occur in association with Greenleaf Manzanita (*Arctostaphylos patula*). Other associated species include Stone-Fruits (*Prunus* spp.), Rabbitbrush (*Chrysothamnus* spp.), Squirreltail (*Sitanion hystrix*), Fescue (*Festuca* spp.), Wheatgrass (*Agropyron* spp.), Ryegrass (*Elymus* spp.), Kentucky Bluegrass (*Poa pratensis*) and Bromegrass (*Bromus* spp.).

BL Low Sagebrush Series

Low Sagebrush (*Artemisia arbuscula*) is the dominant shrub of this Series. It is generally restricted to basins with clay or saline-alkaline soils, which are intermittently flooded, as well as to terraces with hardpan or heavy clay substrates. When in association with Bitterbrush (*Purshia tridentata*), these habitats reflect a mosaic of shallow to deep, well-drained soils, with Bitterbrush on the deeper sites and Low Sagebrush on the harsher sites. Low Sagebrush may be associated with Needlegrass (*Stipa* spp.) on more arid sites. Other shrub and tree associates include Black Sagebrush (*Artemisia nova*), Basin Sagebrush (*Artemisia tridentata*), Rabbitbrush (*Chrysothamnus* spp.), Singleleaf Pinyon Pine (*Pinus monophylla*), Junipers (*Juniperus* spp.), a few grass species and a rich variety of forbs.

Alpine Dwarf Scrub

AC Cushion Plant Series

Prostrate shrubs and herbs form the major vegetation component in alpine areas of this type. These cushion plants generally occur on granitic rock above 8500 ft (2590 m). This Series has a high diversity of species which includes the following plants: Goldenbush (Haplopappus acaulis), Sedge (Carex exerta), Knotweed (Polygonum davisiae), Pussytoes (Antennaria alpina), Sierra Primrose (Primula suffrutenscens) and Bush Cinquefoil (Potentilla fruticosa). Phlox (Phlox spp.) and Buckwheat (Eriogonum spp.) are also likely to be present on these sites.

AX Mixed Alpine Scrub Series

These communities are often low graminoid and forb species with a mixture of dwarf shrubs. Species composition varies considerably. In the Sierra Nevada, the most common shrubs are Creambush Oceanspray (Holodiscus discolor), Greene Goldenweed (Haplopappus greenei) and Mountain White Heather (Cassiope mertensiana). Non-shrub species include Sedge (Carex exerta), Knotweed (Polygonum davisiae), Pussytoes (Antennaria alpina), Sierra Primrose (Primula suffrutenscens), Bush Cinquefoil (Potentilla fruticosa), Eschscholtz Buttercup (Ranunculus eschscholtzii), Prostrate Sibbaldia (Sibbaldia procumbens), Bluegrass (Poa spp.), Buckwheat (Eriogonum spp.), Squirreltail (Sitanion spp.), Rock Cress (Arabis spp.), Mountain Sorrel (Oxyria digyna), Pussypaws (Calyptridium umbellatum), Indian Paintbrush (Castilleja spp.) and Payson's Draba (Draba paysonii). The High Sierra has an abundance of Columbine (Aquilegia spp.), Heart Willowweed (Epilobium obcordatum), Davidson's Penstemon (Penstemon davidsonii), Jacob's Ladder (Polemonium spp.) and Coville's Phlox (Phlox covillei).

Herbaceous

HG Annual Grass - Forb Series

On the east side of the Sierra Nevada, annual grasslands, dominated by Cheatgrass (Bromus tectorum), occur as a direct result of fire. These grasslands are occasionally associated with the Basin Sagebrush Series.

HJ Wet Meadows: Grass - Sedge - Rush Series

This wet meadow series occurs on aquatic soils of level or gently sloping areas. These sites have permanent water sources and occur mainly on the eastside of the Sierran crest. The Series also occurs adjacent to streams, meadows, lakes, and occasionally as an understory to Lodgepole Pine (Pinus contorta) in wet swales. Dominant species are Sedges (Carex spp.) and Rushes (Juncus spp.) as well as water tolerant grass and forb species.

North Interior Ecological Province

Conifer Forest/Woodland

MF Mixed Conifer - Fir Series

This mid-elevation Series typically occurs above the Mixed Conifer - Pine and Ponderosa Pine - White Fir Series and usually below the White Fir Series near 4500 - 7600 ft (1372 - 2318 m) in the Southern Cascades and Modoc Plateau Sections. White Fir (Abies concolor) may dominate the tree layers on some sites and is an important but not dominant conifer on other sites. At least two other conifers of importance in this mixture, typically Jeffrey Pine (Pinus jeffreyi) at the higher elevations, Ponderosa Pine (P. ponderosa) and Incense Cedar (Calocedrus decurrens) on the drier, warmer sites, Sugar Pine (P. lambertiana) on northern slopes, Lodgepole Pine (P. contorta var. murrayana) in cold air basins and moist

soils, and Red Fir (*A. magnifica*) at the highest elevations. Stands of Washoe Pine (*P. washoensis*) mixed with White Fir, Western White Pine (*P. monticola*) and Lodgepole Pine occurs at higher elevations in the Warner Mountains (Modoc Plateau Section). Few if any hardwoods occur, although Canyon Live Oak (*Quercus chrysolepis*) may be present at the lowest elevations. The typically sparse understory includes shade tolerant species such as Snowberry (*Symphoricarpos* spp.), Serviceberry (*Amelanchier* spp.), Gooseberry or Currant (*Ribes* spp.), Mahala Mat (*Ceanothus prostratus*), and Bitter Cherry (*Prunus emarginata*). Bush Chinquapin (*Castanopsis sempervirens*), Greenleaf Manzanita (*Arctostaphylos patula*) and Snowbrush (*Ceanothus velutinus*) are often found on more open or disturbed sites in this Series, which may dominate the cover until the tree canopy closes. The understory herbaceous component may include graminoids such as Sedges (*Carex* spp.), Western Needlegrass (*Stipa occidentalis*), Blue Wildrye (*Elymus glaucus*) and Squirreltail (*Sitanion* spp.), in addition to forbs such as species of *Penstemon*, species of *Monardella*, Wintergreen (*Pyrola* spp.), and Little Princes Pine (*Chimaphila menziesii*).

WF White Fir Series

White Fir (*Abies concolor*) dominates the forest stands of the Northern Interior Ecological Province in an elevational band between the higher Red Fir (*A. magnifica*) and the lower Mixed Conifer - Fir Series. Elevations are of the order 4800 - 7400 ft (1464 - 2256 m) in the Southern Cascades Section and 5600 - 8000 ft (1708 - 2440 m) mainly in the Warner Mountains and Horsehead Mountain Subsections of the Modoc Plateau Section. Slopes may be shallow or steep, and the aspects are often northerly where this species forms almost pure stands. Many areas in the Southern Cascades Section have relatively high stocking densities, where widespread mortality is occurring. Evidence of the fir engraver beetle is the primary contributor to this mortality. Other conifer species that may be present in minor amounts include Incense Cedar (*Calocedrus decurrens*), Ponderosa Pine (*Pinus ponderosa*), Lodgepole Pine (*P. contorta* var. *murrayana*) and Red Fir *A. magnifica*. Baker Cypress (*Cupressus bakeri*) is found scattered within stands of White Fir in a small area near Goosenest Mountain, and may have occupied a much larger area in the past, when fires were more frequent on these sites. Shrub cover in the White Fir Series is generally sparse and typically includes shade tolerant species such as Snowberry (*Symphoricarpos* spp.) and Serviceberry (*Amelanchier* spp.). Sites within this Series may also contain montane chaparral species such as Greenleaf Manzanita (*Arctostaphylos patula*) and Snowbrush (*Ceanothus velutinus*) where ground disturbances have occurred. Herbaceous vegetation is also typically sparse because of high tree densities. Grasses such as Mountain Brome (*Bromus marginatus*), Western Needlegrass (*Stipa occidentalis*), Squirreltail (*Sitanion* spp.), *Monardella* spp., and the ericaceous plants Pinedrops (*Pterospora andromedea*), Princes' Pine (*Chimaphila umbellata*), and Wintergreen (*Pyrola* spp.) are often present.

EP Eastside Pine Series

The Eastside Pine Series is dominated by Ponderosa Pine (*Pinus ponderosa*) or occasionally by Jeffrey Pine (*P. jeffreyi*). It has been identified in the Southern Cascades Section at elevations between about 3400 - 6800 ft (1036 - 2074 m) and in the Modoc Section at 4200 - 6600 ft (1280 - 2012 m). Soils are often deep, with a relatively high site potential. This Series blends into the Western Juniper and Low Sagebrush Series in the drier and lower elevational sites. As moisture increases at the higher elevations, and on cooler, more north facing slopes it blends into the Ponderosa Pine - White Fir Series. Inclusions of Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) are present on rocky outcrops. Bitterbrush (*Purshia tridentata*) forms an almost continuous shrub canopy under open pine stands, and where the pine is sparse or absent. This brush is absent in pine thickets and is declining in pine stands under closing canopies. Other shrub associates include Basin Sagebrush (*Artemisia tridentata*), Rabbitbrush (*Chrysothamnus* spp.), Wax Currant (*Ribes cereum*), and Mahala Mat (*Ceanothus prostratus*). These species, particularly Rabbitbrush, tend to

increase on disturbed sites. The herbaceous component is dominated by Idaho Fescue (Festuca idahoensis), Ross' sedge (Carex rossii), Pinegrass (Calamagrostis spp.), Bluebunch Wheatgrass (Agropyron spicatum), Squirreltail (Sitanion spp.), and a number of annual forbs depending on the timing and amount of spring rainfall. Perennial forbs such as Mules Ears (Wyethia mollis) and Arrowleaf Balsamroot (Balsamorhiza sagittata) are found on the moister sites in this Series.

RF Red Fir Series

Shasta Red Fir (Abies magnifica var. shastensis) dominates high elevation forests in the Southern Cascades Section from about 5500 - 7500 ft (1687 - 2288 m), although it is absent from or very limited in the Modoc Plateau Section. It occurs, for example, in areas of Lassen Peak (Lassen - Almanor Subsection), Mt. Shasta and high elevations to the north (High Cascade Subsection) and in the Medicine Lake Highlands Subsection. Lodgepole Pine (Pinus contorta var. murrayana) is a common conifer associate at lower elevations, and subalpine conifers such as Mountain Hemlock (Tsuga mertensiana), Western White Pine (P. monticola), and Whitebark Pine (P. albicaulis) are found as inclusions on some ridge tops, such as in the Lassen Peak area. In some areas, such as around Mt. Shasta and in Medicine Lakes, Red Fir and White Fir (A. concolor) commonly occur together in this Series. Soils in the Red Fir Series are generally deep to very deep. Shrubs and herbaceous plants are sparse under the typically dense growth of Red Fir. Common understory associates in the generally sparse understory includes the shrubs Pinemat Manzanita (Arctostaphylos nevadensis) and, at lower sites, Greenleaf Manzanita (A. patula), Snowbrush (Ceanothus velutinus), Bush Chinquapin (Castanopsis sempervirens) Scoulers' Willow (Salix scouleriana), and Snowberry (Symphoricarpus). Grasses and herbaceous plants such as Western Needlegrass (Stipa occidentalis), Mountain Brome (Bromus marginatus), Squirreltail (Sitanion), upland Sedges (Carex spp.), Strawberry (Fragaria spp.) and Wintergreen (Pyrola spp.) are also occasionally found in this Series.

MH Mountain Hemlock Series

Mountain Hemlock (Tsuga mertensiana) dominates small subalpine areas and those at or just below timberline in some areas of the Southern Cascades Section such as on Lassen Peak and higher north slopes of the Medicine Lakes area. This Series is often found on cold, moist slopes above about 6600 ft (2012 m). Conifers such as Western White Pine (Pinus monticola), Whitebark Pine (P. albicaulis), and an occasional Lodgepole Pine (P. contorta var. murrayana) may also be present in minor amounts. The soils are typically an unconsolidated pumice or volcanic ash. Although these stands are somewhat open, the harsh conditions limit the understory species, which may include the prostrate Pinemat Manzanita (Arctostaphylos nevadensis) and a only a few forbs such as Princes Pine (Chimaphila umbellata).

LP Lodgepole Pine Series

Dense stands of widely scattered Lodgepole Pine (Pinus contorta var. murrayana) are found mainly in the High Cascade and Medicine Lake Highlands Subsections of the Southern Cascade Section at elevations from about 4500 ft (1395 m) to 8000 ft (2480 m). It is also found less commonly in the Modoc Plateau Section. This pine is often confined to gentle slopes in areas of waterlogged soils or high water tables such as near meadows. It will also occur in basin sites that permit cold-air pockets to accumulate as well as in drier areas with shallow soils or those having a relatively recent ground disturbance activity. Lodgepole Pine often associates with Red Fir (Abies magnifica var. magnifica and var. shastensis) and other conifers in the Subalpine Series such as Mountain Hemlock (Tsuga mertensiana) and Western White Pine (P. monticola) at its upper limits and White Fir (A. concolor) at its lower elevations. Western Serviceberry (Amelanchier pallida) or Bitterbrush (Purshia tridentata)

may occasionally be found in forest openings. Quaking Aspen (Populus tremuloides) is occasionally found with Lodgepole Pine in the Southern Cascades Section.

MP Mixed Conifer - Pine Series

This is a mid elevation mixed type occurring between the Eastside Pine and the Mixed Conifer Fir Series near 4000 - 6000 ft (1220 - 1830 m) elevations in the Southern Cascades and Modoc Plateau Sections. Ponderosa Pine (Pinus ponderosa) and/or Sugar Pine (Pinus lambertiana) are prominent in this mixture, which usually includes several other conifers. In this area, this Series commonly includes White Fir (Abies concolor), Sugar Pine (P. lambertiana), Incense Cedar (Calocedrus decurrens), Knobcone Pine (P. attenuata) or Lodgepole Pine (P. contorta var. murrayana). Several oaks may form an understory of this Series or in openings adjacent to it. These include Canyon Live Oak (Quercus chrysolepis), Black Oak (Q. kelloggii), White Oak (Q. garryana) and much less commonly, Interior Live Oak (Qercus wislizenii). Understory shrubs within this Series include Bitterbrush (Purshia tridentata), Greenleaf Manzanita (Arctostaphylos patula), Snowbrush (Ceanothus velutinus), Snowberry (Symphoricarpus spp.), Serviceberry (Amelanchier spp.), Bush Chinquapin (Castanopsis sempervirens) and Mahala Mat (Ceanothus prostratus). Common graminoids are Western Needlegrass (Stipa occidentalis), Idaho Fescue (Festuca idahoensis), Ross' and other sedges (Carex rossii, C. spp.), California Brome (Bromus carinatus) and Blue Wildrye (Elymus glaucus). A variety of annual and perennial forbs is associates in this Series.

KP Knobcone Pine Series

Knobcone Pine (Pinus attentuata) occasionally forms pure and often even-aged dense stands in scattered, burned areas of low to moderate elevations of the Southern Cascades Section. The Series is less common in this region than in areas of northern California. It is usually found below 4800 ft (1464 m), and may occur on lava flows in eastern Shasta and Lassen Counties at about 4000 ft (1220 m). Common associates include the trees Douglas-Fir (Pseudotsuga menziesii), White Fir (Abies concolor), Madrone (Arbutus menziesii), Canyon Live Oak (Quercus chrysolepis), Black Oak (Q. kelloggii), and low to mid elevation chaparral shrubs such as Wedgeleaf Ceanothus and Snowbrush (C. cuneatus, C. velutinus) and Greenleaf Manzanita (Arctostaphylos patula).

PP Ponderosa Pine Series

Pure to nearly pure Ponderosa Pine (Pinus ponderosa) stands occur in a narrow elevational band below the Mixed Conifer - Ponderosa Pine Series and above the chaparral areas. Elevations are usually within about 1500 - 5200 ft (458 - 1586 m) in the Southern Cascades Section. Hardwoods such as Black Oak (Quercus kelloggii), Blue Oak (Q. douglasii), Canyon Live Oak (Q. chrysolepis) and less commonly, White Oak (Q. garrayana) are common associates in this area. Douglas-Fir (Pseudotsuga menziesii), Incense Cedar (Calocedrus decurrens) may also be present in minor amounts in this Series, with White Fir (Abies concolor) occurring less commonly. The pine may become the dominant conifer on well drained, often droughty, non-serpentinized soils such as coarse-textured alluvial sites and southwest-facing or steep slopes. However, its occurrence in pure stands is limited in the North Interior Ecological Zone but it is prominent in the Shingletown - Paradise Subsection of the Southern Cascades Section.

WB Whitebark Pine Series

In the North Interior Ecological Zone, Whitebark Pine (Pinus albicaulis) becomes the primary frostline (upper timberline) conifer of certain exposed, often northerly ridges near 7800 - 10000 ft (2380 - 3050 m). These areas occur, for example, in Goosenest Mtn., China Mtns., the Eddies, and southern Warner Mountains, Ball Mountain area and on Mt. Shasta. Sites are usually very open and rocky with little Vegetation Composition. Tthe understory is

generally sparse except for a few perennial grasses and forbs, although Bush Chinquapin (Castanopsis sempervirens) grows in some adjacent rock outcrop sites. Red Fir (Abies magnifica) and Jeffrey Pine (Pinus jeffreyi) may occasionally be found at the lower elevations of this type. The Whitebark Pine Series grades into the Subalpine Conifer type where greater species diversity exists to include such species as Lodgepole Pine (P. contorta var. murrayana) and Western White Pine (P. monticola).

MO Baker (Modoc) Cypress Series

The major site of this Series is in the southwest corner of Modoc County. It is occupied by Baker Cypress (Cupressus bakeri), occurring on brush fields from 3500 - 4000 ft (1068 – 1220 m) on recent lava flows and on basalt. It is a common geographical associate of the Mixed Conifer - Pine Series. Associated species may include Western Juniper (Juniperus occidentalis), Ponderosa Pine (Pinus ponderosa), and Basin or Big Sagebrush (Artemisia tridentata).

WJ Western Juniper Series

Conifer areas in which Western Juniper (Juniperus occidentalis var. occidentalis) is dominant occur as inland or semi-desert environments of moderate elevations (below about 5600 ft or 1708 m). It is very common in the Modoc Plateau Section. Annual average precipitation in these eastern regions is usually less than 15" (38 cm)/year. The species is typically found in pure stands on southern and southwestern exposures and on steep slopes having shallow soil profile development. It intergrades with the Eastern Pine Series and semi-desert shrub types such as the Curlleaf Mountain Mahogany (Cercocarpus ledifolius) Series. Other common associates include the conifer Ponderosa Pine (P. ponderosa) and shrubs such as Greenleaf Manzanita (Arctostaphylos patula), Bitterbrush (Purshia tridentata), Basin and Low Sagebrush (Artemisia tridentata, A. arbuscula), Rabbitbrush (Chrysothamnus spp.) and Mahala Mat (Ceanothus prostratus). Areas with less past disturbance patterns may contain native grasses such as Thurber's Needlegrass (Stipa thurberiana), Western Needlegrass (Stipa occidentalis), and Bluebunch Wheatgrass (Agropyron spicatum).

DF Pacific Douglas-Fir Series

Pacific Douglas-Fir (Pseudotsuga menziesii) occurring in pure stands is very limited in the North Interior Ecological Zone. Douglas-Fir sites are more often mixed with Ponderosa Pine (Pinus ponderosa) or less commonly with White Fir (Abies concolor) in this region. This Series tends to occur on mesic soils, primarily on north-facing slopes in the southwestern part of the project area, and adjacent to drainages. The elevational band is below the Mixed Conifer - Fir Series and coincides with the Ponderosa Pine Series, in the range approximately 1500 - 4800 ft (458 - 1464 m). Canyon Live Oak (Quercus chrysolepis) becomes a dominant understory species on steep slopes.

SA Subalpine Conifer Series

Small areas of the North Interior Ecological Province have a mixture of conifers at the higher elevations, commonly above 6500 ft (1982 m) or just below timberline in the Mt. Shasta area. No single species is dominant. This Series has been identified mainly in the High Cascades Subsection of the Southern Cascades Section. Combinations of Red Fir (Abies magnifica var. magnifica and var. shastensis), Western White Pine (Pinus monticola), Lodgepole Pine (Pinus contorta var. murrayana) and Whitebark Pine (Pinus albicaulis) may be present in this area. Shrubs such as Pinemat Manzanita (Arctostaphylos nevadensis), Curlleaf Mtn. Mahogany (Cercocarpus ledifolius), and Bush Chinquapin (Castanopsis sempervirens) may occur on drier sites of this Series.

MN McNab Cypress Series

McNab Cypress (Cupressus macnabiana) associates in small groves with Gray Pine (Pinus sabiniana) and various Scrub Oak (Quercus spp.) and chaparral species. Its elevation range is 980 - 2790 ft (300 - 850 m). This Cypress is occasionally found on low - elevation ridgetops in harsh, rocky areas, such as the Ishi Wilderness, or scattered among woodlands at lower elevations in relict stands north of its main areas of concentration.

PD Gray Pine Series

This open conifer series is primarily found in the low-elevation foothills, front country and steep, drier canyons, generally below about 4000 ft (1220 m). It has been identified in scattered areas of the Hat Creek Rim and Shingletown - Paradise Subsections and elsewhere in the Southern Cascades Section. The sparsely leaved Gray Pine (Pinus sabiniana) is usually the only conifer in this series, but the sites are typically diverse in structure. A mixture of hardwoods such as Canyon Live Oak (Quercus chrysolepis), Oregon White Oak (Q. garryana), Interior Live Oak (Q. wislizenii) and Blue Oak (Q. douglasii) and low-elevation chaparral shrubs such as Wedgeleaf Ceanothus (C. cuneatus) and Whiteleaf and Common Manzanitas (Arctostaphylos viscida, A. manzanita) occur.

Hardwood Forest/Woodland

QC Canyon Live Oak Series

The Canyon Live Oak (Quercus chrysolepis) Series generally occurs on steep, colluvial, low elevation slopes and associates with the Blue Oak (Quercus douglasii), Ponderosa Pine (Pinus ponderosa), and chaparral Series. The oak series occurs sparsely in the Southern Cascades Ecological Province of this region; and cannot be found east of Mount Lassen. Steep, rocky south slopes of major river canyons often are clothed extensively by Canyon Live Oak (Quercus chrysolepis) and, in the southern parts of this section, occasionally also with Douglas-Fir (Pseudotsuga menziesii) individuals.

QK Black Oak Series

Black Oak (Quercus kelloggii) occurs as a dominant species in scattered areas of the Southern Cascades Section and mainly in the Big Valley Mountains Subsection of the Modoc Plateau Section. It can occur in pure stands in forest openings of the Eastside Pine and Mixed Conifer - Pine Series in this region. In the Hat Creek Rim Subsection, Big Leaf Maple (Acer macrophyllum) may be a common associate. In the Modoc Plateau Section, Black Oak associates with the conifers such as Pinus ponderosa, P. jeffreyi and White Fir (Abies concolor). Incense Cedar (Calocedrus decurrens) may occasionally be found in this Series towards the southern portions of the Southern Cascades Section, but Black Oak is absent from the Warner Mountains. As the interior sections become increasingly more xeric with distance away from the coast, Black Oak may occasionally be found near riparian zones or on steeper slopes, sometimes associating with Western Juniper (Juniperus occidentalis) in these areas.

QJ Cottonwood - Alder Series

Moderate to moderately high riparian areas are sometimes dominated by Black Cottonwood (Populus trichocarpa) and White Alder (Alnus rhombifolia), in combination with or without Mountain Alder (Alnus tenuifolia). These hardwoods, any of which may become locally dominant, occur adjacent to streams, perennial seeps, and meadows. Oregon Ash (Fraxinus latifolia), Willows (Salix spp.) and a high diversity of forbs are common associates. This Series occurs sparsely in the Southern Cascades (Lassen - Almanor and Shingletown - Paradise Subsections), Northeastern Basin and Range (mainly in the Sheldon Range Subsection) and more rarely in the Modoc Plateau Section. Elevations are of the order 4500

- 7400 ft (1372 - 2256 m) in the easternmost areas and 3000 - 4000 ft (914 - 1220 m) in the western subsections.

QQ Quaking Aspen Series

Scattered, relict stands of Aspen (Populus tremuloides) occur along streamcourses and as an indicator of moist conditions on upland sites in this region. It is more likely to be identified in the Southern Cascades Section than in the Modoc or Northeastern Basin and Range Sections. Soils typically have a mollic epipedon and occur in mesic and frigid temperatures regimes. Willow (Salix spp.), Mountain Alder (Alnus tenuifolia), and Lodgepole Pine (Pinus contorta var. murrayana) are common associates. The understory species include numerous grasses and forbs such as Kentucky bluegrass (Poa pratensis), Redtop (Agrostis spp.), Timothy (Phleum pratense), Clover (Trifolium spp.), Cinquefoil (Potentilla spp.), and a variety of Sedges (Carex spp.).

QD Blue Oak Series

Blue Oak (Quercus douglasii) savannas occur sparsely, mainly in the southeastern edges of the Southern Cascades Section (Shingletown - Paradise Subsection) of the North Interior Ecological Zone. The Series is found at low elevations, usually below 3000 ft (914 m). It intergrades in this area with the Canyon Live Oak and the low - elevation Sierran Mixed Chaparral Series, as well as with dry and annual grasslands series. Scattered Gray Pine (Pinus sabiniana) may also occur within the Blue Oak Series, but the pine is not dominant in the canopy. The primary understory species include annual grasses and forbs.

QW Interior Live Oak Series

Interior Live Oak (Quercus wislizenii) occurs as the dominant of this hardwood Series. This oak does not commonly occur in the North Interior Ecological Zone, but it is more likely to be found in its tree form in the Shingletown - Paradise Subsection of the Southern Cascades Section at elevations of 2000 - 3400 ft (610- 914 m). It is often seen as a shrub (var. frutescens) within the Canyon Live Oak (Q. chrysolepis) or the low elevation Sierran Mixed Chaparral Series. Scattered Gray Pine (Pinus sabiniana) may occur within this Series.

QG Oregon White Oak Series

This Series, dominated by the shade - intolerant Oregon White Oak (Quercus garryana) occurs on gentle slopes and often shallow or otherwise less productive soils in the Southern Cascades Section. It has been identified in its tree form (var. garryana) in scattered stands in the Klamath River Watershed (Parker Mountain Flats and Old Cascades Subsections) and Pit River Watershed (Hat Creek Rim and Medicine Lake Highlands Subsections). It occurs from Shasta Lake to southwestern Modoc County, occurring less commonly towards the east, being identified in several scattered stands in the Big Valley Mountains Subsection of the Modoc Plateau Section. This series intermingles with and may form a hardwood understory of the Ponderosa Pine (Pinus ponderosa) vegetation types, including the Ponderosa Pine, Mixed Conifer - Pine, and Douglas-Fir - Ponderosa Pine Series. Common associates also include Gray Pine (Pinus sabiniana), Whiteleaf Manzanita (Arctostaphylos viscida), annual grasses, Blue Oak (Q. douglasii), Black Oak (Q. kelloggii), and low elevation chaparral types. In Tehama County, Oregon White Oak occurs as a shrub form. A mixture of Oregon White Oak, Ponderosa Pine and Western Juniper (Juniperus occidentalis) are often found on volcanic substrates towards the northeastern areas of the North Interior Ecological Zone at elevations below about 4500 ft (1372 m). Understory associates in this area include Sierra Plum (Prunus subcordata), Chokecherry (Prunus virginiana), Bitter Cherry (Prunus emarginata), Gooseberry (Ribes spp.), Squirreletail (Sitanion spp.), Blue Wildrye (Elymus glaucus) and a variety of forbs.

QO Willow Series

This riparian stringer-like Series is defined by shrub or tree-sized willows of any species (Salix spp.) in the wettest portion of riparian floodplains or wet meadows of the North Interior Ecological Zone. It occurs sparsely throughout the area but is found most commonly within the Modoc Plateau Section at elevations of 4200 - 5400 ft (1280 - 1648 m). Willows dominate these stream or seepage areas to the exclusion of other riparian species but other species such as Aspen or the Cottonwoods (Populus spp.) and White Alder (Alnus rhombifolia) may occur in small amounts. Species of Gooseberry and Currant (Ribes spp.), Blackberry and other edible berries (Rubus spp.), Wild Rose (Rosa spp.) and Western Poison Oak (Toxicodendron diversilobum) are associated with the series, but not as obligate hydrophytes. The herbaceous layer is primarily Sedges (Carex spp.) and numerous grasses and forbs. The most common willows in this general area are Lemmon Willow (S. lemmonii), Pacific Willow (S. lasiandra) and Narrowleaf Willow (S. exigua). Aspen (Populus tremuloides) and White Alder (Alnus rhombifolia) also occasionally occur in this Series.

Shrubs and Chaparral

CM Montane Chaparral Series

This mixed shrub Series occurs in harsh site, exposed ridge tops from 6000 - 9000 ft (1830 - 2744 m) in scattered locations of the North Interior Ecological Zone. The Series has been identified less commonly in the Modoc Plateau than in the Southern Cascades Section and even more rarely in the Northwestern Basin and Range Section. The major species include Pinemat Manzanita (Arctostaphylos nevadensis), Bush Chinquapin (Castanopsis sempervirens) and Shrub Tanoak (Lithocarpus densiflorus var. echinoides), which can occur locally in pure stands or in various mixes. This Series generally occurs in geographical association in and above the Mixed Conifer - Fir and Red Fir Series as well as above timberline. Occasional associates include Cream Bush (Holodiscus microphyllus), Bitter Cherry (Prunus emarginata), and Greenleaf Manzanita (Arctostaphylos patula).

CL Wedgeleaf Ceanothus Series

This Wedgeleaf Ceanothus (Ceanothus cuneatus) dominated series occurs sparsely in the Southern Cascades Section below an elevation of about 4000 ft (1220 m), especially in the Shasta Valley. It is much more common in areas to the south (Sierra Nevada Foothills Section) and west (Klamath Mountains Section). It invades some disturbed or burned areas and is generally an indicator of a good growing site when dominant, but is more typically a component of the lower-elevation mixed chaparral series elsewhere. In this area, it is found mainly in the Old Cascades Subsection towards the northeast of this Section with its shrub associates Greenleaf and Whiteleaf Manzanita (Arctostaphylos patula, A. viscida).

CC Sierran Mixed Chaparral Series

A low-elevation mixed chaparral Series has been identified in the Southern Cascades (commonly found in the Hat Creek Rim and Shingletown - Paradise Subsections) and Modoc Plateau Section (mainly in the Fall River Valley, Big Valley Mtns. and Bald Mtn. - Dixie Valley Subsections) at elevations generally under 4500 ft (1372 m). It differs from but occasionally intergrades with another mixed chaparral series found in the northwestern North Interior Ecological Zone areas. This Series generally has an absence of more western low elevation shrub species such as Toyon (Heteromeles arbutifolia) and Chamise (Adenostoma fasciculatum). Its indicator species are Wedgeleaf Ceanothus (Ceanothus cuneatus) and Whiteleaf Manzanita (Arctostaphylos viscida) in western areas such as Shasta Valley. Species such as Sierra Plum (Prunus subcordata), Bitter Cherry (P. emarginata), Ribes spp., Birchleaf Mountain Mahogany (Cercocarpus betuloides), Creeping Snowberry (Symphoricarpus mollis), and, at the upper elevations of this Series, Greenleaf Manzanita

(A. patula) are commonly found within this Series in this area and other parts of its distribution.

CX Montane Chaparral Series

This Series is a mixed shrub type containing species such as Greenleaf Manzanita (Arctostaphylos patula), Deerbrush (Ceanothus integerrimus) and Snowbrush (Ceanothus velutinus). It is common throughout the North Interior Ecological Zone at elevations above about 4500 ft (1372 m). Other species include Mountain Whitethorn (Ceanothus cordulatus), Bitter Cherry (Prunus emarginata), Bush Chinquapin (Castanopsis sempervirens), Gooseberry (Ribes spp.), and Serviceberry (Amelanchier pallida) may occur in this Series. Greenleaf Manzanita, a stump-sprouter, is scattered throughout the Mixed Conifer - Fir Series. Large stands of this type occur on the eastside where stand - replacing fires or silvicultural activities have removed the conifers. On eastside slopes, Basin Sagebrush (Artemisia tridentata), Snowbrush, Huckleberry Oak (Quercus vaccinifolia), and the grass Squirreltail (Sitanion hystrix) may occur as associated species with montane chaparral.

CG Greenleaf Manzanita Series

This Series may occur on the lowest elevations of the Southern Cascades Section, especially in the Shasta Valley below the Montane Chaparral Series. However, it usually is found in this area in pure stands at higher elevations, above about 4500 ft (1372 m). It forms almost pure stands following intense fires and heavy soil disturbance partially due to its vigorous stump-sprouting abilities. The soils are typically deep with surface textures that drain rapidly. Deeply rooted species such as the manzanita and its associates Western Juniper (Juniperus occidentalis), Basin Sagebrush (Artemisia tridentata), and Bitterbrush (Purshia tridentata) are able to occupy these extremely droughty soils. Cheatgrass (Bromus tectorum) and annual forbs are common in the understory, utilizing the fall and spring rains. Native grasses from these historic grasslands still exist in scattered patches, and include Western Needlegrass (Stipa occidentalis), Squirreltail (Sitanion hystrix), and Needle-and-Thread (Stipa comata). Greenleaf Manzanita is shade intolerant and will eventually diminish as tree stand canopy increases.

CS Shrub Oak Series

This mixed Shrub Oak Series is rare in this area, intergrading with the Sierran Mixed Chaparral Series below about 5000 ft (1524 m) and forming localized patches within it. It has been identified only in the extreme southwestern parts of the Southern Cascades Section (Shingletown - Paradise Subsection) in this Zone and in the adjoining Sierra Nevada Foothills Section (Tuscan Flows Subsection) of the Central Valley Ecological CALVEG Zone. The Series is dominated by Scrub Oak (Quercus berberidifolia) and shrub forms of Interior Live Oak (Q. wislizenii var. frutescens), Oregon White Oak (Q. garryana var. breweri or var. garryana) and Canyon Live Oak (Q. chrysolepis var. nana). Species within this series stump sprout after fire and may fully occupy the site within ten years. Since there is hybridization between the Quercus species, identifications are sometimes difficult to make.

BM Mountain Mahogany Series

This series is dominated by Curleaf Mountain Mahogany (Cercocarpus ledifolius), occurring on rocky outcrops such as scarp offsets, colluvial slopes, and lava pressure ridges throughout the North Interior Ecological Zone. It is found in this area commonly at elevations in the range 3000 - 8000 ft (915 - 2440 m). These stands are most commonly found as inclusions in the Eastside Pine and Western Juniper Series. On more xeric sites, Basin Sagebrush (Artemisia tridentata), Idaho Fescue (Festuca idahoensis), Squirreltail (Sitanion hystrix), and a few other grasses and forbs often occur as associates. On more

mesic sites, such associates may include Western Juniper (Juniperus occidentalis), scattered Ponderosa Pine (Pinus ponderosa), and a variety of other shrubs. Due to its low tolerance to fire, Curlleaf Mountain Mahogany is restricted to rocky areas and many of its stands are relatively old due to their locations in low-frequency fire areas, which lack deep soil profiles and do not support much understory vegetation. This dominant species may occur in two growth forms: a shrub form that occurs in sites that are more scattered and a small tree form that occurs in dense thickets.

CQ Northern Mixed Chaparral

A mesic, mixed shrub, low-elevation Series can be identified in western portions of the Southern Cascades Section at elevations from about 2500 - 4500 ft (762 - 1372 m). Occurring much more commonly in the North Coast Ecological Zone, it is found in scattered patches in this Zone in the Old Cascades, Shingletown - Paradise and more rarely in the Hat Creek Rim Subsections. The mixture includes species such as Wedgeleaf and Lemmon Ceanothus (C. cuneatus, C. lemmonii), Whiteleaf Manzanita (Arctostaphylos viscida), shrubby California Buckeye (Aesculus californica), Toyon (Heteromeles arbutifolia), Gray Pine (Pinus sabiniana), and some Chamise (Adenostoma fasciculatum). Toyon and Chamise are generally absent in the Sierran Mixed Chaparral Series, with which this Series intergrades in the Shasta Valley and other areas.

Sagebrush Shrub

BS Basin Sagebrush Series

Basin Sagebrush (Artemisia tridentata) occurs as a dominant shrub species over much of the North Interior Ecological Zone. This Series, in which it is the dominant shrub, is usually found on volcanic and basaltic flows, which form broad, flat expanses. This Series is often found on meadow edges, and occupies old meadow sites with lowered water tables. Bitterbrush (Purshia tridentata), Rabbitbrush (Chrysothamnus nauseosus), Wheatgrass (Agropyron spp.), and Fescue (Festuca spp.) are associated species. Black Sagebrush (A. nova) becomes dominant on shallow, or stoney, gravelly soils in the forest openings. Silver Sagebrush (A. cana) becomes dominant in soils with high calcium carbonate concentrations, where the soil remains saturated through the spring. On low flats with shallow soils and restricted drainage, Low Sagebrush (A. arbuscula) may be locally dominant. Basin Sagebrush also occurs with Ponderosa Pine (Pinus ponderosa) and Birchleaf Mountain Mahogany (Cercocarpus betuloides) on gentle to steep slopes without rock outcrops. Other associates include Juniper (Juniperus spp.), Greenleaf Manzanita (Arctostaphylos patula), Squirreltail (Sitanion hystrix), Great Basin Wild Rye (Elymus cinereus) and KentuckyBluegrass (Poa pratensis). Sagebrush occurs at a wide range of middle elevations, up to an elevation of about 6500 ft (1982 m) or higher. At lower elevations and on drier sites, it gives way to such species as Saltbush (Atriplex spp.), and Greasewood (Sarcobatus vermiculatus). At mid-elevations and on more mesic sites the habitat includes species such as Bitterbrush, Curlleaf Mountain Mahogany (C. ledifolius) and Western Serviceberry (Amelanchier pallida). At high elevations, it intergrades with Quaking Aspen (Populus tremuloides) in some areas.

BL Low Sagebrush Series

Low Sagebrush (Artemisia arbuscula) is generally restricted to basins with clay and hardpan soils of glacial outwash plains or shallow soils of lava flows. These soils are commonly saturated in the spring and early summer. When in association with the Bitterbrush Series, the vegetation reflects a mosaic of shallow and deep soil conditions; the Bitterbrush (Purshia tridentata) on the deeper and more well drained sites and the Low Sagebrush on shallow, harsher sites. Other associated shrubs include Buckwheat (Eriogonum spp.) on shallower sites and Basin Sagebrush (Artemisia tridentata) and Rabbitbrush

(Chrysothamnus spp.) on slightly deeper and more loamy soils. The understory may include grasses such as Idaho Fescue (Festuca idahoensis), One Spike Oatgrass (Danthonia unispicata), Hairgrass (Deschampsia spp.), Junegrass (Koeleria spp.), Sandberg's Bluegrass (Poa incurva) and Squirreltail (Sitanion hystrix). Many forbs are associated with this series including a number of hydrophytes in the ponded sites. Oregon Yampah (Perideridia oregana), Lomatium spp. and Wild Onion (Allium spp.) are common herbaceous associates of this series.

BC Saltbush Series

Saltbush (Atriplex spp.) dominates fluvial lakes with saline soils. These fine textured, saline deposits are the result of erosion of the surrounding volcanics. Fluvial lakes occur mainly at Honey Lake and Surprise Valley; however smaller saline basins are located throughout the Modoc Plateau. Greasewood (Sarcobatus vermiculatus) and Black Sagebrush (Artemisia nova), Rabbitbrush (Chrysothamnus spp.), and a few grass species also may occur in this Series.

BR Rabbitbrush Series

Rubber Rabbitbrush (Chrysothamnus nauseosus) has been identified in pure stands on disturbed sites in northern areas of the Southern Cascades Section (more commonly in the Butte Valley Subsection, but also found occasionally in the Medicine Lake Lava Flows, Medicine Lake Highlands and High Cascades Subsections). These sites have been mapped on low elevation dry slopes and flats at elevations below about 5000 ft (1525 m), above which the Series usually grades into a Bloomers Rabbitbrush (C. bloomeri) type. Typical sites include farmed rangelands, areas, which burned, road berms and silvicultural units in which the plantations have failed. These stands are persistent and sprout when burned or mechanically disturbed. Associated tree and shrub species may include Bitterbrush (Purshia tridentata), Sagebrush (Artemisia spp.), Jeffrey Pine (Pinus jeffreyi), Western Juniper (Juniperus occidentalis), Buckwheat (Eriogonum spp.), Blackbush (Coleogyne ramosissima), and Mormon Tea (Ephedra trifurca). Other grass species include Cheatgrass (Bromus spp.), Squirreltail (Sitanion hystrix), historically planted Wheatgrasses (Agropyron spp.) and a variety of annual forbs.

BB Bitterbrush Series

This Series is characterized by almost pure stands of Bitterbrush (Purshia tridentata), often within the same elevations and soils as the Eastside Pine and Western Juniper Series. It is very common in this Zone in the Southern Cascades and Modoc Plateau Sections and has been identified at elevations within the general range 4000 - 6500 ft (1220 - 1982 m). The abundance of Bitterbrush is relative to the canopy of the associated conifers, Ponderosa Pine (Pinus ponderosa) and Western Juniper (Juniperus occidentalis). Bitterbrush forms an almost continuous shrub canopy at low forest densities and is absent in pine thickets. Decadent bitterbrush may occur on lower elevation sites where precipitation is low and pine regeneration is poor. Western Juniper tends to increase its occurrence on these sites. Inclusions of Curlleaf Mountain Mahogany (Cercocarpus ledifolius) may occur on shallow lava outcrops in this Series. Other shrub associates include Basin Sagebrush (Artemisia tridentata), Rabbitbrush (Chrysothamnus spp.), Wax Currant (Ribes cereum) and Mahala Mat (Ceanothus prostratus), some of which may increase on disturbed sites, particularly at lower elevations. Rabbitbrush and Cheatgrass (Bromus tectorum) may occupy very disturbed sites in place of Bitterbrush. The dominant graminoids of the Bitterbrush Series include Idaho Fescue (Festuca idahoensis), Squirreltail (Sitanion hystrix), Ross' sedge (Carex rossii), Cheatgrass and annual forbs.

BG Black Greasewood Series

Black Greasewood (*Sarcobatus vermiculatus*) dominates a mound/intermound complex in the Meiss Lake basin playa of the northeastern area of the Southern Cascades Section (Butte Valley Subsection) that contains alkaline and saline soils. It has been mapped only at elevations between 4200 - 4400 ft (1280 - 1342 m). Vernal ponding occurs in the depressions which are shallow to a hardpan and which support very little vegetation. The mounds are habitat for the shrubs and their understory in this Series. Spiny Hopsage (*Grayia spinosa*) is a common associate within the Series, except in disturbed soils where Rubber Rabbitbrush (*Chrysothamnus nauseosus*) dominates. A sparse understory of grass and forbs includes Squirreltail (*Sitanion* spp.), Sandberg's Bluegrass (*Poa sandbergii*), Saltgrass (*Distichlis spicata*) and Cheatgrass (*Bromus tectorum*). Great Basin Wildrye (*Elymus cinereus*) may also be present in areas with little or late season grazing and historically made up a significant portion of the cover. Poverty Weed (*Iva axilaris*) and other hydrophytes occur in the ponded depression. The mounds themselves contain a variety of forbs.

Alpine Dwarf Scrub

AX Mixed Alpine Scrub Series

The Mixed Alpine Scrub Series contains a mixture of low graminoid and forb species in addition to dwarf shrubs, which often develop cushion or rosette, forms. Species composition varies considerably throughout California. In the Warner Mountains, for example, this Series includes Rock Cress (*Arabis* spp.), Pussy Paws (*Calyptridium umbellatum*), and Squirreltail (*Sitanion hystrix*). The most common shrubs in this area are Rock Spiraea (*Holodiscus microphyllus*), Greene and Macronea Goldenbush (*Haplopappus greenei*, *H. macronea*), and Mountain White Heather (*Cassiope mertensiana*). Non-shrub species also include Sedges (*Carex* spp.), Knotweed (*Polygonum* spp.), Rosy Pussytoes (*Antennaria rosea*), Eschscholtz's Buttercup (*Ranunculus eschscholtzii*), Bush Cinquefoil (*Potentilla fruticosa*), Creeping Sibbaldia (*Sibbaldia procumbens*), Bluegrass (*Poa* spp.), Buckwheat (*Eriogonum* spp.), Alpine Spring Beauty (*Claytonia bellidifolia*), Indian Paintbrush (*Castilleja* spp.) and Denseleaf Draba (*Draba densifolia*).

Herbaceous

HG Annual Grass - Forb Series

Annual grasslands occur at relatively low elevations (below about 5400 ft or 1646 m) in scattered areas of this Zone. These areas are often stands of introduced (non-native) annual grasses that occupy formerly perennial native grasslands which have been disturbed through fire, agriculture, livestock grazing and the like. Cheatgrass (*Bromus tectorum*) and a variety of annual forbs are the most common species in the Butte and Redrock Valleys (Likely Tableland Subsection of the Southern Cascades Section). Dwarf and Oregon Woolly Marbles (*Psilocarphus brevissimus*, *P. oregonus*), Starthistle (*Centaurea* spp.) Filaree (*Erodium* spp.) and Wild Oats (*Avena* spp.) are also common in this Series. Small areas of perennial grasses, found in moist, lightly grazed or relic prairie areas may be included here, being represented by species of Needlegrass (*Stipa* spp.) and Idaho Fescue (*Festuca idahoensis*). Vernal pools, found in small depressions with a hardpan soil layer also may occur adjacent to or within these areas. The latter support the more mesic herbaceous species such as *Downingia* spp. and Meadowfoam (*Limnanthes* spp.).

HJ Wet Meadows (Grass - Sedge - Rush) Series

The characteristic vegetation of this series varies from a grass-sedge-rush typically found along meadows adjacent to stream courses to an emergent marsh community adjacent to

lower elevation lakes in this Zone. Wet meadows occur on level or gently sloping sites with water available through the growing season. Included in this Series are the grasses Hairgrass (Deschampsia spp.), Timothy (Phleum spp.), and Alkaligrass (Puccinellia spp.). Common forbs include Clover (Trifolium spp.), False Hellebore (Veratrum californicum), Monkeyflower (Mimulus spp.) and Buttercup (Ranunculus spp.). Shrub and tree cover is usually sparse, but may be important at the meadow or water's edge. These species may include Willow (Salix spp.), Aspen (Populus tremuloides), White Alder (Alnus rhombifolia) and Lodgepole Pine (Pinus contorta var. murrayana). The timing and reliability of available water largely determines the vegetational stability of the species composition of this Series. Areas having seasonal hydric fluctuations are often populated by species not dependant on constant water level such as Douglas' Sedge (Carex douglasii), certain Rushes (Juncus spp.), Bluegrass (Poa spp.), Needlegrass (Stipa spp.), and annual grasses such as Oatgrass (Danthonia spp.). Some meadows are often bordered by Basin sagebrush (Artemisia tridentata) and Rabbitbrush (Chrysothamnus spp.). The emergent marsh type of this Series includes Bulrush (Scirpus spp.), Cattail (Typha spp.), Spikerush (Eleocharis spp.), Sedges (Carex spp.), and Rushes (Juncus spp.).

GR Grass Series

Large areas of the North Interior Ecological Zone have been mapped as dry grassland but it is sometimes not possible to determine species composition. Historically, perennial native grasslands such as Western Needlegrass (Stipa occidentalis) and Thurbers' Needlegrass (Stipa thurberiana) have dominated these areas, but influences such as fire suppression and grazing have altered the species compositions, often to annual grasslands. However, perennial grasslands still occur in this project area. At higher elevations in the Southern Cascades Section, as well as further east, perennial grasses occur intermixed with conifer forests. Common plant species include Needlegrass (Stipa spp.), Squirreltail (Sitanion hystrix) and Wild Rye (Elymus spp.). Throughout the Red Fir, Eastside Pine, and Western Juniper Series, Mule Ears (Wyethia mollis) dominates open patches on coarse, gravelly soils. Associated forb and grass species include Rock Cress (Arabis spp.), Monardella (Monardella spp.) and Buckwheat (Eriogonum spp.). Annual grasslands in the Modoc Plateau are often dominated by Cheatgrass (Bromus tectorum), occurring as a direct result of fire. These grasslands are occasionally associated with the Basin Sagebrush Series. Pasture vegetation is a mix of perennial grasses and legumes that vary according to management practices, including perennial bunchgrasses introduced from Eurasia such as Crested, Pubescent, Tall and Intermediate Wheatgrasses (Agropyron desertortum, A. trichophorum, A. elongatum and A. intermedium). Ryegrasses (Elymus spp.), Tall Fescue (Festuca arundinacea), Dallisgrass (Paspalum dilatatum), Strawberry Clover (Trifolium fragiferum) and others are generally found in northern California.

South Coast and Montane Ecological Province

Conifer Forest/Woodland

DM Bigcone Douglas-Fir Series

Bigcone Douglas Fir (Pseudotsuga macrocarpa) stands are found in the Transverse and Peninsular Ranges from the Mt. Pinos region south. On protected, mesic canyon slopes, Bigcone Douglas Fir is locally dominant with Canyon Live Oak (Quercus chrysolepis) as an associate at elevations as low as 1000 ft (305 m) or less up to 7000 ft (2135 m) or more, but is not dominant at high elevations. It occurs intermingled with trees of the Mixed Conifer - Pine and Mixed Conifer - Fir Series in its higher elevations such as Ponderosa Pine (Pinus ponderosa) and Sugar Pine (P. lambertiana).

EP Eastside Pine Series

Jeffrey Pine (*Pinus jeffreyi*) dominates this open forest type that is found mainly on the transmontane side of the crest of the San Bernardino Mountains. This series is often associated with Western Juniper (*Juniperus occidentalis*) or other Junipers but Black Oak (*Quercus kelloggii*) is absent. Great Basin species such as Basin Sagebrush (*Artemisia tridentata*), Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) and Desert Bitterbrush (*Purshia glandulosa*) are associated understory species of this type. Birchleaf Mountain Mahogany (*Cercocarpus betuloides*) may also regularly occur. Elevations are in the range 6800 - 9000 ft. (2074 - 2745 m), or slightly higher in the eastern San Bernardino Mtns.

KP Knobcone Pine Series

Knobcone Pine (*Pinus attenuata*) reaches its southernmost extent in the United States in the San Bernardino (San Bernardino NF) and Santa Ana Mountains (Cleveland NF) at elevations from about 3800 to 4000 ft (1160 - 1220 m). This closed-cone conifer has a chaparral understory and occurs in a region of ultramafic soils in the Santa Ana Mtns., and generally shallow or coarse soils in the San Bernardino Mtns. Shrubs such as *Ceanothus* spp. and Manzanitas (*Arctostaphylos* spp.) are common in this Series.

JP Jeffrey Pine Series

Pure Jeffrey Pine (*Pinus jeffreyi*) stands occur in desert-facing areas of the South Coast, Transverse and Peninsular Ranges, such as in the Cedar Creek drainage of Cleveland National Forest west of Anza Borrego Desert State Park. Elevations are generally 4500 - 8000 ft (1380 - 2745 m). Jeffrey Pine in this area forms open forests with montane chaparral or Basin Sagebrush (*Artemisia tridentata*) understory species. It is often found with a significant Black Oak (*Quercus kelloggii*) component but without a *Juniperus* spp. understory. Ponderosa Pine (*P. ponderosa*) may form a component of this Series and may hybridize with Jeffrey Pine where the ranges overlap.

MF Mixed Conifer - True Fir Series

This is a more mesic phase of the Mixed Conifer - Pine Series, generally occurring on north-facing slopes between elevations of about 5800 - 9000 ft (1770 - 2745 m) in the South Coast, Transverse and northern Peninsular Ranges. It also occurs in the southern Peninsular Ranges at lower elevations. True fir (usually White Fir or *Abies concolor*) comprises a prominent portion of the conifer canopy cover. Jeffrey Pine (*Pinus jeffreyi*) often is present on south-facing slopes at these elevations. Lodgepole Pine (*P. contorta* var. *murrayana*) may replace Jeffrey Pine on some sites. The combination of species includes at least three prominent conifers, including possibly Sugar Pine (*P. lambertiana*) and Incense Cedar (*Calocedrus decurrens*) in addition to those mentioned above. This type is usually found above the Mixed Conifer-Pine Series.

MP Mixed Conifer - Pine Series

This Series occurs throughout the Transverse and Peninsular Ranges on mid- to high montane sites above about 4800 ft (1460 m) and below the Subalpine Conifer and Mixed Conifer - True Fir Series. No single species is dominant, the conifer mixture usually including prominent Ponderosa Pine (*Pinus ponderosa*) or Sugar Pine (*P. lambertiana*), particularly at the lower elevations. At least two other conifers are usually present, including Incense Cedar (*Calocedrus decurrens*), White Fir (*Abies concolor*), Bigcone Douglas-Fir (*Pseudotsuga macrocarpa*) or Coulter Pine (*Pinus coulteri*). Jeffrey Pine (*P. jeffreyi*) and Lodgepole Pine (*P. contorta* var. *murrayana*) are generally absent. Black Oak (*Quercus kelloggii*) is a commonly occurring hardwood associate.

MC Cuyamaca Cypress Series

Cuyamaca Cypress (Cupressus arizonica var. stephensonii), the rarest cypress in California, occurs in relict stands near Japacha Peak (Cleveland NF and adjacent Cuyamaca Rancho State Park). Sites are at elevations of about 4000 - 5800 ft (1220 - 1770 m), in an area of relatively high precipitation for southern California and on gabbro (clayey) soils. Fire history determines potential survival of this closed-cone cypress, since it is subject to devastating chaparral fires. Chaparral shrub associates include Chamise (Adenostoma fasciculatum), Eastwood Manzanita (Arctostaphylos glandulosa) and Cupleaf Ceanothus (Ceanothus greggii var. perplexans). The more protected riparian sites contain hardwood associates such as Coast Live Oak (Quercus agrifolia) as well as shrubs such as California Wild Rose (Rosa californica) and Spreading Snowberry (Symphoricarpus mollis).

MT Tecate Cypress Series

Stands of Tecate Cypress (Cupressus forbesii), a species of conservation concern, occur in scattered locations of southern California at elevations below 4900 ft (1500 m). It has been mapped on Guatay Mountain (Cleveland NF) in an area of gabbroic (clay-rich) soils and mixed chaparral vegetation. Shrub associates in this area include Eastwood Manzanita (Arctostaphylos glandulosa), Chamise (Adenostoma fasciculatum), Birchleaf Mountain Mahogany (Cercocarpus betuloides) and Cupleaf Ceanothus (Ceanothus greggii var. perplexans) in addition to herbaceous plants such as Broom Snakeweed (Gutierrezia sarothrae) and Common Goldenstar (Bloomeria crocea). Tecate Cypress also occurs on Otay Mountain in southern San Diego County and elsewhere to the north.

PC Coulter Pine Series

Coulter Pine (Pinus coulteri) dominant sites occur as open forest or woodland stands throughout montane and coastal areas of central and southern California. This type often forms sparse stands having a chaparral understory and is found at elevations below the Mixed Conifer - Pine Series. Canyon Live Oak (Quercus chrysolepis), Coast Live Oak (Q. agrifolia) and California Black Oak (Q. kelloggii) are common hardwood associates in the Series. Soils tend to be shallow and well drained. Elevations generally are in the range from about 3800 to 6000 ft (1160 - 1830 m). The pine is found as low as 1500 ft (460 m) in the Santa Lucia Mtns. of the Los Padres National Forest and as high as 7500 ft (2290 m) in the San Jacinto Mtns. of the San Bernardino National Forest and adjacent state parks.

PD Gray Pine Series

Gray Pine (Pinus sabiniana) reaches its southernmost extent in the Santa Ynez Mtns. (Los Padres NF) and northwestern areas of the Angeles NF close to the San Joaquin Valley. The Series is usually an open woodland type with a diverse mixture of hardwoods such as Valley Oak (Quercus lobata), Blue Oak (Q. douglasii) and Canyon Live Oak (Q. chrysolepis) and low-elevation chaparral shrubs with Gray Pine as the only conifer. It has been mapped in the San Andreas Rift Zone of the Western Transverse Ranges (Angeles NF) and occurs elsewhere in this region.

PJ Singleleaf Pinyon Series

Singleleaf Pinyon Pine (Pinus monophylla) dominates the higher elevations of this semi-arid open woodland Series. The shrub California Juniper (Juniperus californica) occupies sites in this Series at lower elevations and often on gentle slopes or alluvium. The arboreal Sierra or Mountain (Western) Juniper (J. occidentalis var. australis) may also occur in this Series. Within the southern California national forests, the Series has been mapped in transmontane regions under arid climatic influence such as those adjacent to the Tehachapi Mtns. (Los Padres NF) and northern areas of the Transverse Ranges adjacent to the Mojave Desert (Angeles and San Bernardino NF). Elevations are generally of the order 4000 - 8000

ft (1220 - 1950 m). Understories are diverse and may include Desert Bitterbrush (Purshia glandulosa), Tucker Oak (Quercus john-tuckeri) and Mojave Yucca (Yucca brevifolia). Recent forest fires in these areas have caused extensive mortality in this Series in the San Bernardino Mtns.

PQ Four Needle (Parry) Pinyon Series

Small dense stands of Four Needle Pinyon Pine (Pinus quadrifolia) occur on slopes near Thomas Mountain (San Bernardino National Forest) and very sparsely in southern areas of the Cleveland National Forest near Anza Borrego Desert State Park in the northern Peninsular Ranges. They often occupy west-facing drainages of semiarid desert transition zones. Typical sites have scattered or clumped individuals emergent through relatively dense chaparral. Elevations range from about 4600 - 5400 ft (1400 - 1650 m) in the north. Associated species include Chamise (Adenostoma fasciculatum), Red Shank (Adenostoma sparsifolium), California Juniper (Juniperus californica), Curlleaf Mountain Mahogany (Cercocarpus ledifolius) and Jeffrey Pine (Pinus jeffreyi). Singleleaf Pinyon Pine (P. monophylla) may be present in this Series in areas of species overlap.

PL Limber Pine Series

Limber Pine (Pinus flexilis) occurs in scattered open stands or as individual trees above the White Fir range in southern California. It seldom occurs below 6000 ft (1830 m) and occurs on the highest desert facing slopes of the Santa Rosa and San Jacinto Mountains as well as higher areas of the San Gabriel and San Bernardino Mtns. such as on Mt. Baden-Powell. The trees are rarely over 30 ft (10 m) tall and may form very scattered, low krummholz or wind-trained forms at timberline. Lodgepole Pine (P. contorta var. murrayana) intermixes with Limber Pine. The understory is typically very sparse.

SA Subalpine Conifer Series

This type is a mixed Lodgepole Pine (Pinus contorta var. murrayana) - Limber Pine (P. flexilis) open forest that occurs at the higher elevations, usually above 8500 ft (2590 m) to the extent of timberline. Limber Pine is most important on exposed high slopes and ridges, where it may form small areas of pure stands in the Limber Pine Series. Lodgepole Pine becomes locally abundant on similar dry sites. This Series is defined by the lack of clear dominance of either.

WF White Fir Series

The White Fir (Abies concolor) Series occurs at higher elevations than the Mixed Conifer - Pine Series throughout the Transverse and Peninsular Ranges. White Fir is more common in pure stands on moist north and east facing slopes and cooler canyons, but rarely occurs in pure stands below about 6000 ft (1800 m) elevation. Sugar Pine (Pinus lambertiana) may become more prominent in this Series on sunnier sites. At lower elevations, White Fir is less abundant and becomes a component of the Mixed Conifer Series.

LP Lodgepole Pine Series

This Series occurs at high elevations in the San Gabriel and San Bernardino Mountains and has isolated occurrence in the San Jacinto Mountains. On southern slopes, Lodgepole Pine (Pinus contorta var. murrayana) rarely occurs below 7300 ft (2200m) elevation. On high windswept peaks, Lodgepole Pine associates with Limber Pine (P. flexilis) in the Subalpine Conifer Series.

PP Ponderosa Pine Series

Pure stands of Ponderosa Pine (Pinus ponderosa) occur in the San Bernardino Mtns. (San Bernardino NF), Mt. Pinos area (Los Padres NF) and elsewhere in the Peninsular, South

Coast and Transverse Ranges. Sites are usually above the Northern Mixed Chaparral and Coulter Pine Series at elevations of 4510 - 6610 ft (1375 - 2015 m). This pine readily hybridizes with Jeffrey Pine (*Pinus jeffreyi*) in the upper part of its elevation range, especially in the areas around San Antonio Canyon (Angeles NF) and near San Geronio Wilderness area (San Bernardino NF). California Black Oak (*Quercus kelloggii*) is often a hardwood associate of this series.

PM *Bishop Pine Series*

Bishop Pine (*Pinus muricata*) occurs in the Santa Ynez Mountains, on Santa Rosa Island, and on Santa Cruz Island. It is closely related to Monterey Pine (*Pinus radiata*) and Santa Cruz Island Pine (*Pinus remorata*). Bishop Pine grows well in moist, ocean influenced climates below 1200 ft (350m) but generally grows best on shallow, poorly drained, acidic soils. Fog drip is important during the summer months. Geographically associated with the Bishop Pine stands are the Annual Grass - Forb and the Chamise Series.

PT *Torrey Pine Series*

This Series is centered in San Diego County adjacent to the coast near Del Mar and in Torrey Pine State Park. Torrey Pine (*Pinus torreyana*) occurs on low coastal bluffs and ridgetops or on slopes and in gullies. Associated species include Chamise (*Adenostoma fasciculatum*), California Sagebrush (*Artemisia californica*), Toyon (*Heteromeles arbutifolia*), Sumac (*Rhus spp.*) and specimens of the disjunct Mojave Yucca (*Y. schidigera*). Torrey Pine also occurs on a coastal strip of Santa Rosa Island in association with Chamise and Toyon.

Hardwood Forest/Woodland

QA *Coast Live Oak Series*

Coast Live Oak (*Quercus agrifolia*) is abundant in southern and central California in coastal valleys and lower slopes of montane areas. It has been mapped throughout the Transverse, Peninsular and South Coast Ranges. Stands may form open savanna-like grasslands in interior sites or dense forests near the coast depending on site conditions such as climate, lithology and slope angle. Elevations of this hardwood are generally below 4000 ft (1220 m) but may climb to 6000 ft (1830 m) on some slopes. It intergrades with *Ceanothus* dominated chaparral in the Santa Ynez Mtns. (Los Padres NF); with species in the California Sagebrush Series and Northern Mixed Chaparral Series in the southern portions of the San Gabriel Mtns. (Angeles NF); and with dry grasslands, Engelmann Oak (*Quercus engelmannii*) and Northern Mixed Chaparral species in the southern Peninsular Ranges (Cleveland NF). Canyon Live Oak (*Q. chrysolepis*) is often present and abundant in this Series.

QC *Canyon Live Oak Series*

Canyon Live Oak (*Quercus chrysolepis*) forms pure stands throughout southern California as a tree and shrubby species on steep and often rocky canyon slopes. It occurs in a wide elevation range up to about 8500 ft (2600 m) and often associates with Bigcone Douglas-Fir (*Pseudotsuga macrocarpa*) in canyon bottoms and with Coulter Pine (*Pinus coulteri*) on gentle slopes and more xeric sites in this area. In sheltered slopes and in mesic ravines closer to the coast, its hardwood associates include Madrone (*Arbutus menziesii*) and California Bay (*Umbellularia californica*), especially in the Los Padres NF. The Series has been mapped extensively in the Santa Ana Mtns. (Cleveland NF), throughout the Transverse Ranges (San Bernardino and Angeles NF) and in the Sierra Madre and western Transverse Ranges of the Los Padres NF. This oak often associates with tree and shrub forms of Interior Live Oak (*Quercus wislizenii*), especially in the Transverse Ranges, and with Black Oak (*Q. kelloggii*) in the Peninsular Ranges. Deerbrush (*Ceanothus integerrimus*),

Chaparral Whitethorn (*C. leucodermis*), Birchleaf Mountain Mahogany (*Cercocarpus betuloides*), Poison Oak (*Toxicodendron diversiloba*) and Manzanitas (*Arctostaphylos* spp.) are common chaparral shrub associates.

QD Blue Oak Series

Blue Oak (*Quercus douglasii*) forms open woodlands on well-drained soils in low elevation sites throughout interior California, reaching its southernmost extent in the Southern Coast and Montane Province. Elevations of this hardwood are usually below 3000 - 4000 ft (915 - 1220 m). The series has been mapped extensively along the forest border of the Liebre and Sawhill Mtns. (Angeles NF) in this area. It also occurs in the Santa Ynez Valley (Los Padres NF), and historically was distributed on Santa Cruz and Santa Catalina Islands. Blue Oak is often found adjacent to, or intermixed with, the Coast Live Oak Series in the north and usually occupies lower elevations than does the Gray Pine Series where the trees occur in the same area. Other common associates include dry grassland species such as Bromes (*Bromus* sp.) and the shrubs Wedgeleaf Ceanothus (*C. cuneatus*) and Birchleaf Mountain Mahogany (*Cercocarpus betuloides*) in the southern part of the Blue Oak range.

QK Black Oak Series

Black Oak (*Quercus kelloggii*) is often a component of the Mixed Conifer - Pine, Coulter Pine and Jeffrey Pine Series but may occur in pure stands on mesic slopes at low to mid-montane elevations up to about 7900 ft (2400 m). These stands often develop because of intensive fires or other disturbance such as logging of conifers, varying greatly in canopy closure from very dense to savanna-like. Soils are usually well drained and have loamy textures. In addition to the conifers, other common associates in this series are Birchleaf Mountain Mahogany (*Cercocarpus betuloides*), Mexican Manzanita (*Arctostaphylos pungens*), Eastwood Manzanita (*A. glandulosa*), Interior Live Oak (*Quercus wislizenii*), Scrub Oak (*Q. berberidifolia* or *Q. dumosa*) and Canyon Live Oak (*Q. chrysolepis*). It has been mapped most extensively in the Palomar Mtns. (Cleveland NF), the Santa Lucia Ranges (Los Padres NF), Liebre Mtns. (Angeles NF), northwestern San Bernardino and San Jacinto Mtns. (San Bernardino NF) and Palomar, Laguna and other Peninsular Mtns. (Cleveland NF).

QL Valley Oak Series

Valley Oak (*Quercus lobata*), a species of conservation concern, reaches its southernmost extent in western Los Angeles County in association with dry grasslands in open woodlands. Similar to the Blue Oak Series, this Series also occurs in savannas within the Santa Ynez Mountains as well as in valleys near Oak Ridge (Ventura and Los Angeles Counties). The Series is often found on alluvial or other sites that may retain more summer moisture than Blue Oak woodlands. It has been mapped in scattered stands in southern California in the Liebre Mtns. (Angeles NF), and very sparsely in the western Transverse Ranges of the Los Padres NF. These elevations are usually below 2000 ft (610 m).

QV California Walnut Woodland Series

California Walnut (*Juglans californica*), a species endemic to the state, historically occurs in a restricted range of southern California at elevations from 500 to 2500 ft (150 - 760 m). It has been planted widely up to about 3500 ft (1070 m) in this area. Walnuts are usually widely spaced and have various associates, including Coast Live Oak (*Quercus agrifolia*), California Bay (*Umbellularia californica*), Foothill Ash (*Fraxinus dipetala*), Mexican Elderberry (*Sambucus mexicana*), Sugar Bush (*Rhus ovata*) and Skunkbush (*R. trilobata*). Sites are usually mesic to moist such as north slopes, creek beds, seeps, canyon bottoms and alluvial terraces with deep soils. This species has been mapped west of Pacoima Reservoir (Angeles NF).

QW Interior Live Oak Series

Interior Live Oak (Quercus wislizenii) occurs throughout interior valleys and coast foothills of the Transverse and Peninsular Ranges in its shrub and arboreal forms. It forms pure stands at low to intermediate elevations, especially in the San Bernardino Mountains up to an elevation of about 5800 ft (1770 m). It often associates with Canyon Live Oak (Q. chrysolepis), Coulter Pine (Pinus coulteri) and conifers of the Mixed Conifer - Pine Series such as Ponderosa Pine (P. ponderosa). Its chaparral associates include Chaparral Whitethorn (Ceanothus leucodermis), Scrub Oak (Q. berberidifolia or Q. dumosa), and Honeysuckle (Lonicera spp.).

QT Tanoak-Madrone Series

Tanoak (Lithocarpus densiflorus), widely distributed in coastal regions of northern and central California, reaches its southernmost extent in the Santa Ynez Mtns. (Los Padres NF). It seldom occurs in pure stands in southern California. Its range overlaps with that of Madrone (Arbutus menziesii) in this area and further north. Madrone occurs in the Santa Ynez Mountains and south of Ventura County as well as on Santa Cruz Island, the Santa Monica Mountains and on Palomar Mountain. Associates in southern California include coastal sage scrub species such as Sages (Salvia spp.) and California Sagebrush (Artemisia californica), low elevation chaparral species such as Wedgeleaf Ceanothus (Ceanothus cuneatus), conifers such as Ponderosa Pine (Pinus ponderosa), and other hardwoods such as Canyon Live Oak (Quercus chrysolepis) and Coast Live Oak (Q. agrifolia).

QU California Bay Series

California Bay (Umbellularia californica) occurs in canyons, shaded slopes and moist sites in chaparral and woodland communities throughout much of California. Since it has competitive advantage in its ability to sprout vigorously from stumps and its crown after fires, it may be the only tree component of old stands. It reaches such dominance in the hardwood canopy in the Santa Ynez Mtns., where it was mapped, and elsewhere in the Transverse and Peninsular Ranges at elevations below 5000 ft (1500 m). Its associates in southern California are the hardwoods Coast Live Oak (Quercus agrifolia) and Interior Live Oak (Q. wislizenii) and the shrubs in the Scrub Oak Series such as Quercus berberidifolia or Q. dumosa and those in the Northern Mixed Chaparral Series such as Hollyleaf Redberry (Rhamnus ilicifolia).

QY Willow - Alder Series

This riparian Series consists of obligate hydrophytic shrubs and trees. These species have been mapped in the Transverse and Peninsular Ranges at low to moderate elevations such as in the Santa Ana River, Little Rock and Mill Creeks; Bee and Francisquito Canyons (San Gabriel and western Transverse Ranges of the Angeles NF); Lytle and San Geronio Creeks; and Mojave River (San Bernardino Mtns). The species mixtures vary by forest and elevation and may include any combination of tree or shrub in which Willow (Salix spp.) and/or White Alder (Alnus rhombifolia) are prominent. The hardwoods Fremont and Black Cottonwood (Populus fremontii, P. trichocarpa) and California Sycamore (Platanus racemosa) and the shrub Seep-Willow (Baccharis glutinosa) are also common but minor associate species. Other shrubs such as California Rose (Rosa californica) and Poison Oak (Toxicodendron diversiloba) are likely to occur in this Series at the drier margins. The Series has been mapped as low as 1500 ft (460 m) south of Vail Lake near the Cleveland NF.

QZ Eucalyptus Series

Species of Eucalyptus (Eucalyptus globulus, E. polyanthemus and E. tereticornis) occur in dense, pure stands at lower elevations (below 1000 ft or 300 m) within southern California,

especially in the western Transverse Ranges. These stands are widely scattered and are seldom extensive in nature, having been initially established through cultivation. Naturalization has occurred in disturbed areas, augmented by the ability of this genus to sprout after disturbances.

QN *Engelmann Oak Series*

Engelmann Oak (*Quercus engelmannii*) occurs mainly in San Diego County in open woodlands with a grassland or chaparral understory. This Series also has minor distributions in Riverside, Orange and Ventura Counties. Engelmann Oak becomes a dominant hardwood in botanical preserves such as the Santa Rosa Plateau of Riverside County and certain areas of the Cleveland National Forest such as the Organ Valley Research Natural Area. Elevations are generally below 4000 ft (1220 m). Common associates in the Series include Coast Live Oak (*Quercus agrifolia*), Black Oak (*Quercus kelloggii*), Toyon (*Heteromeles arbutifolia*), Sugar Bush (*Rhus ovata*), California Sagebrush (*Artemisia californica*), grasses such as Needlegrass (*Stipa* spp.) and forbs such as Checker Mallow (*Sidalcea malvaeflora*).

QF *Fremont Cottonwood Series*

This Series occurs along streambanks in canyons of the Transverse and Peninsular ranges below about 6000 ft (2000m). Fremont Cottonwood (*Populus fremontii*), the dominant species, occurs in pure stands or with minor proportions of associated riparian and canyon species. These include Black Cottonwood (*P. trichocarpa*), Box Elder (*Acer negundo*), Bigleaf Maple (*A. macrophyllum*), California Sycamore (*Platanus racemosa*) and California Bay (*Umbellularia californica*).

QO *Willow Series*

The high elevation counterpart of the Willow - Alder Series is dominated by shrub and tree Willows (*Salix* spp.) with Aspen (*Populus tremuloides*) as an associate in this area. The Willow Series occurs along streambanks above 6500 ft (2000 m) in the Transverse and Peninsular Ranges. Associated species may include Black Cottonwood (*P. trichocarpa*) and a variety of perennial and annual forbs. Aspen becomes a prominent associate only at the head of the Santa Ana River in the San Bernardino Mountains.

Q1 *Live Oak - Madrone Series*

Either Canyon Live Oak (*Quercus chrysolepis*) and/or Coast Live Oak (*Q. agrifolia*) are dominant alone or in combination in this hardwood Series. Madrone (*Arbutus menziesii*) is present in abundance but Tanoak (*Lithocarpus densiflorus*) is usually absent. Other hardwood associates include California Bay (*Umbellularia californica*), California Black Oak (*Quercus kelloggii*) and California Buckeye (*Aesculus californica*). The Series has been mapped at low to moderate elevation transmontane slopes of the western Transverse Ranges (Los Padres NF).

Shrubs and Chaparral

CA *Chamise Series*

Southeast of Santa Barbara County, Chamise (*Adenostoma fasciculatum*) occurs in pure stands and covers a greater area than any other chaparral species. This Series often develops on sites that are harsher in terms of having shallow soils, more xeric or sunnier environments (e.g., south-facing slopes) than the adjacent Northern Mixed Chaparral Series. It has been mapped extensively in the Transverse and Peninsular Ranges (Angeles, San Bernardino and Cleveland NF). The elevation of the series is generally below about 4000 ft (1220 m), but may reach 5500 ft (1680 m) or more in interior sites such as those

adjacent to Anza Borrego Desert State Park (Cleveland NF) and transmontane slopes of the San Rafael and adjacent highlands (Los Padres NF). It grades into the Redshank (Adenostoma sparsifolium) Series in the Palomar Mtns. (Cleveland NF) and in areas near the San Jacinto Mtns. (San Bernardino NF). Very little other vegetation is found on these sites but Chaparral Yucca (Yucca whipplei) often occurs on sites that are more open.

CC *Ceanothus Chaparral Series*

Southern California chaparral is occasionally dominated in small areas by species of Ceanothus in contrast to the more extensively occurring mixed chaparrals. This low to mid elevation shrub series is identified by any of the following dominant species: Hoaryleaf Ceanothus (C. crassifolius) in the western portions of the Transverse Ranges (Los Padres and Angeles NF) and Santa Ana Mtns. (Cleveland NF); Cupleaf Ceanothus (C. greggii var. perplexans) in the eastern Transverse Ranges (San Bernardino NF) and southern Peninsular Ranges (Cleveland NF, San Jacinto Range of San Bernardino NF); Wedgeleaf Ceanothus (C. cuneatus) in the Western Transverse Ranges (Angeles and Los Padres NF); Chaparral Whitethorn (C. leucodermis) forming dense post-fire stands in all forests; and Greenbark Ceanothus C. spinosus in the general mapping area (all forests). Other species in this Series include Hairyleaf Ceanothus (C. oliganthus) in the western Transverse Ranges (Angeles and Los Padres NF) and Santa Ana Mtns. (Cleveland NF), Woollyleaf Ceanothus (C. tomentosus) in the Santa Ana Mtns. and Peninsular Ranges (Cleveland NF), and Bigpod Ceanothus (C. megacarpus) near the coast in the western Transverse Ranges (Los Padres NF). Sites range from mesic and coastal (Bigpod Ceanothus) to xeric (Cupleaf Ceanothus) with elevations ranging from below 2000 ft or 610 m (Woollyleaf and Bigpod Ceanothus) up to about 6400 ft (2100 m). Chamise (Adenostoma fasciculatum) occurs throughout this area and is commonly associated with these species.

CD *Southern Mixed Chaparral Series*

This shrub Series contains mixtures of chaparral species in areas having lower elevation, somewhat lower precipitation and more moderate temperatures than in the Northern Mixed Chaparral Series, which is often contiguous to it. It is found in coastal foothills and further inland at elevations usually between 1000 - 3000 ft (305 - 915 m) in San Diego and Riverside Counties as mapped in the Cleveland NF. There is no single dominant species, the indicator chaparral shrubs being Woollyleaf Ceanothus (Ceanothus tomentosus), Mission Manzanita (Xylococcus bicolor), with minor amounts of Chamise (Adenostoma fasciculatum) and Scrub Oak (Quercus berberidifolia or Q. dumosa). California Sagebrush Series species such as Purple and Black Sages (Salvia leucophylla, S. mellifera), California Sagebrush (Artemisia californica), Laurel Sumac (Malosma laurina) and Lemonade Berry (Rhus integrifolia) may be prominent in this Series.

CQ *Northern Mixed Chaparral Series*

This is a mixed shrub Series occurring extensively on cismontane low to moderate elevation slopes in southern California. The species mixture is highly variable and includes any combination of non-dominant Wedgeleaf (Ceanothus cuneatus), Cupleaf (C. greggii perplexans), Hoaryleaf (C. crassifolius) or Hairy Ceanothus (C. oliganthus); non-dominant Scrub Oak (Quercus berberidifolia or Q. dumosa), Bigberry (Arctostaphylos glauca), Eastwood (A. glandulosa) or other species of Manzanita (Arctostaphylos spp.), Chaparral Whitethorn (Ceanothus leucodermis), Sugar Bush (Rhus ovata), Hollyleaf Redberry (Rhamnus ilicifolia) and Hollyleaf Cherry (Prunus ilicifolia). Chamise (Adenostoma fasciculatum) is usually abundant but not dominant in this Series. It has been mapped at elevations up to about 6000 ft (1830 m) in the western Transverse Ranges (Los Padres NF) but is usually found lower than the Montane Mixed Chaparral Series and above the Southern Mixed Chaparral Series in San Diego and Riverside Counties (Cleveland NF).

CS Scrub Oak Series

Scrub Oak (Quercus berberidifolia, formerly Q. dumosa) or other species of shrubby oaks may become dominant on steep, mesic slopes at low to moderately high elevations in southern California. Any combination of Scrub Oak, Shrub Interior Live Oak (Q. wislizenii var. frutescens) and Shrub Canyon Live Oak (Q. chrysolepis var. nana) may be present in this Series. Common chaparral associates are the shrubs Chamise (Adenostoma fasciculatum), Birchleaf Mountain Mahogany (Cercocarpus betuloides), Toyon (Heteromeles arbutifolia), Poison Oak (Toxicodendron diversiloba) and vines such as Cucumber Vine (Marah macrocarpus) and Honeysuckle (Lonicera spp.). The Series has been abundantly mapped in the Peninsular Ranges (Cleveland NF) and sparsely in the Transverse Ranges (San Bernardino NF) at elevations generally below 5000 ft (1525 m). It grades into the Northern Mixed Chaparral Series and Tucker Desert Scrub Oak Series on very dry interior sites.

CR Redshank Series

Redshank (Adenostoma sparsifolium) forms open and often pure stands in several discrete populations in central and southern California. Locations are usually at least 50 miles (80 km) inland from the coast. These stands have been mapped in areas of the Peninsular Ranges adjacent to Sonoran Desert climatic influences such as in the rainshadow of Palomar Mtn. (Cleveland NF) and south of the San Jacinto Mtns. (San Bernardino NF) at elevations below about 6700 ft (2040 m). Chamise (Adenostoma fasciculatum) is a common associate of this Series and may be equally as prominent as Redshank, but not clearly dominant. Birchleaf Mountain Mahogany (Cercocarpus betuloides) and other drought-tolerant species such as Muller's Oak (Quercus cornelius-mulleri) and Cupleaf or Desert Ceanothus (Ceanothus greggii) may also be present at low densities.

CT Tucker Desert Scrub Oak Series

A drought-tolerant scrub oak type (the former Quercus turbinella group) has been separated into several species in the new California taxonomy. Tucker Desert Scrub Oak (Quercus john-tuckeri) occurs in interior western regions of southern California in very open semi-arid transmontane stands at moderate to high elevations. Singleleaf Pinyon Pine (Pinus monophylla). This Series has been mapped in the northeastern rainshadow area of the Sierra Madre and San Rafael Mtns. (Los Padres NF) at elevations below 5600 ft (1710 m) and occurs in transmontane northern areas of the Angeles NF and other sites in semi-arid environments. Birchleaf Mountain Mahogany (Cercocarpus betuloides) is often present in these areas in addition to Scrub Oak (Quercus berberidifolia or Q. dumosa). This Series is adjacent to and shares elements of the Pinyon-Juniper Series, the Northern Mixed Chaparral Series and the Buckwheat - White Sage Series.

SB Buckwheat - White Sage Series

Chamise is not prominent in this subshrub, xeric type. The combination of California Buckwheat (Eriogonum fasciculatum) and White Sage (Salvia apiana), alone or together forms the dominant component of this interior Series. Chaparral Yucca (Y. whipplei) and Deerweed (Lotus scoparius) are often present. The sites are in non-coastal locations, are often steep, south facing, sparsely vegetated and with good drainage. The degradation of Chamise or mixed chaparral sites from past fires or changes in subsurface moisture conditions appear to initiate and perpetuate many of these communities. This Series has been mapped extensively but in scattered areas of the Western Transverse Ranges (Los Padres NF and Angeles NF), western and southern edges of the San Bernardino Mtns., the western border of the San Jacinto Mtns. area (San Bernardino NF) and in the Santa Ana Mtns. and other sites of the Peninsular Ranges (Cleveland NF). Elevations are usually 2000 - 5000 ft (610 - 1525 m).

CX Montane Mixed Chaparral Series

This Series contains a mixture of chaparral species existing at moderately high elevation levels, generally above about 5000 ft (1525 m) within coniferous areas. No single species is clearly dominant. Chamise (Adenostoma fasciculatum) is generally absent at these elevations. These sites are often steep and south facing or have rocky, shallow soils that are unfavorable to good conifer growth in the adjacent Mixed Conifer and Ponderosa or Jeffrey Pine Series. Shrubs such as Mountain Whitethorn or Deerbrush (Ceanothus cordulatus, C. integerrimus), Bush Chinquapin (Castanopsis sempervirens) and Greenleaf, Parry, Mexican or Pink-Bract Manzanita (Arctostaphylos patula, A. parryana, A. pungens, A. pringlei) may occur in the mixture. Palmer Ceanothus (C. palmeri) is an indicator species in the Peninsular Ranges (Cleveland NF). The type has been mapped in small areas of each forest, more abundantly in the San Bernardino NF.

CZ Semi-Desert Chaparral Series

This Series develops on interior (transmontane) slopes of the Transverse and Peninsular Ranges at elevations of 2000 - 7000 ft (610 - 2135 m). Sites are often open and sparsely vegetated. It is a transitional type that includes a mixture of common chaparral shrubs such as Chamise (Adenostoma fasciculatum), Birchleaf Mountain Mahogany (Cercocarpus betuloides), Bigberry Manzanita (Arctostaphylos glauca) and California Buckwheat (Eriogonum fasciculatum) with other desert or semi-desert shrub or perennial species such as Flannel Bush (Fremontodendron californicum), Desert Bitterbrush (Purshia glandulosa), Tucker or Miller Scrub Oak (Quercus john-tuckeri, Q. cornelius-mulleri), Desert Ceanothus (C. greggii var. vestitus), Rabbitbrush (Chrysothamnus spp.), Mojave Yucca (Y. schidigera), Prickly Pear or Cholla (Opuntia spp.), Desert Almond or Desert Apricot (Prunus fasciculata, P. fremontii), Basin Sagebrush (Artemisia tridentata), and more rarely Creosote Bush (Larrea tridentata).

Soft Chaparral

SS California Sagebrush (Coastal Sage Scrub) Series

This Series occurs in several habitats, including coastal environments such as the dunes south of Point Conception and coastal slopes. It also is found in more interior low-elevation locations below the Northern Mixed Conifer Series and in local pockets of disturbed or dry sites, usually at elevations below about 3000 ft (915 m). The Series usually has a prominent California Sagebrush (Artemisia californica) component along with a varying mixture of other shrubs, subshrubs and perennials. These associates include Black or Purple Sage (Salvia mellifera, S. leucophylla), Laurel Sumac (Malosma laurina), Lemonade Berry (Rhus integrifolia), California Buckwheat (Eriogonum fasciculatum), Coyote Brush (Baccharis pilularis), California Encelia (Encelia californica), minor amounts of Chamise (Adenostoma fasciculatum), Deerweed (Lotus scoparius) and grasses. These species produce a vegetative cover, which rapidly invades disturbed areas.

Sagebrush Shrub

BR Rabbitbrush Series

Rubber Rabbitbrush and Stickyleaf Rabbitbrush (Chrysothamnus nauseosus, C. viscidiflorus) occur in California south to Riverside County. This Series is dominated by either or both species and usually is found in a wide elevation range on dry slopes or flats from 500 - 9000 ft (150 - 2700 m). Chrysothamnus viscidiflorus has a more restricted range in this area and has not been found on alkaline soils. The more commonly occurring Chrysothamnus nauseosus may grow on strongly alkaline as well as soils that are more neutral. Associated species of this Series include Desert Bitterbrush (Purshia glandulosa), Basin Sagebrush

(Artemisia tridentata), Blackbush (Coleogyne ramosissima) and Mormon Tea (Ephedra spp.) and grasses. Associated conifers include Jeffrey Pine (Pinus jeffreyi), and Junipers (Juniperus spp.).

BS Basin Sagebrush Series

Basin Sagebrush (Artemisia tridentata) dominates this Series. This type is found in dry interior and transmontane locations in a range of elevations and habitats where slopes are not steep and soils are coarse, often deep and well drained. Typical sites are dry alluvial fans or washes. The Series has been extensively mapped in the western Transverse Mtns. (Los Padres NF), where it intergrades with the Buckwheat - White Sage Scrub Series. It has also been mapped in transmontane slopes of the northern San Gabriel Mtns. (Angeles NF), where it is adjacent to the Semi-Desert Chaparral Series. On xeric interior slopes of the San Bernardino Mtns. (San Bernardino NF), it intergrades with Semi-Desert Chaparral, Jeffrey Pine and Eastside Pine Series. It also has been mapped near Redshank Chaparral and Dry Grassland Series on dry slopes south of the San Jacinto Mtns. (San Bernardino NF). In the areas north of the rainshadow of the Palomar Mtns. (Cleveland NF area), it is located adjacent to Redshank and Chamise Chaparral Series. In addition, it has been mapped in southeastern Peninsular Range areas of the Cleveland NF adjacent to such types as Dry Grassland, Coast Live Oak, Northern Mixed Chaparral, Buckwheat - White Sage Scrub and Chamise Chaparral. Bromes (Bromus spp.), Buckwheats (Eriogonum spp.), Desert Bitterbrush (Purshia glandulosa) and Rabbitbrush (Chrysothamnus spp.) are often present in this type in addition to the species mentioned such as Redshank and Chamise (Adenostoma sparsifolium, A. fasciculatum), Jeffrey Pine (Pinus jeffreyi), Coast Live Oak (Quercus agrifolia), etc.

Desert Shrub

DX Mixed Desert Shrub Series

This Series consists of clearly desert subshrub, perennial and shrub species along the dry margins of the Sonoran and Mojave Deserts in the South Coast and Montane region. The species mixture may include Cholla or Prickly Pears (Opuntia spp.), Joshua Tree or Mojave Yuccas (Yucca brevifolia, Y. schidigera), Creosote Bush (Larrea tridentata), Burroweed (Ambrosia dumosa), Catclaw Acacia (Acacia greggii), species of Saltbush (Atriplex spp.), Ocotillo (Fouquieria splendens), Brittlebush (Encelia farinosa), Hop-Sage (Grayia spinosa), Agave (Agave spp.) and other species in any combinations. It has been mapped abundantly in the northern San Bernardino Mtns. and in the northern and eastern regions of the San Jacinto Mtns. (San Bernardino NF) and sparsely in the Valyermo area close to the Angeles NF.

DL Creosote Series

Creosote Bush (Larrea tridentata) occurs over a broad area of the Sonoran, Colorado and Mojave Deserts. Within the Southern California Mountains and Valleys Section, this desert influence occurs in the extreme eastern subsections: Desert Slopes Subsection and eastern portions of the San Jacinto Foothills - Cahuilla Mtns. Subsection within the southern Colorado Desert climate influence and the Little San Bernardino - Bighorn Mtns. Subsection in the northern Mojaven environment. In the southeastern areas of the South Coast and Montane Ecological Province, Creosote Bush and White Bur-Sage (Ambrosia dumosa) share dominance throughout the vast intermountain bajadas and lower elevation Laguna, Santa Rosa and San Jacinto Mountains. Similar to their occurrence in the Mojave Desert (refer to the Creosote Series description in the South Interior Ecological Province), their best growth is found on well-drained soils with low salinity. Associated species differ notably from the Mojave Desert species, which occur in this Series, however. In the Colorado and Sonoran

Deserts, these include Jojoba (Simmondsia chinensis), Fish-Hook Cacti species (Mammillaria spp.), Hedgehog Cacti species (Echinocereus spp.) and Sage species (Salvia spp.).

Alpine Dwarf Scrub

AC *Alpine Cushion Plant Series*

Alpine flora in southern California is relatively poor in extent, but does occur in a few higher peaks. It has been mapped on the higher ridges and slopes of San Gorgonio Mtn. (San Bernardino NF) above about 9,000 ft (2745 m). A mixture of grasses, herbaceous plants and often-prostrate subshrubs occur on these short-season, exposed sites. Rounded, low-profile xerophytic plant forms ("cushion plants") such as Draba corrugata and Southern Alpine Buckwheat (Eriogonum kennedyi var. alpigenum) occur with other perennials such as Rock Spirea (Holodiscus microphyllus), Silky Raillardella (Raillardella argentea), Campion (Silene parishii), Pussy-paws (Calyptridium monospermum), Alpine Shooting Star (Dodecatheon alpinum), Monkey Flowers (Mimulus spp.), Buttercup (Ranunculus eschscholtzii spp. oxynotus), Hulsea vestita, grasses such as Needlegrass (Stipa or Achnatherum occidentale), Squirreltail (Sitanion hystrix or Elymus elymoides), Rushes (Juncus spp.) and Sedges (Carex spp.).

Herbaceous

HG *Dry Grassland (Annual Grass - Forb) Series*

Low to mid-montane areas of southern California may develop extensive or restricted areas of dry grasslands in otherwise well-vegetated shrub or coniferous regions. Conditions that restrict the the growth and maintenance of species of the surrounding vegetation include the occurrence of pockets of fine-textured (clayey) soils, a frequent fire regime, and ground-disturbing activities such as grazing and mining. Many exotic grasses are characteristic of this type, including species of wild oats (Avena spp.), various Bromes (Bromus spp.), Foxtail Fescue (Vulpia myuros), and Kentucky Bluegrass (Poa pratensis). This Series also includes perennial grasses that develop on coarse, well-drained soils occurring within sunny openings of Jeffrey and Ponderosa Pine (Pinus jeffreyi, P. ponderosa) savannas. In addition to species mentioned above, savannas may also include more native Sedges (Carex spp.) and Melic Grass (Melica spp.)

HJ *Wet Meadows (Grass - Sedge - Rush) Series*

Mountain meadows develop in coniferous areas on fine-textured, more or less permanently moist or wet soils. These conditions in southern California often develop from springs, seeps or faulted areas in which a high water table is maintained throughout the year. The San Bernardino, San Jacinto and Peninsular Ranges contain many scattered moist mountain meadow areas at elevations generally above 3000 ft (915 m) in the south and higher in the north. They often have a dense growth of Sedges (Carex spp.), Rushes (Juncus spp.) perennial grasses such as Mat Muhly (Muhlenbergia richardsonis) and San Bernardino Bluegrass (Poa atropurpurea) and herbaceous perennials such as False Hellebore (Veratrum californicum), Checker Bloom (Sidalcea malvaeflora), Clovers (Trifolium variegatum, T. wormskioldii), Monkey Flower (Mimulus guttatus), etc. Mountain meadow areas have been mapped in the San Gorgonio Mtn. region (San Bernardino NF). Willows (Salix spp.), Roses (Rosa spp.) and Blue Elderberry (Sambucus mexicana) may occur along streambanks associated with some of these meadows. Although a range of hydric conditions usually occur within the same meadow (dry to saturated), mountain meadows are characterized by the permanency of the water source at their lowest topographic level.

South Interior Ecological Zone

Conifer Forest/Woodland

WF White Fir Series

Within the Clark, Providence, New York, and Kingston Mountains, White Fir (Abies concolor) occurs as the dominant conifer Series. White Fir often associates with Singleleaf Pinyon (Pinus monophylla) in steep, mesic, north-facing ravines and on north slopes below ridge crests. Granite and limestone are the dominant substrata for the White Fir Series. The elevation range is 6000 - 7000 ft (1830 - 2134 m).

WJ Juniper Series

This Series is dominated by California Juniper (Juniperus californica) and Utah Juniper (J. osteosperma). The California Juniper stands usually occur on alluvial fans at the desert edge. At higher elevations, above these fans, scattered California Junipers may associate with Jeffrey Pine (Pinus jeffreyi) and White Fir (Abies concolor). Out onto the desert floor, desert shrub species, Basin Sagebrush (Artemisia tridentata), and Creosote (Larrea tridentata) mix freely with Juniper. Singleleaf Pinyon (Pinus monophylla) and Yucca (Yucca spp.) are associates within this Series.

PJ Singleleaf Pinyon Pine Series

In the New York and Providence Mountains, Singleleaf Pinyon (Pinus monophylla) occurs in woodlands. Utah Juniper (Juniperus osteosperma) occurs either as a local dominant or as an associate with Singleleaf Pinyon, Basin Sagebrush (Artemisia tridentata), Bitterbrush (Purshia glandulosa) and Rabbitbrush (Chrysothamnus nauseosus). In southwestern Riverside County and San Diego County Singleleaf Pinyon (P. quadrifolia) replaces Singleleaf Pinyon.

Hardwood Forest/Woodland

QF Fremont Cottonwood Series

Fremont Cottonwood (Populus fremontii), the dominant species of this Series, occurs as a riparian species in sub-irrigated washes throughout the desert and adjacent to the Colorado River. Elevations are usually below 3000 ft (915 m). Since Fremont Cottonwood will not tolerate saline conditions, this species occurs with Salt Cedar (Tamarix spp.) in frequently flushed areas adjacent to the Colorado River, and Velvet Ash (Fraxinus velutina) in desert areas.

UW Fan Palm Series

Palm oases may occur adjacent to permanent water supplies such as streams or emergence of underground water. The dominant species, Washingtonia filifera, occurs in washes or hillsides with sufficient water. Mesquite (Prosopis glandulosa) may be associated. The occurrence of palms often follows fault lines, which allow underground water supplies to come nearer to the surface.

UJ Joshua Tree Series

Both Joshua Tree (Yucca brevifolia) and Mojave Yucca (Y. schidigera) rarely occur in pure stands. They often associate with California Juniper (Juniperus californica), Creosote (Larrea tridentata) and Basin Sagebrush (Artemisia tridentata). Blackbush (Coleogyne ramosissima) may also occur in this Series. Occasionally, Joshua Tree forms stands by cloning, which are seldom over an acre (0.4 ha) in size. The Yuccas are restricted to dry,

rocky slopes and mesas. Although they dominate the overstory, ground cover seldom is over ten percent.

UP Paloverde Series

The largest stands of Border and Small-leaf Paloverde (Cercidium floridum, C. microphyllum) occur adjacent to the Colorado River in the Sonoran Desert. Species associated with this Series include Arrowweed (Pluchea sericea) and Catclaw Acacia (Acacia greggii). Ocotillo (Fouquieria splendens) associates with Paloverde near the Colorado River. The Paloverde Series can be found along margins of washes and in rocky bajadas throughout the Sonoran Desert.

UT Tamarisk Series

Tamarisk or Salt Cedar (Tamarix spp.), a genera of species introduced from Asia, Africa and southeastern Europe, is dominant in this Series. The most common species in this area are Four-Stamen and Five-Stamen Tamarisk (T. parviflora and T. ramosissima). All are usually found along desert and semi-desert washes, moist desert seeps and streams at elevations below about 2600 ft (800 m). The Series commonly occurs adjacent to the Colorado River. Arrowweed (Pluchea sericea) is a common understory species. Mesquite (Prosopis glandulosa), Seep-Willow (Baccharis glutinosa), Saltbush (Atriplex spp.), Willow (Salix spp.) and Fremont Cottonwood (Populus fremontii) may also occur in or adjacent to this Series.

UL Catclaw Acacia Series

The Catclaw (Acacia greggii) Series may become dominant in canyons and sandy washes below 6000 ft (1830 m). It also often associates with Desert Thorn (Lycium spp.) and Brittlebush (Encelia farinosa) in those sites and in rocky sites, with Cholla (Opuntia spp.) and Paloverde (Cercidium spp.). The Catclaw Acacia Series occurs adjacent to the Singleleaf Pinyon Pine Series in the Colorado and southern Mojave Deserts.

UI Desert Ironwood Series

Desert Ironwood (Olneya tesota) is a dominant species in dry washes and arroyos below about 2000 ft (610 m) in the Sonoran Desert. Associated riparian species include Paloverde (Cercidium spp.), Smoketree (Dalea spinosa), Mesquite (Prosopis glandulosa), Water Jacket (Lycium andersonii) and Desert Willow (Chilopsis linearis). Desert Ironwood has not been found in western portions of the Mojave Desert.

UX Smoke Tree - Desert Willow Series

Smoke Tree (Dalea spinosa) and Desert Willow (Chilopsis linearis) occur together in sandy washes below about 1500 ft (456 m) in both the Colorado and Mojave Deserts. Desert Willow may dominate the habitat above this at elevations up to about 5000 ft (1524 m). Associated species may include Paloverde (Cercidium spp.), Desert Ironwood (Olneya tesota), Mesquite (Prosopis glandulosa) and Desert Thorn (Lycium spp.).

UM Mesquite Series

Mesquite (Prosopis glandulosa) is common in low places and washes below about 4000 ft (1220 m) within the Colorado and Mojave Deserts. Associated species include Paloverde (Cercidium spp.), Smoke Tree (Dalea spinosa), Desert Willow (Chilopsis linearis) and Desert Thorn (Lycium spp.). Screwbean (Prosopis pubescens) may associate with Mesquite below about 2500 ft (762 m).

Sagebrush Shrub

BS Basin Sagebrush Series

Basin Sagebrush (Artemisia tridentata ssp. parishii in this area) may occur as the dominant ground cover species or as an understory species with Pinyon Pine (Pinus monophylla) and Juniper (Juniperus spp.) in this Series. Basin Sagebrush also occurs with Jeffrey Pine (P. jeffreyi) and Curlleaf Mountain Mahogany (Cercocarpus ledifolius) on gentle to steep slopes without rock outcrops at higher elevations. Other Sagebrush species included in this desert Series are Bigelow and Black Sagebrush and Budsage (A. bigelovii, A. nova, A. spinescens). This Series usually occurs below about 6000 ft (1830 m).

BC Saltbush Series

Within the Mojave Desert, All-Scale or Cattle and Fourwing Saltbush (Atriplex polycarpa, A. canescens) and Desert Holly (A. hymenelytra) associate in variable dominance on alkali soils. Greasewood (Sarcobatus vermiculatus), Iodine Bush (Allenrolfea occidentalis) and Budsage (Artemisia spinescens) may also occur in association with the saltbushes. Any of these species may display local dominance. In the Sonoran Desert, on moist sandy loams, Saltbush may occur with Mesquite (Prosopis spp.). Here, Saltbush occupies drier, coarser soils and Mesquite grows within areas of shallow water tables. Other associates of this Series include Creosote (Larrea tridentata), Pickleweed (Salicornia spp.), Saltgrass (Distichlis spicata) and other grasses.

Desert Shrub

DL Creosote Series

Throughout the Sonoran and Mojave Deserts, Creosote Bush (Larrea tridentata) occurs as a dominant species or as an associate with White Bur-Sage (Ambrosia dumosa) on flat desert lands and alluvial fans. Other associates in this broad area include Mormon Tea (Ephedra spp.), Cacti (Opuntia spp.), Barrel Cactus (Echinocactus spp.), Yucca (Yucca spp.) and Joshua Tree (Yucca brevifolia). The Creosote Bush Series can be divided into subtypes based upon geographical extent and associated species as follows:

Mojave Creosote Bush

Both Creosote Bush and Ambrosia occur as codominants on well-drained sandy flats, bajadas and upland slopes from below sea level to about 4500 ft (1372 m). In the northern Mojave Desert, dense stands occur which are quite different in cover percent from the open, well-spaced Creosote stands of the southern Mojave Desert. Creosote becomes the major species on alluvial fans. This subtype is identified by its associated species, which include Fourwing Saltbush (Atriplex canescens), Allscale (A. polycarpa), Range Ratany (Krameria parvifolia), Desert thorns (Lycium spp.) and Pencil Cactus (Opuntia ramosissima). In the southern Mojave Desert, Woolly Galleta (Hilaria rigida) becomes an important associate. Within the Saline Valley, associated species such as Basin Sagebrush (Artemisia tridentata) reflect the Great Basin influence.

Sand Creosote Bush

This subtype occurs on sand accumulations within bajadas and dunes. The associated species include Palmer Coldenia (Coldenia palmeri), California Croton (Croton californicus), Smoke Tree (Dalea spinosa), Woolly Galleta (Hilaria rigida) and Mormon Tea (Ephedra spp.). Croton is an indicator of dune habitats in southeastern California. Smoke Tree associates in the wash habitats.

DS Shadscale Series

Shadscale or Spiny Saltbush (*Atriplex confertifolia*) dominates basins of the Mojave Desert and certain valleys southeast of Mono Lake (Owens Valley Subsection of the Mojave Desert Section). These basins form pluvial or dry lakes with salt accumulations. Associated species in the Shadscale Series include Budsage (*Artemisia spinescens*), Nevada Ephedra (*Ephedra nevadensis*), All-Scale (*Atriplex polycarpa*), Iodine Bush (*Allenrolfea occidentalis*), Greasewood (*Sarcobatus vermiculatus*) and occasionally Joshua Tree (*Yucca brevifolia*). In the Mojave Desert, Greasewood or Iodine Bush may be local dominants of the Shadscale Series. Shadscale and Budsage are common associates in the Owens Valley Subsection. All-Scale associates with Shadscale in San Bernardino County near Kramer Junction (High Desert Plains and Hills Subsection of the Mojave Desert Section).

DA Blackbush Series

Blackbrush (*Coleogyne ramosissima*) dominates certain sites within the Mojave Desert and adjacent montane slopes. Its occurrence is usually on non-saline soils, often beneath scattered Joshua Trees (*Yucca brevifolia*) or Singleleaf Pinyon Pines (*Pinus monophylla*). Associated species of this Series may include Spanish Bayonet (*Yucca baccata*), Hopsage (*Grayia spinosa*), Century Plant (*Agave deserti*) and Mormon Tea (*Ephedra* spp.).

DO Ocotillo Series

Ocotillo (*Fouquieria splendens*) mostly occurs on dry, rocky sites below about 2500 ft (762 m) within the Colorado and southeastern Mojave Deserts. It seldom occurs in pure, dense stands but may dominate a site under certain conditions. Species associated with it in this Series include Brittlebush (*Encelia farinosa*), White Bur-Sage (*Ambrosia dumosa*), Creosote Bush (*Larrea tridentata*), Century Plant (*Agave deserti*) and Hedgehog Cactus (*Echinocactus* spp.).

DC Cholla Series

Jumping (*Opuntia bigelovii*) grows in fine-textured soils on south-facing slopes in the Sonoran Desert. This Series usually occurs adjacent to the Creosote (*Larrea tridentata*) Series and includes species such as Hedgehog Cactus (*Echinocereus engelmannii*) and Barrel Cactus (*Echinocactus anthodes*) as associates.

DD Croton Series

California Croton (*Croton californicus* var. *mohavensis*) dominates stabilized desert dunes and sandy places of the Colorado Desert. Associated species in this Series include Sand Verbena (*Abronia villosa*), White Bur-Sage (*Ambrosia dumosa*), Locoweed (*Astragalus* spp.) and other forbs.

DB Buckwheat Series

Species of Buckwheat (*Eriogonum* spp.) occur as local dominants or are associated with almost all desert shrub species throughout the Sonoran and Mojave Deserts. In desert mountain areas where other vegetation may not become established, species of Buckwheat may dominate the terrain. Basin Sagebrush (*Artemisia tridentata*) occurs with Buckwheat species in mountains north and east of the Salton Sea (Pinto Basin and Mountains and Chocolate Mountains and Valleys Subsections).

DE Arrowweed Series

Arrowweed (*Pulchea sericea*) is a dominant shrub along some canals of the lower Colorado River. It forms extensive stands or shares dominance with Tamarisk (*Tamarix* spp.) in areas that are frequently flushed of accumulations of salts. Associated species in this Series

may include Seep-Willow (Baccharis glutinosa), Willow (Salix gooddingii), Fremont Cottonwood (Populus fremontii) and Saltbush (Atriplex lentiformis).

Herbaceous

HC Pickleweed Series

Pickleweed (Salicornia utahensis) occurs as a dominant species adjacent to alkali sinks and in flats above alkali lakes in Death Valley. Species associated with it include Arrowweed (Pulchea sericea) and Seep-Willow (Baccharis glutinosa). Pickleweed associates with Iodine Bush (Allenrolfea occidentalis), Greasewood (Sarcobatus vermiculatus) and Sea-Blite (Suaeda spp.) in playas, sinks and near seeps throughout the Mojave Desert.

HM Perennial Grass Series

Two subtypes occur within this Series in the Southern Interior Ecological Province:

Saltgrass Meadow

The salt-tolerant grass Distichlis spicata dominates saline flats of southern Death Valley where it forms an association with Iodine Bush (Allenrolfea occidentalis), Sea-Blite (Suaeda spp.) and Parry Saltbush (Atriplex parryi).

Woolly Galetta

Woolly Galetta (Hilaria rigida), a perennial grass, is a dominant species within local areas of Joshua Tree National Monument, where it associates with Creosote Bush (Larrea tridentata). In the Mojave Desert, where Joshua Trees (Yucca brevifolia) occur, Galetta is an important species along with other herbs and grasses. In other areas such as on sandy substrates of mountain slopes, it becomes dominant.

South Sierran Ecological Province (Inyo, Stanislaus, Sierra, Sequoia National Forests)

Conifer Forest/Woodland

BT Big Tree Series

The largest populations of the Big Tree (Sequoiadendron giganteum) Series are in Tulare and Fresno Counties. Isolated Big Tree groves also occur north to Tuolumne County. These groves occur within Mixed Conifer - Fir stands between 4000 ft (1200 m) and 6000 ft (1800 m). As Big Tree is not a drought tolerant species, these groves are limited to mesic soils with sufficient soil moisture during the dry summer period. Stability of these groves is maintained by frequent fires, which reduce competition by White Firs (Abies concolor). These fires reduce forest floor litter buildup and allow germination of the Big Tree seeds.

MF Mixed Conifer - Fir Series

This is the high elevation counterpart of the Mixed Conifer - Pine Series. Within the elevational range of 5000 ft (1520 m) to 7000 ft (2130 m), on frigid soils, the major species include White Fir (Abies concolor), Red Fir (Abies magnifica), Sugar Pine (Pinus lambertiana), and Jeffrey Pine (P. jeffreyi). The lower elevations within this range are primarily dominated by White Fir and Jeffrey Pine. In the higher elevations Red Fir becomes more dominant, however Jeffrey Pine and White Fir will continue to occur in decreasing amounts. Other associates are Douglas-fir (Pseudotsuga menziesii), Lodgepole Pine (P. contorta) and Ponderosa Pine (P. ponderosa). In this Series True Fir is greater than 20% of the conifer canopy cover, Jeffrey Pine and/or Lodgepole Pine is present, and at least three conifer species have greater than 10% conifer canopy cover each. If Jeffrey Pine or

Lodgepole Pine is not present then Sugar Pine must be present with at least three conifer species greater than 10% conifer canopy cover each and True Fir greater than 30% of the conifer canopy cover. Greenleaf Manzanita (Actostaphylos patula), Huckleberry Oak (Quercus vaccinifolia), and Mountain Whitethorn (Ceanothus cordulatus) are the associated understory shrubs.

WF White Fir Series

Above the highest elevations of the Mixed Conifer-Fir Series, White Fir (Abies concolor) occurs in pure stands. Sugar Pine (Pinus lambertiana) and Red Fir (Abies magnifica) may be occasional associates. These stands usually have a White Fir overstory with a White Fir understory. There are few understory shrubs and litter accumulation is usually quite high. Understory herbs are represented by scattered Pipsissewa and Wintergreen (Chimaphila menziesii and Pyrola picta). At high elevations, White Fir blends with the Red Fir Series.

JP Jeffrey Pine Series

Above the Ponderosa Pine Series on the west slopes of the Sierra Nevada and at higher elevations on the east side of the Sierra Nevada, Jeffrey Pine (Pinus jeffreyi) assumes dominance. This Series occurs as pure stands on glaciated soils or granitic outcrops. Jeffrey Pine may occur as an associate within the Mixed Conifer - Fir Series just below the Red Fir Series. On large flats on the eastern slopes of the Sierran Range, cold temperatures allow Jeffrey Pine to become the dominant conifer. On these eastern slopes, Jeffrey Pine occurs between the high elevation Red Fir Series and the low elevation Juniper or Basin Sagebrush Series. The Jeffrey Pine Series also occurs in Mono County north and south of Mono Lake, and in relic stands in the White Mountains. It occurs on rolling hills and above flats. In this area, associates may include Singleleaf Pinyon (Pinus monophylla), occasionally Lodgepole Pine (Pinus contorta var. murrayana), and Basin Sagebrush (Artemisia tridentata).

RF Red Fir Series

This Series generally occurs as dense, pure stands or as an inclusion in the Mixed Conifer - Fir Series. The type is found on both east and west slopes in the Sierra Nevada from about 7000 ft (2130 m) to 9000 ft (2740 m) on frigid soils. In dense Red Fir (Abies magnifica) stands with heavy litter accumulation, understory plants do not occur except for Pipsissewa and Wintergreen (Chimaphila menziesii and Pyrola picta). In stands that are more open or where Red Fir intergrades with Mixed Conifer - Fir, Tobacco Brush (Ceanothus velutinus), Mountain Whitethorn (C. cordulatus), Pinemat Manzanita (Arctostaphylos nevadensis) and Greenleaf Manzanita (Arctostaphylos patula) are the dominant understory shrubs. Western White Pine (P. monticola) and Lodgepole Pine (P. contorta var. murrayana) are associated conifer species. Mountain Hemlock (Tsuga mertensiana) may occur as isolated trees in colder areas of the Red Fir Series.

FP Foxtail Pine Series

This high elevation series, dominated by Foxtail Pine (Pinus balfouriana) occurs on the Kern Plateau and Cottonwood Basin west of Owens Lake. This Series usually occurs on shallow, well drained, granitic soils and exposed ridges. Although it may be windswept, a krummholzed form does not develop. Little vegetation is found beneath Foxtail Pine stands; rock and bare soils is normal. Rabbitbrush (Chrysothamnus viscidiflorus), Whitestem Goldenbush (Tetradymia canescens), Wax Currant (Ribes cereum), and Buckwheat (Eriogonum spp.) are the occasional associates of this Series.

MH Mountain Hemlock Series

Mountain Hemlock (Tsuga mertensiana) the dominant of this series, is representative of subalpine areas within the Sierra Nevada. It is generally found on north or east facing slopes where snow accumulation holds well into the summer months. It occurs as a dominant species in cold swales from 7000 ft (2130 m) to 9000 ft (2740 m), and in almost pure open stands on ridgetops above 8500 ft (2590 m) with Western White Pine (Pinus monticola). North of Yosemite, Mountain Hemlock groves dominate the subalpine forest. These groves are usually pure Mountain Hemlock with very few associated conifer species. South of Yosemite, Mountain Hemlock occurs only on cold, moist slopes. These stands may be associated with scattered species such as Lodgepole Pine (P. contorta), Western White Pine (P. monticola), Foxtail Pine (P. balfouriana) and Red Fir (Abies magnifica). In moist areas, Willows (Salix spp.) and Mountain Alder (Alnus tenuifolia) are associated understory species.

LP Lodgepole Pine Series

The Lodgepole (Pinus contorta var. murrayana) Series occurs above the Red Fir Series, generally above 7200 ft (2200 m). This pine series grows in open or closed stands on poorly drained soils or adjacent to meadows. Lodgepole Pine is usually an indicator of shallow soils formed by glacial scouring or area with shallow water tables. Lodgepole Pine is an important invader species following fire or disturbance.

KP Knobcone Pine Series

Knobcone Pine (Pinus attenuata) occurs in small dense stands scattered throughout the mixed conifer - Pine and Canyon Live Oak Series. It is generally prevalent in Mariposa County, although it may occur in other areas within the southern Sierra on dry, south facing slopes. This series is a result of past disturbances (usually fire) and is mixed with Whiteleaf Manzanita (Arctostaphylos viscida). Dense groves of Knobcone Pine may dominate disturbed areas. This Series usually occurs from 2000 ft (610 m) to 3000 ft (910 m) on south or west facing slopes and is tolerant of ultra-basics.

PP Ponderosa Pine Series

The Ponderosa Pine (Pinus ponderosa) Series forms an identifiable zone within an elevational range of 3500 ft (1050 m) to 6500 ft (2000 m). This zone occurs above the low elevation chaparral and hardwood series, and below the Mixed Conifer - Fir Series. This Series occurs on xeric soils and is well adapted to low ground fires, which cause openings for this light demanding Series to become established. Associate tree species are Incense Cedar (Calocedrus decurrens), Sugar Pine (P. lambertiana), and White Fir (Abies concolor). Mountain Misery (Chamaebatia foliolosa) and Mariposa Manzanita (Arctostaphylos mariposa) are major understory species.

WB Whitebark Pine Series

This Series, dominated by Whitebark Pine (Pinus albicaulis), occurs on high windswept ridges at treeline. In these areas, a krummholzed form is common. This Series also grows in areas of glacial scouring where soil development is poor. Whitebark Pine also associates with Lodgepole Pine (Pinus contorta) and Foxtail Pine (P. balfouriana).

WW Western White Pine Series

On high elevation, dry, windblown, granitic slopes, Western White Pine (Pinus monticola) occurs in small groves. On better soil conditions, Western White Pine associates with Red Fir (P. magnifica), Mountain Hemlock (Tsuga mertensiana), and Lodgepole Pine (P. contorta). Western White Pine has not been found south of Tulare County.

PL Limber Pine Series

The Limber Pine (*Pinus flexilis*) Series persists on dry, steep, high elevation slopes. These slopes are usually east facing, eroded, rocky, and coarse-textured. Soil nutrient levels are low. Limber Pine seems to grow where Whitebark Pine (*P. albicaulis*) is absent. On better soil conditions, Limber Pine loses dominance and becomes associated with other conifer species.

MI Piute Cypress Series

Within Kern County, Piute Cypress (*Cupressus arizonica* var. *nevadensis*) occurs in a major grove near Bald Eagle Peak. Smaller groves occur with chaparral species, Pinyons, and Junipers north of Bald Eagle Peak into Tulare County.

PJ Singleleaf Pinyon Series

On the dry, east slopes of the southern Sierra and north of Mono Lake, Singleleaf Pinyon (*Pinus monophylla*) dominates in open woodlands. Associated with Singleleaf Pinyon is Western Juniper (*Juniperus occidentalis*), Utah Juniper (*J. utahensis*), and Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*). Associated understory species include Basin Sagebrush (*Artemisia tridentata*), Bitterbrush (*Purshia tridentata*), and Rabbitbrush (*Chrysothamnus parryi*). At low elevations of mountain areas near Lee Vining, Singleleaf Pinyon becomes the sole dominant conifer.

MP Mixed Conifer - Pine Series

The codominants of the Series are Ponderosa Pine (*Pinus ponderosa*) and Sugar Pine (*P. lambertiana*). White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*), Knobcone Pine (*P. attenuata*) and various hardwoods may be present in varying amounts. This Series can be found at elevations between 2000 ft (610 m) and 5500 ft (1680 m) on mesic soils between the Mixed Conifer - Fir and the Ponderosa Pine Series. Understory shrubs within this Series include Mountain Whitethorn (*Ceanothus cordulatus*), Mariposa Manzanita (*Arctostaphylos mariposa*), and at higher elevations Greenleaf Manzanita (*A. patula*).

BP Bristlecone Pine Series

In the White Mountains, Bristlecone Pine (*Pinus aristata*) occurs on Dolomite soils between 9500 ft (2900 m) and 11,500 ft (3500 m). This Series also occurs in scattered populations on dry, rocky slopes within the Inyo and Last Chance Mountains as well as in the Panamint Range. Bristlecone Pine may be associated with Limber Pine (*P. flexilis*) and is an indicator of treeline and very poor soil conditions.

MB Mixed Conifer Forest with Giant Sequoia Series

This Series occurs on well-drained, usually granitic soils at elevations below 9000 ft (2600 m) in the Southern Sierra Nevadas. Giant Sequoia (*Sequoiadendron giganteum*) occurs in groves associated with typical mixed conifer forest types such as Incense Cedar (*Calocedrus decurrens*), Sugar Pine (*Pinus lambertiana*), Ponderosa Pine (*Pinus ponderosa*), White Fir (*Abies concolor*) and Douglas-fir (*Pseudotsuga menziesii*).

SA Subalpine Conifer Series

This is a mixed type, found at the higher elevations. North of Yosemite, Mountain Hemlock (*Tsuga mertensiana*) groves dominate the subalpine forest. South of Yosemite, Mountain Hemlock occurs only on cold, moist slopes. These stands may be associated with scattered species such as Lodgepole Pine (*Pinus contorta*), Western White Pine (*P. monticola*), Foxtail Pine (*P. balfouriana*) and Red Fir (*Abies magnifica*). On high windswept ridges at treeline, Whitebark Pine (*Pinus albicaulis*) occurs, commonly with a krummholzed form. Whitebark

Pine also grows in areas of glacial scouring where soil development is poor. Its associates are Lodgepole Pine and Foxtail Pine. The Kern Plateau and Cottonwood Basin west of Owens Lake are dominated by Foxtail Pine on shallow, well-drained, granitic soils and exposed ridges. The Limber Pine (*Pinus flexilis*) persists on dry, steep, high elevation slopes. These slopes are usually east facing, eroded, rocky, and coarse-textured. Soil nutrient levels are low. Limber Pine seems to grow where Whitebark Pine is absent. On better soil conditions, Limber Pine loses dominance and becomes associated with other conifer species.

PD Gray Pine Series

Primarily found in the foothills, front country and steep, drier canyons. Type was restricted to those areas where Gray Pine (*Pinus sabiniana*) is the only conifer whose tree canopy cover was greater than 10% and the total tree canopy cover of Gray Pine is greater than 75%. The type is typically diverse in structure, with a mix of hardwoods, conifers and shrubs. These components tend to be clumped, with interspersed patches of annual grasses. Stands dominated by Gray Pine tend to share dominance with Canyon Live Oak (*Quercus chrysolepis*), especially under drier site conditions in the central and southern Sierras.

QD Douglas-Fir/Canyon Live Oak Series

Douglas-Fir (*Pseudotsuga menziesii*), often accompanied by Ponderosa Pine (*Pinus ponderosa*) in this region, has a strong Canyon Live Oak (*Quercus chrysolepis*) component on steep north-facing slopes. This mixed conifer and hardwood series occurs at relatively low elevations in the Sierras.

Hardwood Forest/Woodland

QE White Alder Series

Four hardwood species make up this series, White Alder (*Alnus rhombifolia*), Oregon Ash (*Fraxinus latifolia*), Water Birch (*Betula occidentalis*) and Black Cottonwood (*Populus trichocarpa*). These species occur in riparian areas at higher elevations throughout the southern Sierra Nevada. They occur on both east and west slopes. These species may share dominance, or occur separately depending on microhabitat conditions and availability of seed.

QC Canyon Live Oak Series

This Series is dominated by Canyon Live Oak (*Quercus chrysolepis*) occurs above chaparral Series and below Black Oak and Ponderosa Pine on droughty sites. This Series is found on shallow colluvial soils in steep canyons generally between 2000 ft (610 m) and 4500 ft (1370 m). This hardwood is occasionally associated with the Mixed Conifer - Pine and Black Oak Series, usually on rock outcrops and ridgetops. Canyon Live Oak also occurs on the eastern slopes of the southern Sierra Nevada. Mixed shrubs (*Ceanothus integerrimus* and *Arctostaphylos viscida*) will occur in the understory, as will grasses.

QK Black Oak Series

The Black Oak (*Quercus kelloggii*) Series occurs in pure stands or associates with Ponderosa Pine (*Pinus ponderosa*) generally below 6000 ft (1830 m) on the westside slopes of the southern Sierra Nevada. This sprouting hardwood becomes dominant on poorly drained or somewhat shallow soils. Black Oak grows on sites which will not support Ponderosa Pine. Black Oak also associates with Jeffrey Pine (*P. jeffreyi*) and Black Cottonwood (*Populus trichocarpa*) on the higher west slopes.

QQ Quaking Aspen Series

The Quaking Aspen (Populus tremuloides) Series occurs at high elevations as an indicator of moist conditions. Groves of Quaking Aspen associate with Red Fir, Lodgepole Pine, Basin Sagebrush, and high elevation meadow Series. The elevational range is from 5500 ft (1680 m) to 9000 ft (2740 m). At the higher elevations, under exposed conditions, Quaking Aspen stands will maintain a shrub-like appearance and never reach a tree-like form.

QO Willow Series

This series, dominated by Willow (Salix spp.), occurs on the east side of the Sierra Nevada where stream or pond conditions provide sufficient moisture. Associates of this stringer-like Series include Water Birch (Betula occidentalis), Wild Rose (Rosa woodsii), Aspen (Populus spp.), and other water tolerant species.

QD Blue Oak - Gray Pine Series

This Series occurs on shallow upland soils in the foothill savannas adjacent to the western slopes of the Sierra Nevada. Blue Oak (Quercus douglasii) naturally occurs in an oak-grass association on well-drained, gentle slopes. Blue Oak and Gray Pine (Pinus sabiniana) are the major codominant trees in the hillside series. Interior Live Oak (Quercus wislizenii) may also be a major species and Valley Oak (Quercus lobata) may be present on deep soils. Non-stump sprouting chaparral shrubs (Ceanothus cuneatus, Arctostaphylos spp., Rhamnus spp., and Rhus diversiloba) are scattered throughout this Series. Within the higher elevations of the Blue Oak Series, evergreen trees and shrubs occur with increasing density.

QW Interior Live Oak Series

This Interior Live Oak (Quercus wislizenii) dominated Series occurs in semi-open or closed stands or may associate with the Canyon Live Oak Series at higher elevations. Gray Pine (Pinus sabiniana) and Buckeye (Aesculus californica) are associated species. This Series is located above the Blue Oak Series and below the Black Oak and Ponderosa Pine Series, generally between 500 ft (150 m) and 2000 ft (610 m). Interior Live Oak also associates occasionally with Black Oak (Quercus kelloggii), Ponderosa Pine (P. ponderosa), and chaparral species. On drier sites, Gray Pine becomes an associate.

QL Valley Oak Series

This Series, dominated by Valley Oak (Quercus lobata), occurs on the deep, fertile loam soils of old alluvial terraces on west slopes of the Sierra Nevada. Valley Oak may be associated with Interior Live Oak (Q. wislizenii) on less productive soils. They occur as pure stands of large trees with no woody understory. These stands appear similar in structure on valley bottoms and in rolling slopes over a range of elevations, generally below 2000 ft (610 m). The major distribution of the Valley Oak Series is adjacent to major streamcourses in Kern and Tulare Counties.

QF Cottonwood Series

This Series includes the riparian species Fremont Cottonwood (Populus fremontii), Willows (Salix spp.), Sycamore (Platanus racemosa). These hardwoods occur in moist areas from the valley foothills to the Mixed Conifer - Fir Series above. Sycamore dominates the riparian type in the valley and Cottonwood occurs along streams in the higher elevation montane areas. Cottonwood also occurs as the dominant riparian species east of the Kern River north to Mono Lake. Buckeye (Aesculus californica) and an occasional Bigleaf Maple (Acer macrophyllum) associate in moist areas within the lower elevation montane slopes.

Shrubs and Chaparral

CV Snowbrush Series

In this Series, Snowbrush (Ceanothus velutinus) is the dominant brush species on the east slopes of the southern Sierra Nevada. These brushfields occur in the elevational range of the Mixed Conifer-Fir Series. Also known as Tobacco Brush, it associates with Jeffrey Pine (Pinus jeffreyi), Red Fir (Abies magnifica) and an occasional White Fir (A. concolor). Associate species include Greenleaf Manzanita (Arctostaphylos patula), Choke Cherry (Prunus virginiana) and Bitter Cherry (P. emarginata). Tobacco Brush may invade deep well drained soils after fire or logging. This Ceanothus Series occurs on both good and poor soils, with density and vigor being an indicator of local site conditions.

CH Huckleberry Oak (High elevation) Series

Huckleberry Oak (Quercus vaccinifolia) is the dominant of this Series and occurs with Pinemat Manzanita (Arctostaphylos nevadensis) on shallow ultrabasic soils and very shallow dry stoney or gravelly soils on other geologies at elevations between 3000 ft (910 m) to 7000 ft (2130 m) and above. They represent a climax condition due to shallow soils and identify poor conifer production sites. This Series occurs on both east and west slopes of the southern Sierra Nevada associated with Mixed Conifer - Fir, Red Fir and Jeffrey Pine Series. Greenleaf Manzanita (A. patula), Bush Chinquapin (Castanopsis sempervirens), Mountain Whitethorn (Ceanothus cordulatus), Bitter Cherry (Prunus emarginata) and Hoary Manzanita (A. canescens) are associated shrub species. Conifer species, if present, are Jeffrey Pine (Pinus jeffreyi), Red Fir (Abies magnifica) and Western White Pine (P. monticola).

CL Wedgeleaf Ceanothus Series

This Series, dominated by Wedgeleaf Ceanothus (Ceanothus cuneatus), occurs on well-drained soils on dry, exposed slopes and ridges. This Series occurs above 300 ft (90 m) and below 4000 ft (1200 m). It may occur as a nearly pure, dense thicket or more open with other shrubs. The associated species include Greenleaf Manzanita (Arctostaphylos patula), Deerbrush (Ceanothus integerrimus), Black Oak (Quercus kelloggii), Ash (Fraxinus dipetala), Flannel Bush (Fremontia californica) and Buckeye (Aesculus californica).

CA Chamise Series

This is a fire adapted Series, dominated by Chamise (Adenostoma fasciculatum). It grows on hot, xeric slopes and ridges of the western Sierra Nevada Mountains between 1500 ft (460 m) and 4500 ft (1370 m). Associated species include Redbud (Cercis occidentalis), Manzanita (Arctostaphylos spp.), Mountain Whitethorn (Ceanothus cordulatus) and other Ceanothus spp., Leather Oak (Quercus durata), Huckleberry Oak (Q. vaccinifolia) and Bush Chinquapin (Castanopsis sempervirens). An associated herb species is Eriogonum fasciculatum. An associated rye grass species is Elymus condensatus.

CJ Brewer Oak Series

Steep and rocky upper slopes of foothills and montane areas of the southern Sierra Nevada occasionally are occupied by a dominant shrub, Brewer Oak (Quercus garryana var. breweri). It is sometimes associated with lower elevation shrubs, subshrubs and trees such as Shrub Interior Live Oak (Q. wislizenii var. frutescens), Birchleaf Mountain Mahogany (Cercocarpus betuloides), Wedgeleaf Ceanothus (Ceanothus cuneatus), Black Oak (Q. kelloggii), Sumac (Rhus spp.), and Honeysuckle (Lonicera spp.). The vine Virgin-Bower (Clematis lasiantha) may also occur.

CG Greenleaf Manzanita Series

This Series, dominated by Greenleaf Manzanita (Arctostaphylos patula) occupies elevations above the Whiteleaf Manzanita Series and in proximity to the Mixed Conifer - Fir and Red Fir Series. Greenleaf Manzanita occasionally associates with Jeffrey Pine. Other shrubs in mid-montane areas of the Sierra Nevada may also associate, such as Deerbrush (Ceanothus integrerrimus) and Bush Chinquapin (Castanopsis sempervirens). The ability of the species to sprout after fire and the long-term viability of its seeds allow it to reoccupy a site after about five years.

CW Whiteleaf Manzanita Series

Whiteleaf Manzanita (Arctostaphylos viscida) assumes dominance on dry slopes in the same elevational range as Ponderosa Pine and the Mixed Conifer - Pine Series in the southern Sierra Nevada. It is usually found on south and west aspects or on rocky or infertile soils with Wedgeleaf Ceanothus (Ceanothus cuneatus).

CX Montane Chaparral Series

This Series is a mid-elevation, mixed type containing species such as Greenleaf Manzanita (Arctostaphylos patula), Mountain Whitethorn (Ceanothus cordulatus), Bear Clover (Chamaebatia foliolosa), and Deerbrush (C. integrerrimus). Deerbrush is found extensively on deep mesic soils on the westside of the Sierra Nevada from about 3000 ft (930 m) to 7000 ft (2170 m). Snowbrush generally occurs below 8500 ft (2635 m) only on the eastern slopes of the Sierra Nevada. It is also found in association with Greenleaf Manzanita and occasionally with Bitter Cherry (Prunus emarginata). Greenleaf Manzanita, a stump-sprouter, is scattered throughout the Mixed Conifer - Fir Series, primarily on xeric soils. Mountain Whitethorn occurs on dry, open flats and slopes from 3000 ft (930 m) to 9000 ft (2790 m). It often occurs together with Greenleaf Manzanita, Pinemat Manzanita (A. nevadensis), Bush Chinquapin (Castanopsis sempervirens) and Bitter Cherry on west Sierran slopes. On east Sierran slopes, Basin Sagebrush (Artemisia tridentata), Snowbrush (Ceanothus velutinus), and Squirreltail (Sitanion hystrix) may occur as associated species. Huckleberry Oak (Quercus vaccinifolia) often occurs on the west side as an associated shrub.

CC Sierran Mixed Chaparral Series

This low elevation chaparral Series ranges up to about 3500 ft (1085 m) and is a floristically rich type that changes species composition with respect to precipitation, aspect and soil type. Dominant species include species of ceanothus and manzanita in addition to some scrub oaks (Quercus spp.). Individual sites may support pure stands of these shrubs refer to, for example, the Chamise Series, or diverse mixtures of several species. Commonly associated shrubs include Chamise (Adenostoma fasciculatum), Wedgeleaf Ceanothus (Ceanothus cuneatus), Birchleaf Mountain Mahogany (Cercocarpus betuloides), Silk-tassel (Garrya fremontii), Toyon (Heteromeles arbutifolia), Yerba-santa (Eriodictyon spp.), and Whiteleaf Manzanita (Arctostaphylos viscida). Other shrub species below coniferous and hardwood sites in this Series include Interior and Canyon Live Oaks (Q. wislizenii, Q. chrysolepis) and Poison Oak (Toxicodendron diversiloba).

CS Scrub Oak Series

This type is found intermixed with the Mixed Chaparral Series below 5000 ft (1550 m). It is dominated by shrubby Interior Live Oak (Q. wislizenii var. frutescens), or shrubby Canyon Live Oak (Q. chrysolepis var. nana). As there is much hybridization among Quercus species, positive identifications become difficult. Most species of oak in this Series stump sprout after fire and may fully occupy the site within ten years. Other associated shrubs

include Birchleaf Mountain Mahogany (Cercocarpus betuloides), Poison Oak (Toxicodendron diversilobum) and other mesic chaparral species.

CM Upper Montane Mixed Shrub Series

This mixed shrub Series occurs in upper montane positions on harsh sites such as exposed ridge tops or under excessively drained soils conditions. Elevations typically are between 6000 to 9000 ft (1860 – 2790 m) within the Red Fir, Lodgepole Pine and Jeffrey Pine Series. Major shrub species include Huckleberry Oak (Quercus vaccinifolia), Creeping Snowberry (Symphoricarpus acutus), Pinemat Manzanita (Arctostaphylos nevadensis) and Bush Chinquapin (Castanopsis sempervirens). Minor associates include Greenleaf and Whiteleaf Manzanita (A. patula, A. viscida), Bitter Cherry (Prunus emarginata) and Mountain Whitethorn (Ceanothus cordulatus) towards the west. Basin Sagebrush (Artemisia tridentata), Bitterbrush (Purshia tridentata), and Mountain or Parish's Snowberry (Symphoricarpus vaccinioides or S. parishii) occur on the east side.

BM Curlleaf Mountain Mahogany Series

This Series occurs on gently to steeply sloping mountain uplands and ridgetops usually in association with rocky outcrops. On more xeric sites Curlleaf Mountain Mahogany (Cercocarpus ledifolius) occurs as the dominant species in association with Idaho Fescue (Festuca idahoensis), Squirreltail (Sitanion hystrix), and a few other grasses and forbs. On more mesic sites, associates may include Juniper (Juniperus spp.), scattered Ponderosa Pine (Pinus ponderosa), Jeffrey Pine (P. jeffreyi) or Singleleaf Pinyon (P. monophylla). This Series may occur in two forms; a shrub form that occurs scattered throughout an area, and a small tree form that occurs in dense thickets.

Sagebrush Shrub

BC Saltbush Series

Both Spiny Saltbush (Atriplex confertifolia) and Fourwing Saltbush (A. canescens) occur from northern Owens Valley to Kern County. Spiny Saltbush generally is located on dry alkaline plains and hills on the east slopes of the Sierra Nevada in Mono, Kern, and Inyo Counties. Fourwing Saltbush may be abundant on saline desert flats and washes of the same counties. Associated species include Sagebrush (Artemisia spp.), Creosote (Larrea divaricata) and grasses.

BS Basin Sagebrush Series

Basin or Big Sagebrush (Artemisia tridentata) the dominant of this Series, generally occurs on dry slopes and plains from 4000 ft (1220 m) to 10,600 ft (3230 m) east of the Sierran crest. Basin Sagebrush is usually found on frigid soils with a lack of soil profile development. Basin Sagebrush may be codominant with Bitterbrush (Purshia tridentata). Basin Sagebrush also occurs with Jeffrey Pine (Pinus jeffreyi) and Mountain Mahogany (Cercocarpus spp.) on gentle to steep slopes without rock outcrops. Other associates include Juniper (Juniperus spp.), Greenleaf Manzanita (Arctostaphylos patula), Rabbitbrush (Chrysothamnus spp.), Squirreltail (Sitanion hystrix), Fescue (Festuca spp.), Kentucky Bluegrass (Poa pratensis) and Sagebrush (A. nova, A. arbuscula, and A. rothrockii).

BB Bitterbrush Series

In the Mono Basin, southeast of Mono Lake and in the headwaters of the Owens River, Bitterbrush (Purshia tridentata) becomes the dominant of this Series. This high value forage species occurs at higher elevations than Saltgrass (Distichlis spp.) meadows and below montane slopes with Basin Sagebrush (Artemisia tridentata), Pinyon Pine (P.

monophylla) and Juniperus spp. Bitterbrush may also be locally dominant when associated with Basin Sagebrush.

BR Rabbitbrush Series

The extreme southeastern areas of the Southern Sierra Nevada are partially under the influence of the Mojave Desert climate regime. This Series is found on dry slopes and flats that are dominated by Rabbitbrush (Chrysothamnus spp.). Other associated species may include Bitterbrush (Purshia tridentata), Sagebrush (Artemisia spp.), Jeffrey Pine (Pinus jeffreyi), Junipers (Juniperus spp.), Buckwheat (Eriogonum spp.) and perennial grasses such as Stipa spp. and Festuca spp.

Desert Shrub

DL Creosote Series

In this Series Creosote (Larrea divaricata) is the dominant shrub species on the low elevation east slopes of the Sierra Nevada. Creosote can also be found on the east slopes of the Tehachapi Mountains. Associated species include Mormon Tea (Ephedra spp.), Cacti (Opuntia spp.), Barrel Cactus (Echinocactus spp.), Spanish Bayonet (Yucca spp.) and Joshua Tree (Y. brevifolia).

DX Mixed Desert Shrub Series

On the low elevation east slopes of the Sierra Nevada, Creosote (Larrea divaricata) is the dominant shrub of this type. Associated species include Mormon Tea (Ephedra spp.), Cacti (Opuntia spp.), Barrel Cactus (Echinocactus spp.), Spanish Bayonet (Yucca spp.) and Joshua Tree (Y. brevifolia). Saltbush (Atriplex spp.) can also be a component of this mixed desert shrub type. In the more southern parts of the Inyo National Forest, Blackbush (Coleogyne ramosissima) dominates. Occurrence is on non-saline soils, often beneath scattered Pinyon Pine (Pinus monophylla). Associated species may include Yucca (Yucca baccata), Hopsage (Grayia spinosa), Agave (Agave deserti) and Mormon Tea (Ephedra spp.).

Alpine Dwarf Scrub

AC Cushion Plant Series

Prostrate shrubs and herbs form the major vegetation component in alpine areas of this type. On dry, open fell-fields, Phlox (Phlox covillei) dominates the site. On granite and metamorphics, Buckwheat (Eriogonum ovalifolium) is the primary associated species. When parent material is dominated by marble, Cymopterus (Cymopterus cinerarius) is of major importance along with Phlox. Many other cushion plants occur within these fell-fields. Local conditions and seed sources contribute heavily to cushion plant diversity in these high elevation areas. Other species commonly present in the Sierra Nevada are Bush Cinquefoil (Potentilla fruticosa), Pussytoes (Antennaria alpina), Sierra Primrose (Primula suffrutenscens), Haplopappus spp.

AX Mixed Alpine Scrub Series

These communities are often low graminoid and forb species with an admixture of dwarf-shrubs (often cushion plants). Species composition varies considerably throughout California. In the Sierra Nevada, the most common shrubs are Creambush Oceanspray (Holodiscus discolor), Greene Goldenweed (Haplopappus greenei) and Mountain White Heather (Cassiope mertensiana). In the White Mountains, the most common alpine shrub is Timberline Sagebrush (Artemisia rothrockii). Nonshrub species include Sedge (Carex exerta), Knotweed (Polygonum davisiae), Pussytoes (Antennaria alpina), Sierra Primrose (Primula suffrutenscens), Bush Cinquefoil (Potentilla fruticosa), Eschscholtz Buttercup

(Ranunculus eschscholtzii), Prostrate Sibbaldia (Sibbaldia procumbens), Bluegrass (Poa spp.), Buckwheat (Eriogonum spp.), Squirreltail, Rock-cress (Arabis spp.), Mountain Sorrel (Rubus parviflorus), Pussypaws (Calyptridium umbellatum), Indian Paintbrush (Castilleja spp.) and Payson's Draba (Draba paysonii). The high Sierra is dominated by Columbine (Aquilegia spp.), Heart Willowweed (Epilobium obcordatum), Davidson's Penstemon (Penstemon davidsonii), Jacob's-ladder (Polemonium spp.) and Colville's Phlox (Phlox covillei). In the White Mountains, the dominant nonshrub species include Scribner's Wheatgrass (Agropyron scribneri), several species of Phlox and Jacob's-ladder.

Herbaceous

HG Annual Grass - Forb Series

Throughout the low elevations of the western slopes of the southern Sierra Nevada, annual grasses (Bromus spp., Stipa spp. and Avena spp.) dominate rolling hills. Dominant forbs in this Series include Owl's Clover (Orthocarpus spp.), Fiddleneck (Amsinckia intermdia) and Stork's Bill (Erodium spp.). These grasses and forbs may occur in pure stands or contain an overstory of Oaks (Quercus spp.) or Buckeye (Aesculus californica). East of Bakersfield, this Series may dominate a vast array of slopes and aspects. Associated species include hardwoods growing in sheltered areas and Gray Pine (Pinus sabiniana) on rocky slopes.

HJ Wet Meadows Grass - Sedge - Rush Series

This Series is composed of Sedges (Carex spp.) and Rushes (Juncus spp.) and designates yearlong water availability. Perennial grasses, forbs, Willows (Salix spp.) and Lodgepole Pine (Pinus contorta) may be associated with this Series. This Series represents a much wetter site than the Annual Grass - Forb Series.

APPENDIX F: POTENTIAL VEGETATION REFERENCES

Table 9: Region 5 references

Code	Name	
501	Riparian Community Type Classification for Humboldt and Toiyable National Forests, Nevada and Eastern California. R4-ECOL-95-01. 1995.	Mary E. Manning and Wayne G. Padgett
502	Westside Mixed Conifer Ecosystems – Plumas, Lassen, and Tahoe National Forests; Zone 4	Gary Benson (1988)
503	Ecological Type Classification for California: Mixed Conifer of the Trinity Ultramafic Sheet; Zone 3	Bud Adamson (1988)
504	Ecological Guide to Eastside Plant Associations; Northeastern California: Modoc, Lassen, Klamath, Shasta-Trinity, Plumas, and Tahoe National Forests. 1988.	Sydney Smith, S.

Code	Name	
506	A Classification of Upper Montane Forests in the Central and Southern Sierras of California. Zone 5. Gen. Tech. Report R5-ECOL-TP-003.	Potter, D. (1994)
507	Some combination of references 504, 513, 514, and 515.	USDA Forest Service
508	CAL-VEG codes. Timber Management Plan Inventory Handbook, USDA Forest Service, Pacific Southwest Region.	June 1995
509	Ecological Guide to Mixed Conifer Plant Associations in Northwest California. USDA Forest Service Report R5-ECOL-TP-001.	Jo Ann Fites
510	A Field Guide to Port Orchard Cedar Plant Associations in Northwest California. USDA Forest Service Report R5-ECOL-TP-002	Jimerson, Thomas M. (1994)
511	Ecological Guide to Southern California Chaparral Plant Series. Transverse and Penninsular Ranges; Angeles, Cleveland, and San Bernardino National Forests. USDA Forest Service Report R5-ECOL-TP-005.	Gordon, H. and T.C. White (1994)
512	A Field Guide to Serpentine Plant Associations and Sensitive Plants in Northwestern California; USDA Forest Service Report R5-ECOL-TP-006.	Jimerson, Thomas M., et. al. (1995)
513	A Field Guide to the Tanoak and the Douglas-fir Plant Associations to Northwestern California; USDA Forest Service Report R5-ECOL-TP-009.	Jimerson, T. M., et. al. (1996)
514	Coast Redwoods Ecological Types of Southern Monterey County, California. USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. GTR PSW – 107. 1988.	Mark Borchert, Daniel Segotta, and Michael D. Purser
515	Blue Oak Plant Communities of Southern San Luis Obispo and Northern Santa Barbara Counties, California. USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. GTR PSW-139. 1993.	Mark I. Borchert, Nancy D. Cunha, Patricia C. Krosse, and Marcee L. Lawrence
516	A System of Vegetation Classification Applied to Hawaii. Gen Tech Rep. PSW-76. Berkeley, CA: USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. 11 pp. illus.	Buck, M.G., T.E. Paysen. 1984

APPENDIX G: POTENTIAL VEGETATION CODES

Table 10: Reference Code 501

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
42012	Quaking aspen/Kentucky bluegrass	POTR5/POPR
42228	Geyers willow/mesic graminoid	SAGE2/2GRAM
43001	Conifer/redosier dogwood	2TE/COSE16
43010	Conifer/Kentucky bluegrass	2TE/POPR
43014	Conifer/water birch	2TE/BOEC2
43015	Conifer/Woods' rose	2TE/ROWO
43016	Conifer/tall form	2TE/2FORB
43017	Conifer/mesic forb	2TE/2FORB
43031	Lodgepole pine/mountain sedge	PICO/CASC12
43061	Quaking aspen/water birch	POTR5/BEOC2
43062	Quaking aspen/redosier dogwood	POTR5/COSE16
43063	Quaking aspen/willow	POTR5/SALIX
43064	Quaking aspen/Woods' rose	POTR5/ROWO
43065	Quaking aspen/California brome	POTR5/BRCA5
43066	Quaking aspen/Kentucky bluegrass	POTR5/POPR
43067	Quaking aspen/mesic forb	POTR5/2FORB
43071	Cottonwood/water birch	POPUL/BEOC2
43072	Cottonwood/redosier dogwood	POPUL/COSE16
43072	Cottonwood/willow	POPUL/SALIX
43073	Cottonwood/Woods' rose	POPUL/ROWO
43075	Cottonwood/fragrant sumac	POPUL/RHAR4
43076	Cottonwood (stream bar)	POPUL
43101	Gray alder	ALIN2

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
43103	Gray alder/mesic forb	ALIN2/2FORB
43104	Gray alder/mesic graminoid	ALIN2/2GRAM
43106	Gray alder/redosier dogwood	ALIN2/COSE16
43151	Water birch/redosier dogwood	BEOC2/COSE16
43152	Water birch/mesic forb	BEOC2/2FORB
43153	Water birch/mesic graminoid	BEOC2/2GRAM
43154	Water birch/field horsetail	BEOC2/EQAR
43155	Water birch/Kentucky bluegrass	BEOC2/POPR
43156	Water birch (bench)	BEOC2
43222	Geyer's willow/beaked sedge	SAGE2/CARO6
43243	Narrowleaf willow/mesic forb	SAEX/2FORB
43246	Narrowleaf willow/Woods' rose	SAEX/ROWO
43247	Narrowleaf willow (bench)	SAEX
43261	Lemmon's willow/mountain sedge	SALE/CASC12
43262	Lemmon's willow/mesic graminoid	SALE/2GRAM
43263	Lemmon's willow/mesic forb	SALE/2FORB
43264	Lemmon's willow/tall forb	SALE/2FORB
43265	Lemmon's willow (seep)	SALE
43265	Lemmon's willow (bench)	SALE
43272	Yellow willow/mesic graminoid	SALU2/2GRAM
43273	Yellow willow/mesic forb	SALU2/2FORB
43274	Yellow willow/Woods' rose	SALU2/ROWO
43275	Yellow willow/Kentucky bluegrass	SALU2/POPR
43276	Yellow willow (bench)	SALU2
43282	Drummond's willow	SADR

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
43284	Pacific willow/mesic forb	SALUL/2FORB
43285	Pacific willow (bench)	SALUL
43287	Arroyo willow/Woods' rose	SALA6/ROWO
43288	Arroyo willow (bench)	SALA6
43289	Willow/beaked sedge	SALIX/CARO6
43290	Willow/mesic graminoid	SALIX/2GRAM
43291	Willow/mesic forb	SALIX/2FORB
43292	Willow/tall forb	SALIX/2FORB
43293	Willow/Woods' rose	SALIX/ROWO
43294	Willow/Kentucky bluegrass	SALIX/POPR
43304	Wolf's willow/mountain sedge	SAWO/CASC12
43325	Diamondleaf willow/mountain sedge	SAPL2/CASC12
43327	Mountain willow/mountain sedge	SAEA/CASC12
43328	Sierra willow/tall forb	SAOR/2FORB
43329	Low willow/mesic forb	SALIX/2FORB
43351	Redosier dogwood	COSE16
43352	Redosier dogwood-willow	COSE16
43451	Chokecherry/Woods' rose	PRVI/ROWO
43500	Woods' rose	ROWO
43554	Shrubby cinquefoil/Gray's licorice-root	DAFL3/LIGR
43605	Silver sagebrush/graminoid (dry)	ARCA13/2FORB
43606	Silver sagebrush/graminoid (mesic)	ARCA13/2FORB
43651	Big basin sagebrush/Woods' rose	ARTRT/ROWO
43801	Water sedge	CAAQ
43803	Douglas' sedge	CADO2

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
43805	Woolly sedge	CAPE42
43807	Smallwing sedge	CAMI17
43808	Nebraska sedge	CANE2
43809	Beaked sedge	CARO6
43811	Mountain sedge	CASC12
43812	Analogue sedge	CASI2
43821	Common spikerush	ELPA3
43822	Fewflower spikerush	ELQU2
43831	Baltic rush	JUBA
43871	Tufted hairgrass	DECA18
43872	Tufted hairgrass-Nebraska sedge	DECA18-CANE2
43882	Kentucky bluegrass	POPR
43883	Sandberg bluegrass	POSE
43905	Sierra shootingstar	DOJE
43911	Bigleaf lupine-arriwleaf ragwort	LUPO2-SETR
43915	Rocky Mountain iris/dry graminoid	IRMI/2GRAM
43916	Rocky Mountain iris/mesic graminoid	IRMI/2GRAM
43921	Tall fringed bluebells	MECI3
43931	California false hellebore	VECA2
43991	Creeping bentgrass	AGST2
43995	Meadow barley	HOBR2

Table 11: Reference Code 502

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CC0311	Mountain hemlock/bride's bonnet	TSME/CLUN2
CPJGBW11	Jeffrey pine-white fir/bluegrass (granite)	PIJE-ABCO/POA

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CPJGNG11	Ponderosa pine-Jeffrey pine-white fir/western needlegrass (ash)	PIPO-PIJE-ABCO/AMPA2
CJSAM11	Ponderosa pine-Jeffrey pine-California black oak/pale serviceberry	PIPO-PIJE-QUKE/AMPA2-MARE11
CPJSBB11	Jeffrey pine-California black oak/skunkbush sumac	PIJE-QUKE/RHTRQ
CPJSBB12	Jeffrey pine/antelope bitterbrush-curl-leaf mountain mahogany/western needlegrass	PIJE/PUTR2-CELE3/ACOCO
CPJSBB13	Jeffrey pine/antelope bitterbrush-Utah snowberry/bluegrass	PIJE/PUTR2-SYORU/POA
CPJSBB14	Jeffrey pine/antelope bitterbrush/woolly mule-ears	PIJE/PUTR2/WYMO
CPJSBB15	Ponderosa pine-Jeffrey pine-Douglas-fir/antelope bitterbrush/woolly mule-ears	PIPO-PIJE-PSME/PUTR2/WYMO
CPJSBB16	Ponderosa pine-Jeffrey pine-California black oak/bluegrass (granite)	PIPO-PIJE-QUKE/POA
CPJSBB17	Ponderosa pine-Jeffrey pine/mountain big sagebrush-antelope bitterbrush	PIPO-PIJE/ARTRV-PUTR2
CPJSBB18	Ponderosa pine-Jeffrey pine/antelope bitterbrush/Idaho fescue	PIPO-PIJE/PUTR2/FEID
CPJSBB19	Ponderosa pine-Jeffrey pine/antelope bitterbrush/Idaho fescue (granite)	PIPO-PIJE/PUTR2/FEID
CPJSBB20	Ponderosa pine-Jeffrey pine/antelope bitterbrush/lambstongue ragwort (granite)	PIPO-PIJE/PUTR2/SEINM
CPJSBB21	Ponderosa pine-Jeffrey pine/Modoc buckthorn/Sandberg bluegrass	PIPO-PIJE/FRRUM/POSE
CPJSBB23	Ponderosa pine-Jeffrey pine-white fir/interior live oak	PIPO-PIJE-ABCO/QUWI2
CPJSMC11	Jeffrey pine/curl-leaf mountain mahogany	PIJE/CELE3
CPJSMC12	Ponderosa pine-Jeffrey pine/curl-leaf mountain mahogany/bluebunch wheatgrass	PIPO-PIJE/CELE3/PSSPS
CPJSMC13	Ponderosa pine-Jeffrey pine/curl-leaf mountain mahogany/arrowleaf balsamroot	PIPO-PIJE/CELE3/BASA3

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CPJSOH11	Ponderosa pine-Jeffrey pine-white fir/huckleberry oak/woolly mule-ears	PIPO-PIJE-ABCO/QUVA/WYMO
CPJSSB11	Jeffrey pine/mountain big sagebrush/Idaho fescue	PIJE/ARTRV/FEID
CPJSSS12	Ponderosa pine-Jeffrey pine-white pine/sharpleaf snowberry/woolly mule-ears	PIPO-PIJE-ABCO/SYAC/WYMO
CPJSSY11	Jeffrey pine-white fir/Utah snowberry/Wheeler bluegrass	PIJE-ABCO/SYORU/PONE2
CPOSMP11	Washoe pine/pinemat manzanita	PIWA/ARNE
CPOSSY11	Washoe pine-white fir/Utah snowberry/tuber starwort	PIWA-ABCO/SYORU/PSJA2
CPPSAM11	Ponderosa pine/pale serviceberry-creeping barberry/heartleaf arnica	PIPO/PMPA2-MARE11/ARCO9
CPPSAM12	Ponderosa pine/pale serviceberry-plum	PIPO/PMPA2-PRUNU
CPPSAM13	Ponderosa pine-white fir-lodgepole pine/pale serviceberry	PIPO-ABCO-PICO/AMPA2
CPPSAM14	Ponderosa pine-white fir-black oak/pale serviceberry	PIPO-ABCO-QUVE/AMPA2
CPPSAM15	Ponderosa pine-white fir/pale serviceberry-creeping barberry	PIPO-ABCO/AMPA2-MARE11
CPPSAM16	Ponderosa pine-white fir/pale serviceberry-snowbrush ceanothus/Orcutt's brome	PIPO-ABCO/AMPA2-CEVE/BROR2
CPPSBB11	Ponderosa pine-incense cedar/antelope bitterbrush/western needlegrass	PIPO-CADE27/PUTR2/BASA3
CPPSBB12	Ponderosa pine-California black oak/antelope bitterbrush/arrowleaf balsamroot	PIPO-QUKE/PUTR2/ACOCO
CPPSBB13	Ponderosa pine/curl-leaf mountain mahogany-antelope bitterbrush/Idaho fescue	PIPO/CELE3-PUTR2/FEID
CPPSBB14	Ponderosa pine/antelope bitterbrush-snowbrush ceanothus-greenleaf manzanita/Orcutt's brome	PIPO/PUTR2-CEVE-ARPA6/BROR2
CPPSBB15	Ponderosa pine/antelope bitterbrush-plum/Orcutt's brome	PIPO/PUTR2-PRUNU/BROR2

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CPPSBB16	Ponderosa pine/antelope bitterbrush-plum/bluebunch wheatgrass	PIPO/PUTR2-PRUNU/PSSPS
CPPSBB17	Ponderosa pine/antelope bitterbrush-wax currant/Orcutt's brome	PIPO/PUTR2-RICE/BROR2
CPPSBB18	Ponderosa pine/antelope bitterbrush/arrowleaf balsamroot	PIPO/PUTR2/BASA3
CPPSBB19	Ponderosa pine/antelope bitterbrush/Idaho fescue	PIPO/PUTR2/FEID
CPPSBB20	Ponderosa pine/antelope bitterbrush/western needlegrass (pumice)	PIPO/PUTR2/ACOCO
CPPSBB21	Ponderosa pine-white fir/snowbrush ceanothus/western needlegrass	PIPO-ABCO/CEVE/ACOCO
CPPSBB22	Ponderosa pine-white fir/antelope bitterbrush-greenleaf manzanita/western needlegrass	PIPO-ABCO/PUTR2-ARPA6/ACOCO
CPPSBB11	Ponderosa pine/mountain big sagebrush/Idaho fescue	PIPO/ARTRV/FEID
DC0811	Douglas-fir-ponderosa pine/Pacific poison oak	PSME-PIPO/TODI
DC0812	Douglas-fir-ponderosa pine/mountain misery/Sierra milkwort	PSME-PIPO/CHFO/POCOC
DC0813	Douglas-fir-pine-canyon live oak/deerbrush	PSME-PINUS-QUCH2/CEIN3
DC0911	Douglas-fir-white fir-tanoak/western brackenfern	PSME-ABCO-LIDE3/PTAQ
DH0711	Douglas-fir-mountain dogwood-tanoak/California hazelnut/stickywilly	PSME-CONU2-LIDE3/COCOC/GAAP2
PC0611	Ponderosa pine-white fir/tobaccobrush-squawcarpet	PIPO-ABCO/CEVE3-CEPR
QS0111	Sugar pine-western white pine/huckleberry oak-pinemat manzanita	PILA-PIMO3/QUVA-ARNE
WC0911	White fir-Douglas-fir-tanoak/California hazelnut	ABCO-PSME-LIDE2/COCOC
WC0912	White fir-Douglas-fir-mountain dogwood/bush chinquapin	ABCO-PSME-CORNU/CHSE11
WC0913	White fir-Douglas-fir/sharpleaf snowberry/thimbleberry	ABCO-PSME/SYAC/RUPA

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
WC0914	White fir-sugar pine/sharpleaf snowberry/Ross' sedge	ABCO-PILA/SYAC/CARO5
WC0915	White fir-Douglas-fir/little prince's pine	ABCO-PSME/CHME
WC0916	White fir-Douglas-fir-incense cedar/pale serviceberry	ABCO-PSME-CADE27/AMPA2
WC0917	White fir-Douglas-fir-Jeffrey pine/rosy everlasting	ABCO-PSME-PIJE/GAMOC

Table 12: Reference Code 503

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
DF	Douglas-fir series	PSME
DF1	Douglas-fir/California hazelnut/western swordfern	PSME/COCOC/POMU
DF2	Douglas-fir-incense cedar/Canyon live oak/Pacific poison oak	PSME-CADE27/QUCH2/TODI
DFJP	Douglas-fir-Jeffrey pine series	PSME-PIJE
DFJP1	Douglas-fir-Jeffrey pine-incense cedar/buckbrush/nakedstem hawksbeard	PSME-PIJE-CADE27/CECU/CRPL
DFJP2	Douglas-fir-Jeffrey pine/California fescue	PSME-PIJE/FECA
DFJP3	Douglas-fir-Jeffrey pine-white fir/hollyleaved barberry/Geyer's sedge	PSME-PIJE-ABCO/MAAQ2/CAGE2
DFPP	Douglas-fir-Ponderosa pine series	PSME-PIPO
DFPP1	Douglas-fir-sugar pine/tanoak/western brackenfern	PSME-PILA/LIDEE/PTAQ
DFPP2	Douglas-fir-ponderosa pine/tanoak/broadleaf starflower	PSME-PIPO/LIDEE/TRBOL
DFPP3	Douglas-fir-ponderosa pine/California buckthorn/western brackenfern	PSME-PIPO/FRCA04/PTAQ
DFPP4	Douglas-fir-ponderosa pine/deerbrush/variableleaf collomia	PSME-PIPO/CEIN3/COHE2
DFPP5	Douglas-fir-ponderosa pine/California fescue	PSME-PIPO/FECA

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
DFPP6	Douglas-fir-ponderosa pine/huckleberry oak/narrowleaf swordfern	PSME-PIPO/QUVA/POIMI
DFPP7	Douglas-fir-pine-incense cedar/forest clover	PSME-PINUS-CADE27/TRBR3
DFPP7A	Douglas-fir-pine-incense cedar/buchbrush/forest clover-California fescue	PSME-PINUS-CADE27/TRBR3-FECA
DFPP8	Douglas-fir-pine-incense cedar/common beargrass	PSME-PINUS-CADE27/XETE
DFPP9	Douglas-fir-pine-incense cedar/Indian's dream	PSME-PINUS-CADE27/ASDE6
JPIC	Jeffrey pine-incense cedar series	PIJE-CADE27
JPIC1	Jeffrey pine-incense cedar/buckbrush/Shasta helianthella	PIJE-CADE27/CECU/HECAS2
JPIC2	Jeffrey pine-incense cedar/huckleberry oak/Indian's dream	PIJE-CADE27/QUVA/ASDE6
JPIC3	Jeffrey pine-incense cedar/hollyleaved barberry/Idaho fescue	PIJE-CADE27/NAAQ2/FEID
JPIC4	Jeffrey pine/curl-leaf mountain mahogany/bluebunch wheatgrass	PIJE/CELE3/PSSPS
JPIC5	Jeffrey pine/Parry's rabbitbrush/spreading phlox	PIJE/ERPAP10/PHDI3
POC	Port Orford Cedar series	CHLA
POC1	Port Orford Cedar-Douglas-fir/western azalea-huckleberry oak	CHLA-PSME/RHOC-QUVA
POC2	Port Orford Cedar-grand fir/western azalea-western Labrador tea	CHLA-ABGR/RHOC-LEGL
RF	Shasta red fir series	ABSH
RF1	Shasta red fir/pinemat manzanita/wintergreen	ABSH/ARNE/PYROL
WFDF	White fir-Douglas-fir series	ABSH
WFDF1	Douglas-fir-white fir-sugar pine/Pacific dogwood	PSME-ABSH-PILA/CONU4
WFDF2	Douglas-fir-white fir/western azalea	PSME-ABSH/RHOC

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
WFDF3	Douglas-fir-white fir-ponderosa pine/pinemat manzanita/pipsissewa	PSME-ABCO-PIPO/ARNE/CHUMO2
WFDF4	White fir-Douglas-fir/huckleberry oak/pipsissewa	ABCO-PSME/QUVA/CHUMO2
WFDF5	White fir-Douglas-fir/western white pine/pinemat manzanita	ABCO-PSME-PIMO3/ARNE
WFJP	White fir-Jeffrey pine series	ABCO-PIJE
WFJP1	White fir-Jeffrey pine-Douglas-fir/huckleberry oak	ABCO-PIJE-PSME/QUVA
WFJP2	White fir-Jeffrey pine-incense cedar/huckleberry oak/mountain monardella	ABCO-PIJE-CADE27/QUVA/MOOD
WFJP3	White fir-western white pine-Jeffrey pine/huckleberry oak	ABCO-PIMO3-PIJE/QUVA
WFWP	White fir-western white pine series	ABCO-PIMO3
WFWP1	White fir-western white pine/pinemat manzanita	ABCO-PIMO3/ARNE
CPJGBW11	Jeffrey pine-white fir/bluegrass (granite)	PIJE-ABCO/POA

Table 13: Reference Code 504

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CPJGNG11	Jeffrey pine-ponderosa pine/western needlegrass (ash)	PIJP-PIPO/ACOCO
CPJS	Jeffrey pine and ponderosa pine series	PIJP-PIPO
CPJSAM11	Jeffrey pine-ponderosa pine-California black oak/pale serviceberry	PIJP-PIPO-QUKE/AMPA2
CPJSAM12	Jeffrey pine-ponderosa pine-white pine/pale serviceberry-creeping barberry	PIJP-PIPO-ABCO/AMPA2-MARE11
CPJSBB11	Jeffrey pine-California black oak/skunkbush sumac	PIJP-QUKE/RHTRQ
CPJSBB12	Jeffrey pine/antelope bitterbrush-curl-leaf mountain mahogany/western needlegrass	PIJP/PUTR2-CELE3/ACOCO

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CPJSBB13	Jeffrey pine/antelope bitterbrush-Utah snowberry/bluegrass	PIJP/PUTR2-SYORU/POA
CPJSBB14	Jeffrey pine/antelope bitterbrush/woolly mule-ears	PIJP/PUTR2/WYMO
CPJSBB15	Jeffrey pine-ponderosa pine-Douglas-fir/antelope bitterbrush/woolly mule-ears	PIJP-PIPO-PSME/PUTR4/WYMO
CPJSBB16	Jeffrey pine-ponderosa pine-California black oak/bluegrass (granite)	PIJP-PIPO-QUKE/POA
CPJSBB17	Jeffrey pine-ponderosa pine/mountain big sagebrush-antelope bitterbrush	PIJP-PIPO/ARTRV-PUTR2
CPJSBB18	Jeffrey pine-ponderosa pine/antelope bitterbrush/Idaho fescue	PIJP-PIPO/PUTR2/FEID
CPJSBB19	Jeffrey pine-ponderosa pine/antelope bitterbrush/Idaho fescue (granite)	PIJP-PIPO/PUTR2/FEID
CPJSBB20	Jeffrey pine-ponderosa pine/antelope bitterbrush/lambstongue ragwort (granite)	PIJP-PIPO/PUTR2/SEINM
CPJSBB21	Jeffrey pine-ponderosa pine/Modoc buckthorn/Sandberg bluegrass	PIJP-PIPO/FRRUM/POSE
CPJSBB23	Jeffrey pine-ponderosa pine-white fir/interior live oak	PIJP-PIPO-ABCO/QUWI2
CPJSMC11	Jeffrey pine/curl-leaf mountain mahogany	PIJP/CELE3
CPJSMC12	Jeffrey pine-ponderosa pine/curl-leaf mountain mahogany/bluebunch wheatgrass	PIJP-PIPO/CELE3/PSSPS
CPJSMC13	Jeffrey pine-ponderosa pine/curl-leaf mountain mahogany/arrowleaf balsamroot	PIJP-PIPO/CELE3/BASA3
CPJSOH11	Jeffrey pine-ponderosa pine-white fir/huckleberry oak/woolly mule-ears	PIJE-PIPO-ABCO/QUVA/WYMO
CJPSSN11	Jeffrey pine/mountain big sagebrush/Idaho fescue	PIJE/ARTRV/FEID
CPJSSS12	Jeffrey pine-ponderosa pine-white fir/sharpleaf snowberry/woolly mule-ears	PIJE-PIPO-ABCO/SYAC/WYMO
CPJSSY11	Jeffrey pine-white fir/Utah snowberry/Wheeler bluegrass	PIJE-ABCO/SYORU/PNOE2

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CPOSMP11	Washoe pine/pinemat manzanita	PIWA/ARNE
CPOSSY11	Washoe pine-white fir/Utah snowberry/tuber starwort	PIWA-ABOC/SYORU/PSJA2
CPPS	Ponderosa pine series	PIPO
CPPSAM11	Ponderosa pine/pale serviceberry-creeping barberry/heartleaf arnica	PIPO/AMPA2-MARE11-ARCO9
CPPSAM12	Ponderosa pine/paleserviceberry-plum	PIPO/AMPA2-PRUNU
CPPSAM13	Ponderosa pine-white fir-lodgepole pine/pale serviceberry	PIPO-ABCO-PICO/AMPA2
CPPSAM14	Ponderosa pine-white fir-California black oak/pale serviceberry	PIPO-ABCO-QUKE/AMPA2
CPPSAM15	Ponderosa pine-white fir/pale serviceberry-creeping barberry	PIPO-ABCO/AMPA2-MARE11
CPPSAM16	Ponderosa pine-white fir/pale serviceberry-snowbrush caenothus/Orcutt's brome	PIPO-ABCO/AMPA2-CEVE/BROR2
CPPSBB11	Ponderosa pine-incense cedar/antelope bitterbrush/western needlegrass	PIPO-CADE27/PUTR2/BASA3
CPPSBB12	Ponderosa pine-California black oak/antelope bitterbrush/western needlegrass	PIPO-QUKE/PUTR2/ACOCO
CPPSBB13	Ponderosa pine/curl-leaf mountain mahogany-antelope bitterbrush/Idaho fescue	PIPO/CELE3-PUTR2/FEID
CPPSBB14	Ponderosa pine/antelope bitterbrush-snowbrush ceanothus-greenleaf manzanita/Orcutt's brome	PIPO/PUTR2-CEVE-ARPA6/BROR2
CPPSBB15	Ponderosa pine/antelope bitterbrush-plum/Orcutt's brome	PIPO/PUTR2-PRUNU/BROR2
CPPSBB16	Ponderosa pine/antelope bitterbrush-plum/bluebunch wheatgrass	PIPO/PUTR2-PRUNU/PSSPS
CPPSBB17	Ponderosa pine/antelope bitterbrush-wac currant/Orcutt's brome	PIPO/PUTR2-RICE/BROR2
CPPSBB18	Ponderosa pine/antelope bitterbrush/arrowleaf balsamroot	PIPO/PUTR2/BASA3

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CPPSBB19	Ponderosa pine/antelope bitterbrush/Idaho fescue	PIPO/PUTR2/FEID
CPPSBB20	Ponderosa pine/antelope bitterbrush/western needlegrass (pumice)	PIPO/PUTR2/ACOCO
CPPSBB21	Ponderosa pine-white fir/curl-leaf mountain mahogany/western wheatgrass	PIPO-ABCO/CELE3/ACOCO
CPPSBB22	Ponderosa pine-white fir/antelope bitterbrush-greenleaf manzanita/western needlegrass	PIPO-ABCO/PUTR2-ARPA6/ACOCO
CPPSSB11	Ponderosa pine/mountain big sagebrush/Idaho fescue	PIPO/ARTRV/FEID
CPPSSS11	Ponderosa pine-white fir/sharpleaf snowberry	PIPO-ABCO/SYAC

Table 14: Reference Code 506

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CFRCFR11	California red fir	ABMA
CFRCW11	California red fir-white fir	ABMA-ABCO
CFRCPL11	California red fir-lodgepole pine/white hawkweed	ABMA-PICO/HIAL2
CFRCPW11	California red fir-western white pine	ABMA-PIMO3
CFRCPW12	California red fir-western white pine/pinemat manzanita	ABMA-PIMO3/ARNE
CFRCPW13	California red fir-western white pine-lodgepole pine	ABMA-PIMO3-PICO
CFRCPW14	California red fir-western white pine/bush chinquapin	ABMA-PIMO3/CHSE11
CFRCRF12	California red fir/pinemat manzanita	ABMA/ARNE
CFRFME11	California red fir/woolly mule-ears	ABMA/WYMO
CFWCPR11	White fir-sugar pine-California red fir	ABCO-PILA-ABMA
CFWCPR12	California red fir-white fir-Jeffrey pine	AMBA-ABCO-PIJE
CHMCHM11	Mountain hemlock (steep)	TSME

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CHMCHM12	Mountain hemlock (flat)	TSME
CJOCJO11	Western juniper	JUOC
CJOCJO12	Western juniper/big sagebrush	JUOC/ARTR2
CPJCPJ11	Jeffrey pine-California red fir	PIJE-ABMA
CPJCPJ12	Jeffrey pine/huckleberry oak	PIJE/QUVA
CPJCPJ13	Jeffrey pine/greenleaf manzanita-snowbrush ceanothus	PIJE/ARPA6-CEVE
CPJCPJ14	Jeffrey pine/whitethorn ceanothus-big sagebrush	PIJE/CECO-ARTR2
CPLCPL11	Lodgepole pine/Gray's licorice-root	PICO/LIGR
CPLCPL12	Lodgepole pine (woodlands)	PICO
CPLCPL13	Lodgepole pine	PICO
CPLCPL14	Lodgepole pine/big sagebrush	PICO/ARTR2
FBLFBL11	Bolander's milkvetch	ASBO2
HQAHQA11	Quaking aspen/California false bellebore	POTR5/VECA2
HQAHQA12	Quaking aspen/mountain mondarella	POTR5/MOOD

Table 15: Reference Code 507

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CD0SOH11	Douglas-fir/huckleberry oak	PSME/QUVA
CN00000	Redwood	SESE3
CN00011	Redwood (Gamboa-Sur)	SESE3
CNF0111	Redwood/western brackenfern-giant chainfern (streamsides)	SESE3/PTAQ-WOFI
CNF0211	Redwood/western swordfern-Pacific trillium (Gamboa-Sur)	SESE3/MAFA3-VISAN2
CNFO311	Redwood/California manroot-garden vetch (Gamboa-Sur)	SESE3/MAFA3-VISAN2

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CNHB011	Redwood-bigleaf maple/California polypody (Gamboa)	SESE3-ACMA3/POCA12
CNHT011	Redwood-tanoak/roundfruit sedge-Douglas-iris (Gamboa)	SESE3-LIDE3/CAGL7-IRDO
HOD00000	Blue oak	QUDO
HODGA000	Blue oak/annual grass	QUDO/2GRAM
HODGA011	Blue oak/leporinum barley-Johnny-jump-up	QUDO/HOMUL-UIPE3
HODGA012	Blue oak/Chilean bird's-foot-trefoil-purple tussockgrass	QUDO/LOWR2-NAPU4
HODGA013	Blue oak/warty spurge-goldback fern	QUDO/EUSP-PETR7
HODGA014	Blue oak/phloxleaf bedstraw-scarlet lupine	QUDO/GAAN-LUCO
HODGA015	Blue oak/musky stork's bill-leporinum barley	QUDO/ERMO7-HOMUL
HODGA016	Blue oak/San Bernardino larkspur-imbricate phacelia	QUDO/DEPA2-PHIM
HODGA017	Blue oak/scarlet lupine-white sweet clover	QUDO/LUCO-MEAL12
HODGA018	Blue oak/common fiddleneck-rusty popcornflower	QUDO/AMMEI2-PLNO
HODGA019	Blue oak/longstem buckwheat/Chilean bird's-foot trefoil-dotseed plantain	QUDO/EREL6/LOWR2-PLER3
HODGA020	Blue oak/spinster's blue eyed Mary-wireweed	QUDO/COSP-RILE2
HODGA021	Blue oak/birchleaf mountain mahogany/hoary bowlesia-San Francisco woodland-star	QUDO/CEMOG/BOIN3-LIAF
HODGA022	Blue oak/hillside gooseberry/ripgut brome	QUDO/RICA/BRDI3
HODHOI00	Blue oak-interior live oak/grass	QUDO-QUWI3/2GRAM
HODHOI11	Blue oak-interior live oak/mission woodland-star	QUDO-QUWI2/LICY3

Table 16: Reference Code 509

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CX	Mixed conifer series	2TE
CXF01	Mixed conifer (moist group)	2TE
CXF0111	Douglas-fir-mixed conifer/California hazelnut	PSME-2TE/COCOC
CXF0112	White fir-mixed conifer/American trailplant	ABCO-2TE/ADBI
CXF0113	White fir-mixed conifer/feathery false lily of the valley-drops of gold	ABCO-2TE/MARAR-DIHO3
CXF02	Mixed conifer (moderate group)	2TE
CXF0211	White fir-mixed conifer/Ross' sedge	ABCO-2TE/CARO5
CXF0212	White fir-mixed conifer/creeping snowberry/kelloggia	ABCO-2TE/SYMO/KELLO
CXF0213	Douglas-fir-mixed conifer/broadleaf starflower	PSME-2TE/TRBOL
CXF03	Mixed conifer (dry group)	2TE
CXF0311	Douglas-fir-mixed conifer/Utah serviceberry	PSME-2TE/AMUT
CXF0312	Ponderosa pine-mixed conifer/Bolander's bedstraw-Sierra milkwort	PIPO-2TE/GABO-POCO4
CXF0313	Ponderosa pine-mixed conifer/everlasting-naked buckwheat	PIPO-2TE/GAMOC-ERNU3
CXHA11	Douglas-fir-mixed conifer-white alder/Indian rhubarb	PSME-2TE-ALRH2/DAPE
CXHB12	Douglas-fir-mixed conifer-bigleaf maple/American trailplant	PSME-2TE-ACMA3/ADBI
CXHD	Pacific dogwood group	CONU4
CXHD12	Douglas-fir-mixed conifer-Pacific dogwood/California hazelbut	PSME-2TE-CONU4/COCOC
CXHD13	Douglas-fir-mixed conifer-Pacific dogwood/American trailplant	PSME-2TE-CONU4/ADBI
CXHL	Canyon live oak	QUCH2
CXHL11	Ponderosa pine-mixed conifer-canyon live oak/mountain misery	PIPO-2TE-QUCH2/CHFO

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CXHL13	Ponderosa pine-mixed conifer-canyon live oak/Bolander's bedstraw	PIPO-2TE-QUCH2/GABO
CXHL14	Douglas-fir-mixed conifer-canyon live oak/western swordfern	PSME-2TE-QUCH2/POMU
CXHT	Tanoak group	LIDE3
CXHT11	Douglas-fir-mixed conifer-tanoak/California hazelnut	PSME-2TE-LIDE3/COCOC
CXHT12	Douglas-fir-mixed conifer-tanoak/Pacific dogwood	PSME-2TE-LIDE3/CONU4
CXHT13	Douglas-fir-mixed conifer-tanoak/mountain nursery	PSME-2TE-LIDE3/CHFO
CXHT14	Douglas-fir-mixed conifer-tanoak/iris	PSME-2TE-LIDE3/IRIS
CXS05	Shrub (evergreen)	2SHRUB
CXS0511	White fir-mixed conifer/vine maple-bush chinquapin	ABCO-2TE/ACCI-CHSE11
CXS0512	White fir-mixed conifer/bush chinquapin	ABCO-2TE/CHSE11
CXS0513	Ponderosa pine-mixed conifer/canyon live oak-huckleberry oak	PIPO-2TE/QUCH2-QUVA
CXS0514	Ponderosa pine-mixed conifer/huckleberry oak (serpentine)	PIPO-2TE/QUVA
CXS06	Mountain misery	CHFO
CXS0611	Ponderosa pine-mixed conifer/manzanita-mountain misery	PIPO-2TE/ARCTO3-CHFO
CXS0612	Ponderosa pine-mixed conifer/mountain misery/Bolander's bedstraw	PIPO-2TE/CHFO/GABO
CXS07	Mixed conifer (riparian group)	2TE
CSX0711	Douglas-fir-mixed conifer/Pacific dogwood	PSME-2TE/CONU4
CSX0712	Douglas-fir-mixed conifer/Sierra laurel	PSME-2TE/LEDA
CSX0715	White fir-mixed conifer/thinleaf alder/sedge	ABCO-2TE/ALVIC/CAREX
CSX0716	White fir-mixed conifer/thinleaf alder/Columbian monkshood	ABCO-2TE/ALVIC/ACCO4

Table 17: Reference Code 510

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CCOCCO00	Port Orchard cedar	CHLA
CCOCCO11	Port Orchard cedar/salal	CHLA/GASH
CCOCCO12	Port Orchard cedar/Pacific rhododendron-salal	CHLA/RHMA3-GASH
CCOCCO13	Port Orchard cedar/western azalea	CHLA/RHOC
CCOCCO14	Port Orchard cedar-western white pine/huckleberry oak	CHLA-PIMO3/QUVA
CCOCCO03	Port Orchard cedar-Douglas-fir-red alder/vine maple-Cascade barberry	CHLA-PSME-ALRU2/ACCI-MANE2
CCOCFR01	Port Orchard cedar-Shasta red fir-Brewer's spruce/deer oak-huckleberry oak	CHLA-ABSH-PIBR/QUSA2-QUVA
CCOCFR02	Port Orchard cedar-Shasta red fir/Sitka alder-deer oak	CHLA-ABSH/ALVIS-QUSA2
CCOCFR03	Port Orchard cedar-Shasta red/Sitka alder-California pitcherplant	CHLA-ABSH/ALVIS-DACA5
CCOCFW00	Port Orchard cedar-white fir	CHLA-ABCO
CCOCFW11	Port Orchard cedar-white fir/huckleberry oak	CHLA-ABCO/QUVA
CCOCFW12	Port Orchard cedar-white fir-western white pine/huckleberry oak	CHLA-ABCO-PIMO3/QUVA
CCOCFW13	Port Orchard cedar-white fir/western azalea	CHLA-ABCO/RHOC
CCOCFW14	Port Orchard cedar-white fir/forbs	CHLA-ABCO/2FORB
CCOCFW15	Port Orchard cedar-white fir/deer oak	CHLA-ABCO/QUSA2
CCOCFW16	Port Orchard cedar-Shasta red fir/deer oak-thinleaf huckleberry	CHLA-ABSH/QUSA2-VAME
CCOCFW17	Port Orchard cedar-Douglas-fir/huckleberry oak	CHLA-PSME/QUVA
CCOCFW18	Port Orchard cedar-incense cedar-white alder	CHLA-CADE27-ALRH2
CCOCFW19	Port Orchard cedar-white fir/Sitka alder	CHLA-ABCO/ALVIS
CCOCFW20	Port Orchard cedar-white fir/vine maple	CHLA-ABCO/ACCI

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
COCPW01	Port Orchard cedar-western white pine/western azalea-tanoak-Western Labrador tea	CHLA-PIMO3/RHOC-LIDEE-LEGL
COCPW02	Port Orchard cedar-western white pine/Western Labrador tea/California pitcherplant (coastal)	CHLA-PIMO3/LEGL/DACA5
CPJCCO01	Jeffrey pine-Port Orchard cedar/huckleberry oak	PIJE-CHLA/QUVA
HT0CCO11	Tanoak-Port Orchard cedar-California laurel/California huckleberry	LIDE3-CHLA-UMCA/VAOV2
HT0CCO12	Tanoak-Port Orchard cedar/California huckleberry-western azalea	LIDE3-CHLA/VAOV2-RHOC
HT0CCO13	Tanoak-Port Orchard cedar/California huckleberry	LIDE3-CHLA/VAOV2
HT0CCO14	Tanoak-Port Orchard cedar/Cascade barberry/longtube twinflower	LIDE3-CHLA/MANE2/LIBOL2
HT0CCO15	Tanoak-Port Orchard cedar-white alder (riparian)	LIDE3-CHLA-ALRH2
HT0CCO16	Tanoak-Port Orchard cedar/vine maple	LIDE3-CHLA/ACCI
HT0CCO17	Tanoak-Port Orchard cedar/red huckleberry	LIDE3-CHLA/VAPA
HT0CCO18	Tanoak-Port Orchard cedar/salal	LIDE3-CHLA/GASH
HT0CCO19	Tanoak-Port Orchard cedar-western hemlock/California huckleberry	LIDE3-CHLA-TSHE/VAOV2
HT0CCO20	Tanoak-Port Orchard cedar-redwood/California huckleberry	LIDE3-CHLA-SESE3/VAOV2
HT0CCO21	Tanoak-Port Orchard cedar/hucklenberry oak	LIDE3-CHLA/QUVA
HT0CCO22	Tanoak-Port Orchard cedar/Pacific rhododendron	LIDE3-CHLA/RHMA3
HT0CCO23	Tanoan-western red cedar/California huckleberry-salal	LIDE3-THPL/VAOV2-GASH

Table 18: Reference Code 511

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
SA000000	Chamise	ADFA
SA0SB000	Chamise/Eastern Mojave buckwheat-white sage	ADFA/ERFA2-SAAP2
SA0SBS00	Chamise/black sage	ADFA/SAME3
SA0SCC00	Chamise-desert ceanothus	ADFA-CEGRP
SA0SCH00	Chamise-hoaryleaf ceanothus	ADFA-CECR
SA0SCT00	Chamise-woollyleaf ceanothus-mission manzanita	ADFA-CETO-XYBI
SA0SCW00	Chamise-buckbrush	ADFA-CECU
SA0SMB00	Chamise-bigberry manzanita	ADFA-ARGL4
SA0SME00	Chamise-Eastwood's manzanita	ADFA-ARGL3
SB0SSW00	Eastern Mojave buckwheat-white sage	ERFA2-SAAP2
SBM00000	Birchleaf mountain mahogany	CEMOG
SCH00000	Hoaryleaf ceanothus	CECR
SCM00000	Chaparral whitethorn	CELE2
SMB00000	Bigberry manzanite	ARGL4
SME00000	Eastwood's manzanita	ARGL3
SOC00000	Canyon live oak	QUCH2
SOI00000	Interior live oak	QUWI2
SOISCL00	Interior live oak-chaparral whitethorn	QUWI2-CELE2
SOISOC00	Interior live oak-canyon live oak	QUWI2-QUCH2
SOISOS00	Interior live oak-scrub oak	QUWI2-QUBE5
SOS00000	Scrub oak	QUBE5
SOSSA000	Scrub oak-chamise	QUBE5-ADFA
SOSSBM00	Scrub oak-birchleaf mountain mahogany	QUBE5-CEMOG
SOSSCH00	Scrub oak-hairy ceanothus-toyon	QUBE5-CEOL-HEAR5

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
SOSSCL00	Scrub oak-chaparral whitethorn	QUBE5-CELE2
SR000000	Redshank	ADSP
SR0SA000	Redshank-chamise	ADSP-ADFA
SSC00000	Coastal sagebrush	ARCA11
SSCSB000	Coastal sagebrush-Eastern Mojave buckwheat	ARCA11-ERFA2
SSCSSB00	Coastal sagebrush-black sage	ARCA11-SAME3

Table 19: Reference Code 512

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CCOCCO12	Port Orchard cedar/Pacific rhododendron-salal	CHLA/RHMA3-GASH
CCOCCO13	Port Orchard cedar/western azalea	CHLA/RHOC
CCOCCO14	Port Orchard cedar-western white pine/huckleberry oak	CHLA-PIMO3/QUVA
CCOCFW11	Port Orchard cedar-white fir/huckleberry oak	CHLA-ABCO/QUVA
CCOCFW12	Port Orchard cedar-white fir-western white pine/huckleberry oak	CHLA-ABCO-PIMO3/QUVA
CCOCFW13	Port Orchard cedar-white fir/western azalea	CHLA-ABCO/RHOC
CCOCFW17	Port Orchard cedar-Douglas-fir/huckleberry oak	CHLA-PSME/QUVA
CCOCFW18	Port Orchard cedar-incense cedar-white alder	CHLA-CADE27-ALRH2
CD0CCI11	Douglas-fir-incense cedar/California fescue	PSME-CADE27/FECA
CD0CPJ11	Douglas-fir-Jeffrey pine/California fescue	PSME-PIJE/FECA
CD0HBC11	Douglas-fir-California laurel/Pacific poison oak	PSME-UMCA/TODI
CD0HT012	Douglas-fir-tanoak/huckleberry oak-oceanspray	PSME-LIDE3/QUVA-HODI
CD0SOH11	Douglas-fir/huckleberry oak	PSME/QUVA
CD0SOH12	Douglas-fir/huckleberry oak-tanoak	PSME/QUVA-LIDE3
CD0SOH13	Douglas-fir/huckleberry oak-Pacific rhododendron	PSME/QUVA-RHMA3

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CPJ00000	Jeffrey pine	PIJE
CPJCCI00	Jeffrey pine-incense cedar	PIJE-CADE27
CPJCCI11	Jeffrey pine-incense cedar-white fir/huckleberry oak	PIJE-CADE27-ABCO/QUVA
CPJCCI12	Jeffrey pine-incense cedar/huckleberry oak/common beargrass	PIJE-CADE27/QUVA/XETE
CPJCCI13	Jeffrey pine-incense cedar/dwarf ceanothus	PIJE-CADE27/CEPU
CPJCCI14	Jeffrey pine-incense cedar/buckbrush	PIJE-CADE27/CECU
CPJCDO11	Jeffrey pine-Douglas-fir/huckleberry oak/California fescue	PIJE-PSME/QUVA/FECA
CPJCFW11	Jeffrey pine-white fir/iris	PIJE-ABCO/IRIS
CPJCFW12	Jeffrey pine-white fir/deer oak/common beargrass	PIJE-ABCO/QUSA2/XETE
CPJGFI00	Jeffrey pine/Idaho fescue	PIJE/FEID
CPJGFI11	Jeffrey pine/Idaho fescue	PIJE/FEID
CPJGC12	Jeffrey pine/huckleberry oak-pinemat manzanita/Idaho fescue	PIJE/QUVA-ARNE/FEID
CPS00000	Sugar pine	PILA
CPSCPL00	Sugar pine-lodgepole pine	PILA-PICO
CPSCPL11	Sugar pine-lodgepole pine/huckleberry oak-tanoak	PILA-PICO/QUVA-LIDEE
CPSCPL12	Sugar pine-lodgepole pine/tanoak-Paific rhododendron	PILA-PICO/LIDEE-RHMA3
CPSCPW00	Sugar pine-giant chinquapin	PILA-CHCHC4
CPW00000	Western white pine	PIMO3
CPWCD000	Western white pine-Douglas-fir	PIMO3-PSME
CPWCD011	Western white pine-lodgepole pine	PIMO3-PICO
CPWCPL00	Western white pine-lodgepole pine	

Table 20: Reference Code 513

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CD000000	Douglas-fir	PSME
CD0CCI00	Douglas-fir-incense cedar	PSME-CADE27
CD0CCI11	Douglas-fir-incense cedar/California fescue	PSME-CADE27/FECA
CD0CPJ00	Douglas-fir-Jeffrey pine	PSME-PIJE
CD0CPJ11	Douglas-fir-Jeffrey pine/California fescue	PSME-PIJE/FECA
CD0HAR00	Douglas-fir-red alder	PSME-ALRU2
CD0HAR11	Douglas-fir-red alder/vine maple/Siberian springbeauty	PSME-ALRU2/ACCI/CL SIS
CD0HBC00	Douglas-fir-California laurel	PSME-UMCA
CD0HBC11	Douglas-fir-California laurel/Pacific poison oak	PSME-UMCA/TODI
CD0HBC12	Douglas-fir-California laurel/oceanspray	PSME-UMCA/HODI
CD0HGC00	Douglas-fir-giant chinquapin	PSME-CHCHC4
CD0HGC11	Douglas-fir-giant chinquapin-tanoak	PSME-CHCHC4-LIDE3
CD0HGC12	Douglas-fir-giant chinquapin/common beargrass	PSME-CHCHC4/XETE
CD0HGC13	Douglas-fir-giant chinquapin/Pacific rhododendron-salal	PSME-CHCHC4/RHMA3-GASH
CD0HGC14	Douglas-fir-giant chinquapin/Pacific rhododendron-Cascade barberry	PSME-CHCHC4/RHMA3-MANE2
CD0HGC15	Douglas-fir-giant chinquapin/Pacific rhododendron-deer oak/common beargrass	PSME-CHCHC4/RHMA3-QUSA2/XETE
CD0HGC16	Douglas-fir-giant chinquapin-tanoak/Cascade barberry	PSME-CHCHC4-LIDE3/MANE2
CD0HGC17	Douglas-fir-giant chinquapin/Pacific rhododendron-deer oak-salal	PSME-CHCHC4/RHMA3-QUSA2-GASH
CD0HMA00	Douglas-fir-maple	PSME-ACER
CD0HMA11	Douglas-fir-bigleaf maple/western swordfern	PSME-ACMA3/POMU
CD0HMA12	Douglas-fir-bigleaf maple/Lewis' mock orange	PSME-ACMA3/PHLE4

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CD0HMA13	Douglas-fir/vine maple-Cascade barberry	PSME/ACCI-MARE11
CD0HOB00	Douglas-fir-California black oak	PSME-QUKE
CD0HOB11	Douglas-fir-California black oak (metamorphic)	PSME-QUKE
CD0HOB12	Douglas-fir-California black oak (sandstone)	PSME-QUKE
CD0HOB13	Douglas-fir-California black oak-Oregon white oak/grass	PSME-QUKE-QUGA4/2GRAM
CD0HOL00	Douglas-fir-canyon live oak	PSME-QUCH2
CD0HOL11	Douglas-fir-canyon live oak (rockpile)	PSME-QUCH2
CD0HOL12	Douglas-fir-canyon live oak-Pacific madrone/Pacific poison oak	PSME-QUCH2-ARME/TODI
CD0HOL13	Douglas-fir-canyon live oak-tanoak	PSME-QUCH2-LIDE3
CD0HOO00	Douglas-fir-Oregon white oak	PSME-QUGA4
CD0HOO11	Douglas-fir-Oregon white oak/grass	PSME-QUGA4/2GRAM
CD0HOO12	Douglas-fir-Oregon white oak/oceanspray	PSME-QUGA4/HODI
CD0HT000	Douglas-fir-tanoak	PSME-LIFE3
CD0HT011	Douglas-fir-tanoak/common whipplea	PSME-LIFE3/WHMO
CD0HT012	Douglas-fir-tanoak/huckleberry oan-oceanspray	PSME-LIDE3/QUVA-HODI
CD0SM000	Douglas-fir/shrub (moist)	PSME/2SHRUB
CD0SM011	Douglas-fir/California hazelnut	PSME/COCOC
CD0SOH00	Douglas-fir/huckleberry oak	PSME/QUVA
CD0SOH11	Douglas-fir/huckleberry oak-tanoak	PSME/QUVA/LIDEE
CD0SOH12	Douglas-fir/huckleberry oak-Pacific rhododendron	PSME/QUVA-RHMA3
HT000000	Tanoak	LIDE3
HT0CCI00	Tanoak-incense cedar	LIDE3-CADE27
HT0CCO00	Tanoak-incense cedar/California fescue	LIDE3-CADE27/FECA

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
HT0CCO00	Tanoak-Port Orchard cedar	LIDE3-CHLA
HT0CCO11	Tanoak-Port Orchard cedar-California laurel/California huckleberry	LIDE3-CHLA-UMCA/VAOV2
HT0CCO12	Tanoak-Port Orchard cedar/California huckleberry-western azalea	LIDE3-CHLA/VAOV2-RHOC
HT0CCO13	Tanoak-Port Orchard cedar/California huckleberry	LIDE3-CHLA/VAOV2
HT0CCO14	Tanoak-Port Orchard cedar/Cascade barberry/longtube twinflower	LIDE3-CHLA/MANE2/LIBOL2
HT0CCO15	Tanoak-Port Orchard cedar-red alder (riparian)	LIDE3-CHLA-ALRH2
HT0CCO16	Tanoak-Port Orchard cedar/vine maple	LIDE3-CHLA/ACCI
HT0CCO17	Tanoak-Port Orchard cedar/red huckleberry	LIDE3-CHLA/VAPA
HT0CCO18	Tanoak-Port Orchard cedar/salal	LIDE3-CHLA/GASH
HT0CCO19	Tanoak-Port Orchard cedar-western hemlock/California huckleberry	LIDE3-CHLA-TSHE/VAOV2
HT0HBC00	Tanoak-California laurel	LIDE3-UMCA
HT0HBC11	Tanoak-California laurel/Pacific poison oak	LIDE3-UMCA/TODI
HT0HBC12	Tanoak-california laurel/California huckleberry	LIDE3-UMCA/VAOV2
HT0HGC00	Tanoak-giant chinquapin	LIDE3-CHCHC4
HT0HGC11	Tanoak-giant chinquapin/salal	LIDE3-CHCHC4/GASH
HT0HGC12	Tanoak-giant chinquapin/salal-Pacific rhododendron	LIDE3-CHCHC4/GASH-RHMA3
HT0HGC13	Tanoak-giant chinquapin/Pacific rhododendron/common beargrass	LIDE3-CHCHC4/RHMA3/XETE
HT0HGC14	Tanoak-giant chinquapin/western brackenfern	LIDE3-CHCHC4/PTAQL
HT0HGC15	Tanoak-giant chinquapin/Cascade barberry	LIDE3-CHCHC4/MANE2
HT0HGC16	Tanoak-giant chinquapin/California huckleberry-salal	LIDE3-CHCHC4/VAOV2-GASH
HT0HM000	Tanoak/maple	LIDE3/ACER

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
HT0HM011	Tanoak-bigleaf maple/western swordfern	LIDE3-ACMA3/POMU
HT0HM012	Tanoak/vine maple-salal	LIDE3/ACCI-GASH
HT0HM013	Tanoak/vine maple	LIDE3/ACCI
HT0HOB00	Tanoak-California black oak	LIDE3/QUKE
HT0HOB11	Tanoak-California black oak	LIDE3/QUKE
HT0HOL00	Tanoak-canyon live oak	LIDE3-QUCH2
HT0HOL11	Tanoak-canyon live oak (rockpile)	LIDE3-QUCH2
HT0HOL12	Tanoak-canyon live oak/California huckleberry	LIDE3-QUCH2/VAOV2
HT0HOL13	Tanoak-canyon live oak/salal-Cascade barberry	LIDE3-QUCH2/GASH-MANE2
HT0HOL14	Tanoak-canyon live oak-California black oak/Pacific poison oak	LIDE3-QUCH2-QUKE/TODI
HT0HOL15	Tanoak-canyon live oak/Pacific poison oak	LIDE3-QUCH2/TODI
HT0HOL16	Tanoak-canyon live oak/Cascade barberry	LIDE3-QUCH2/MANE2
HT0SD000	Tanoak/shrug (dry)	LIDE3/2SHRUB
HT0SD011	Tanoak/Pacific poison oak/pink honeysuckle	LIDE3/TODI/LOHIV
HT0SD012	Tanoak/Cascade barberry	LIDE3/MANE2
HT0SEH00	Tanoak/California huckleberry	LIDE3/VAOV2
HT0SEH11	Tanoak/California huckleberry	LIDE3/VAOV2
HT0SEH12	Tanoak/California huckleberry-salal	LIDE3/VAOV2-GASH
HT0SEH13	Tanoak/California huckleberry-Pacific rhododendron	LIDE3/VAOV2-RHMA3
HT0SM000	Tanoak/shrub (moist)	LIDE3/2SHRUB
HT0SM011	Tanoak/California hazelnut	LIDE3/COCOC
HT0SOH00	Tanoak/huckleberry oak	LIDE3/QUVA
HT0SOH11	Tanoak/huckleberry oak-Pacific rhododendron	LIDE3/QUVA-RHMA3
HT0SSG00	Tanoak/salal	LIDE3/GASH

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
HT0SSG11	Tanoak/salal	LIDE3/GASH
HT0SSG12	Tanoak/salal-Pacific rhododendron	LIDE3/GASH-RHMA3
HT0SSG13	Tanoak/salal-Cascade barberry	LIDE3/GASH-MANE2

Table 21: Reference Code 514

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
CN00000	Redwood	SESE3
CN00011	Redwood (Gamboa-Sur)	SESE3
CNF0111	Redwood/western brackenfern-giant chainfern (streamsides)	SESE3/PTAQ-WOFI
CNF0211	Redwood/western swordfern-Pacific trillium (Gamboa-Sur)	SESE3/POMU-TROV2
CNF0311	Redwood/California manroot-garden vetch (Gamboa-Sur)	SESE3/MAFA3-VISAN2
CNHB011	Redwood-bigleaf maple/California polypody (Gamboa)	SESE3-ACMA3/POCA12
CNHT011	Redwood-tanoak/roundfruit sedge-Douglas iris (Gamboa)	SESE3-LIDE3/CAGL7-IRDO

Table 22: Reference Code 515

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
HOD00000	Blue oak	QUDO
HODGA000	Blue oak/annual grass	QUDO/2GRAM
HODGA011	Blue oak/leporinum barley-Johnny-jump-up	QUDO/HOMUL-UIPE3
HODGA012	Blue oak/Chilean bird's-foot trefoil-purple tussockgrass	QUDO/LOWR2-NAPU4
HODGA013	Blue oak/warty spurge-goldback fern	QUDO/EUSP-PETR7
HODGA014	Blue oak/phloxleaf bedstraw-scarlet lupine	QUDO/GAAN-LUCO
HODGA015	Blue oak/musky stork's bill-leporinum barley	QUDO/ERMO7-HOMUL

PV_CODE	COMMON_NAME	SCIENTIFIC_NAME
HODGA016	Blue oak/San Bernardino larkspur-imbricate phacelia	QUDO/DEPA2-PHIM
HODGA017	Blue oak/scarlet lupine-white sweet clover	QUDO/LUCO-MEAL12
HODGA018	Blue oak/common fiddleneck-rusty popcornflower	QUDO/AMMEI2-PLNO
HODGA019	Blue oak/longstem buckwheat/Chilean bird's-foot trefoil/dotseed plantain	QUDO/EEL6/LOWR2-PLER3
HODGA020	Blue oak/spinster's blue-eyed Mary-wireweed	QUDO/COSP-RILE2
HODGA021	Blue oak/birchleaf mountain mahogany/hoary bowlesia-San Francisco woodland-star	QUDO/CEMOG/BOIN3-LIAF
HODGA022	Blue oak/hillside gooseberry/ripgut brome	QUDO/RICA/BRDI3
HODHOI00	Blue oak-interior live oak/grass	QUDO-QUEI2/2GRAM
HODHOI11	Blue oak-interior live oak/mission woodland-star	QUDO-QUWI2/LICY3

APPENDIX H: FUEL PHOTO REFERENCES & CODES

Table 23: Fuel Photo References

Code	Reference
6	Maxwell, Wayne G. and Franklin R. Ward. 1976. Photo Series for Quantifying Forest Residues in the: Ponderosa Pine Type, Ponderosa Pine and Associated Species Types, Lodgepole Pine Type. USDA Forest Service Gen. Tech. Rep. PNW-52, 74 p. Pacific Northwest Range Exp. Stn., Portland, OR 97208.
7	Blonski, Kenneth S. and Schramel, John L. 1981. Photo Series for Quantifying Natural Forest Residues: Southern Cascades, Northern Sierra Nevada. USDA Forest Service, Gen Tech. Rep. PSW-56, Pacific Southwest Forest and Range Exp. Stn., Forest Service, Berkeley, CA 145 p.
8	Maxwell, Wayne G. and Ward, Franklin R. 1980. Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest. USDA Forest Service, Gen. Tech. Rep. PNW-105. Pacific Northwest Forest and Range Exp. Stn., Portland, OR. 229 p.

Code	Reference
9	Ottmar, Roger D. and Hardy, Colin C. 1989. Stereo Photo Series for Quantifying Forest Residues in Coastal Oregon Forests: Second Growth Douglas-fir—Western Hemlock Type, Western Hemlock—Sitka Spruce Type, and Red Alder Type. USDA Forest Service, Gen. Tech. Rep. PNW-231. Pacific Northwest Range Exp. Stn., Portland, OR 67 p.
13	Wayne G. Maxwell, Franklin R. Ward. 1976. Photo Series for Quantifying Forest Residues in the Coastal Douglas-fir-Hemlock type, Coastal Douglas-fir-Hardwood Type. USDA Forest Service, Gen. Tech. Rep. PNW-51. Northwest Forest and Range Experiment Station, Portland, OR.
22	Wright, Clinton S. Roger D. Ottmar, Robert E. Vihnanek, and David R. Weise. 2002. Stereo Photo Series for Quantifying Natural Fuels: Grassland, Shrubland, Woodland, and Forest Types in Hawaii. PNW-GTR-545. 91 p.
27	Roger D. Ottmar et.al., 2004. 75 p. Stereo Photo Series for Quantifying Natural Fuels. Volume VII: Oregon White Oak, California Deciduous Oak, and Mixed-Conifer with Shrub Types in the Western United States.
28	Wayne G. Maxwell and Franklin R. Ward. 1979. Photo Series for Quantifying Forest Residues in the Sierra Mixed Conifer Type Sierra True Fir Type. USDA Forest Service GTR PNW-95.

FUEL PHOTO CODES

Table 24: Fuel Photo Codes for Reference 6

Code
1PP4CC
2PP4CC
1PP4PC
2PP4PC
3PP4PC
4PP4PC
5PP4PC
1PP1TH
2PP1TH

Code
3PP1TH
4PP1TH
5PP1TH
6PP1TH
1PP&ASSOC4PC
2PP&ASSOC4PC
3PP&ASSOC4PC
4PP&ASSOC4PC
5PP&ASSOC4PC
6PP&ASSOC4PC
7PP&ASSOC4PC
8PP&ASSOC4PC
1LP3PC
2LP3PC
3LP3PC
4LP3PC
5LP3P

Table 25: Fuel Photo Codes for Reference 7

Code
1LP2
1LP3
1LP4
1MF4
1MH4
1MP4
1PP2
1PP3
1PP4
1RF3
1RF4
1WF2
1WF3
1WF4
2LP2
2LP3
2MF4
2MP4
2PP2
2PP3
2PP4
2RF3
2RF4
2WF2

Code
2WF3
2WF4
3LP2
3LP3
3MF4
1MP4
3MP4
3PP2
3PP3
3PP4
3RF3
3RF4
3WF2
3WF3
3WF4
4LP2
4LP3
4MF4
4MP4
4PP2
4PP3
4RF3
4RF4
4WF2
4WF3

Code
4WF4
5LP2
5MF4
5MP4
5RF3
5RF4
5WF3
5WF4

Table 26: Fuel Photo Codes for Reference 8

Code
1BR
1DF2
1DF3
1DF4
1DFHD3
1DFHD4
1GR
1HD2
1JU2
1LP1
1LP2
1LP3
1MC2
1MC3
1MC4

Code
1PP&ASSOC3
1PP&ASSOC4
1PP1
1PP2
1PP3
1PP4
1SA1
1SA2
1SA3
1SA4
2BR
2DF2
2DF3
2DF4
2DFHD3
2DFHD4
2GR
2HD2
2JU2
2LP1
2LP2
2LP3
2MC2
2MC3
2MC4

Code
2PP&ASSOC3
2PP&ASSOC4
2PP1
2PP2
2PP3
2PP4
2SA1
2SA2
2SA3
2SA4
3DFHD3
3DFHD4
3LP1
3LP2
3LP3
3MC2
3MC3
3PP&ASSOC3
3PP&ASSOC4
3PP1
3PP2
3PP3
3PP4
3SA1
3SA3

Code
4DF4
4DFHD4
4LP2
4PP&ASSOC3
4PP2
4PP3
4PP4
4DF4
5DFHD4
5PP&ASSOC3
5PP3
5PP4
6DF4
6PP3
6PP4
7DF4
7PP3
7PP4
8PP3
8PP4

Table 27: Fuel Photo Codes for Reference 9

Code
1DFWHPRE01
1DFWHPRE02
1DFWHPRE03

Code
1DFWHPRE04
1DFWHPRE05
1DFWHPRE06
1DFWHPRE07
1DFWHPRE08
1DFWHPRE09
2WHSSPRE01
3RAPRE01
3RAPRE02
3RAPRE03
3RAPRE05
3RAPRE06
RAPRE07
4DFWHPOST01
4DFWHPOST02
4DFWHPOST03
4DFWHPOST04
5RAPOST01
5RAPOST02
5RAPOST03
5RAPOST04
5RAPOST05

Table 28: Fuel Photo Codes for Reference 13

Code
10DF4CC
1DF1TH
1DF3PC
1DF4CC
1DF4PC
1DFHD4CC
1DFHD4PC
2DF1TH
2DF3PC
2DF4CC
2DF4PC
2DFHD4CC
2DFHD4PC
3DF1TH
3DF3PC
3DF4CC
3DF4PC
3DFHD4CC
3DFHD4PC
4DF1TH
4DF3PC
4DF4CC
4DF4PC
4DFHD4CC

Code
4DFHD4PC
5DF3PC
5DF4CC
5DF4PC
5DFHD4CC
5DFHD4PC
6DF3PC
6DF4CC
6DF4PC
6DFHD4CC
6DFHD4PC
7DF4CC
7DF4PC
7DFHD4CC
8DF4CC
8DF4PC
9DF4CC
9DF4PC

Table 29: Fuel Photo Codes for Reference 22

Code
H1F01
H1F02
H1F03
H1F04
H1F05

Code
H1F06
H1F07
H1F08
H1F09
H1G01
H1G02
H1G03
H1G04
H1G05
H1G06
H1G07
H1G08
H1G09
H1G10
H1G11
H1G12
H1G13
H1S01
H1S02
H1S03
H1S04
H1S05
H1S06
H1S07
H1W01
H1W02
H1W03

Code
H1W04
H1W05
H1W06
H1W07

Table 30: Fuel Photo Codes for Reference 27

Code
WO-01
WO-02
WO-03
WO-04
WO-05
WO-06
WO-07
WO-08
WO-09
WO-10
CDO-01
CDO-02
CDO-03
CDO-04
CDO-05
CDO-06
CDO-07
CDO-08
CDO-09

Code
MCS-01
MCS-02
MCS-03
MCS-04
MCS-05
MCS-06
MCS-07
MCS-08
MCS-09
MCS-10
MCS-11

Table 31: Fuel Photo Codes for Reference 28

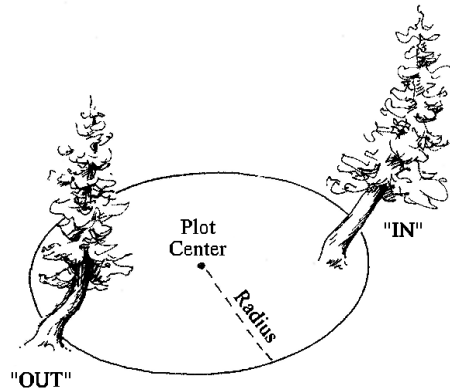
Code
1-MC-4-RC
2-MC-4-RC
3-MC-4-RC
1-MC-4-PC
2-MC-4-PC
3-MC-4-PC
4-MC-4-PC
5-MC-4-PC
6-MC-4-PC
7-MC-4-PC
8-MC-4-PC
1-MC-3-PC

Code
2-MC-3-PC
3-MC-3-PC
4-MC-3-PC
5-MC-3-PC
6-MC-3-PC
7-MC-3-PC
8-MC-3-PC
1-TF-3-RC
2-TF-4-RC
3-TF-4-RC
4-TF-4-RC
5-TF-4-RC
6-TF-4-RC
1-TF-4-PC
2-TF-4-PC
3-TF-4-PC
4-TF-4-PC
5-TF-4-PC

APPENDIX I: FIXED RADIUS PLOT

A fixed radius plot is used to sample trees that are less than the specified breakpoint diameter. These sample trees are determined to be “in” or “out” at ground line. If the measured distance from plot center to the central axis of the tree at ground line is equal to or less than the fixed plot radius the tree is tallied as a sample tree. If this distance is greater than the fixed plot radius, the tree is not tallied.

Figure 1: Trees “in” and “out” of fixed radius plot



On level ground, the fixed plot radius is determined by holding the measuring tape or pole in a horizontal position from plot center to the central axis of the sample tree. On slopes greater than 9 percent, if a measuring tape or pole cannot be horizontally from plot center to the central axis of the sample tree, the fixed plot radius is corrected for the slope percent by using one of the following methods.

METHOD 1

Correct the fixed plot radius for slope percent using the “Circular Plot Radii Corrected for Slope” table and then measuring distances parallel to the ground line. This method always results in a circular plot on the slope. Example – 1/300 acre fixed plot on 50 percent slope. Corrected fixed plot radius is 7.2 feet.

Figure 2: Correcting the fixed plot radius for slope percent

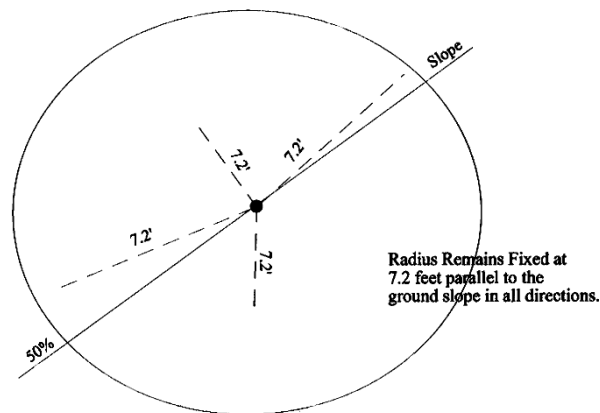


Table 32: Circular Plot Radii Corrected for Slope; plot size in acres

Slope %	1 / 300	1 / 100	1 / 50	1 / 20	1 / 10	1 / 5
0-9	6.8	11.8	16.7	26.3	37.2	52.7
10-17	6.8	11.8	16.7	26.5	37.4	52.9
18-22	6.9	11.9	16.8	26.6	37.6	53.2
23-26	6.9	12.0	16.9	26.7	37.8	53.4
27-30	6.9	12.0	17.0	26.9	38.0	53.7
31-33	7.0	12.1	17.1	27.0	38.2	54.0
34-36	7.0	12.1	17.1	27.1	38.3	54.2
37-39	7.0	12.2	17.2	27.2	38.5	54.5
40-42	7.1	12.2	17.3	27.4	38.7	54.7
43-44	7.1	12.3	17.4	27.5	38.9	55.0
45-47	7.1	12.3	17.5	27.6	39.1	55.2
48-49	7.2	12.4	17.5	27.7	39.2	55.5
50-51	7.2	12.5	17.6	27.9	39.4	55.7
52-53	7.2	12.5	17.7	28.0	39.6	56.0
54-55	7.3	12.6	17.8	28.1	39.8	56.2
56-57	7.3	12.6	17.9	28.2	39.9	56.5
58-59	7.3	12.7	17.9	28.4	40.1	56.7
60-61	7.4	12.7	18.0	28.5	40.3	57.0
62-63	7.4	12.8	18.1	28.6	40.4	57.2
64-65	7.4	12.8	18.2	28.7	40.6	57.4
66-67	7.4	12.9	18.2	28.8	40.8	57.7
68-69	7.5	13.0	18.3	29.0	41.0	57.9
70	7.5	13.0	18.4	29.1	41.1	58.2
71-72	7.5	13.1	18.5	29.2	41.3	58.4

Slope %	1 / 300	1 / 100	1 / 50	1 / 20	1 / 10	1 / 5
73-74	7.6	13.1	18.5	29.3	41.5	58.6
75	7.6	13.2	18.6	29.4	41.6	58.7
76-77	7.6	13.2	18.7	29.6	41.8	59.1
78-79	7.7	13.3	18.8	29.7	42.0	59.3
80	7.7	13.3	18.8	29.8	42.1	59.6
81-82	7.7	13.4	18.9	29.9	42.3	59.8
83	7.8	13.4	19.0	30.0	42.5	60.0
84-85	7.8	13.5	19.1	30.1	42.6	60.3
86	7.8	13.5	19.1	30.3	42.8	60.5
87-88	7.8	13.6	19.2	30.4	42.9	60.7
89	7.9	13.6	19.3	30.5	43.1	61.0
90-91	7.9	13.7	19.3	30.6	43.3	61.2
92	7.9	13.7	19.4	30.7	43.4	61.4
93-94	8.0	13.8	19.5	30.8	43.6	61.6
95	8.0	13.8	19.6	30.9	43.7	61.9
96-97	8.0	13.9	19.6	31.0	43.9	62.1
98	8.0	13.9	19.7	31.2	44.1	62.3
99-100	8.1	14.0	19.8	31.3	44.2	62.5
101	8.1	14.0	19.8	31.4	44.4	62.8
102	8.1	14.1	19.9	31.5	44.5	63.0
103-104	8.2	14.1	20.0	31.6	44.7	63.2
105	8.2	14.2	20.1	31.7	44.8	63.4
106-107	8.2	14.2	20.1	31.8	45.0	63.6
108	8.2	14.3	20.2	31.9	45.1	63.8
109	8.3	14.3	20.3	32.0	45.3	64.1

Slope %	1 / 300	1 / 100	1 / 50	1 / 20	1 / 10	1 / 5
110-111	8.3	14.4	20.3	32.1	45.5	64.3
112	8.3	14.4	20.4	32.2	45.6	64.5
113	8.4	14.5	20.5	32.4	45.8	64.7
114-115	8.4	14.5	20.5	32.5	45.9	64.9
116	8.4	14.6	20.6	32.6	46.1	65.1
117	8.4	14.6	20.7	32.7	46.2	65.3
118-119	8.5	14.7	20.7	32.8	46.4	65.6
120	8.5	14.7	20.8	32.9	46.5	65.8
121	8.5	14.8	20.9	33.0	46.7	66.0
122	8.5	14.8	20.9	33.1	46.8	66.2
123-124	8.6	14.8	21.0	33.2	47.0	66.4
125	8.6	14.9	21.1	33.3	47.1	66.6
130	8.7	15.1	21.3	33.7	47.7	67.4
135	8.8	15.3	21.6	34.1	48.3	68.3
140	8.9	15.4	21.8	34.5	48.8	69.1
145	9.0	15.6	22.1	34.9	49.4	69.9
150	9.1	15.8	22.3	35.3	50.0	70.0

METHOD 2

Determine the slope limiting distance to borderline trees by using the “Slope Correction Table” (the slope being corrected is the slope from plot center to the tree, not the overall plot slope). Measure the distance parallel to the ground line to the borderline tree. This method always results in an oval on the slope. Following is a list of fixed plot sizes and the specific radius for each.

Table 33: Method 2 plot size/radius slope

Plot Size	Plot Radius
1/1000	3.7 feet
1/500	5.3 feet
1/400	5.9 feet
1/300	6.8 feet
1/250	7.4 feet
1/200	8.3 feet
1/150	9.6 feet
1/100	11.8 feet
1/50	16.7 feet
1/20	26.3 feet
1/10	37.2 feet
1/5	52.7 feet
1/4	58.9 feet
1/3	68.0 feet
1/2	83.3 feet
1	117.8 feet

To determine the slope limiting distance, multiply the plot radius for the appropriate plot size by the appropriate slope correction factor.

Example 1

1/300 acre fixed plot with a borderline tree on a 45 percent slope. A 1/300-acre plot equals a 6.8-foot radius and the slope correction factor for a 45 percent slope is 1.10. $6.8 \times 1.10 = 7.48$; thus, a tree on a 1/300 acre fixed plot at a 45 percent slope can be 7.5 feet from plot center.

Example 2

The same plot has another borderline tree on a 25 percent slope. The slope correction factor for a 25 percent slope is 1.03. $6.8 \times 1.03 = 7.0$; thus, a tree on a 1/300 acre fixed plot at a 25 percent slope can be 7.0 feet from plot center.

Figure 3: Plot size radius slope

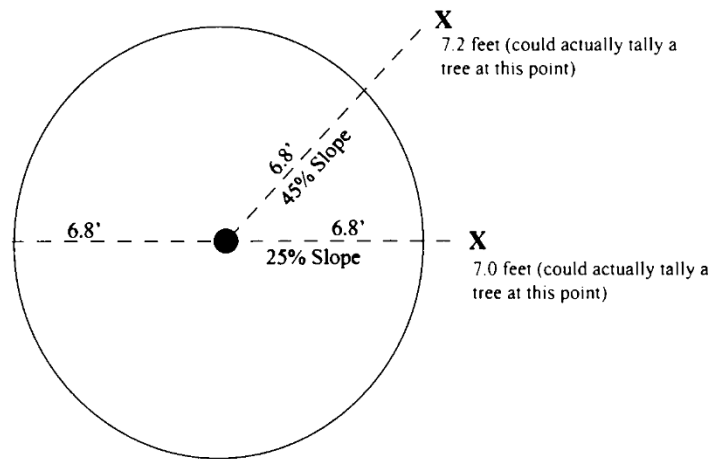


Table 34: Slope Correction Table

Percent of Slope	Degree of Slope	Correction Factor
0 to 9	0-6	1.00
10 to 17	7-10	1.01
18 to 22	11-12	1.02
23 to 26	13-14	1.03
27 to 30	15-17	1.04
31 to 33	18	1.05
34 to 36	19-20	1.06
37 to 39	21	1.07
40 to 42	22	1.08
43 to 44	23	1.09
45 to 47	24	1.10
48 to 49	25-26	1.11
50 to 51	27	1.12
52 to 53	28	1.13
54 to 55	29	1.14

Percent of Slope	Degree of Slope	Correction Factor
56 to 57	29	1.15
58 to 59	30	1.16
60 to 61	31	1.17
62 to 63	32	1.18
64 to 65	33	1.19
66 to 67	34	1.20
68 to 69	34	1.21
70	35	1.22
71 to 72	36	1.23
73 to 74	37	1.24
75	37	1.25
76 to 77	38	1.26
78 to 79	38	1.27
80	39	1.28
81 to 82	39	1.29
83	40	1.30
84 to 85	40	1.31
86	41	1.32
87 to 88	41	1.33
89	42	1.34
90 to 91	42	1.35
92	43	1.36
93 to 94	43	1.37
95	44	1.38
96 to 97	44	1.39

Percent of Slope	Degree of Slope	Correction Factor
98	44	1.40
99 to 100	45	1.41
101	45	1.42
102	46	1.43
103 to 104	46	1.44
105	46	1.45
106 to 107	47	1.46
108	47	1.47
109	47	1.48
110 to 111	48	1.49
112	48	1.50
113	48	1.51
114 to 115	49	1.52
116	49	1.53
117	49	1.54
118 to 119	50	1.55
120	50	1.56
121	50	1.57
122	51	1.58
123 to 124	51	1.59
125	51	1.60
126	52	1.61
127 to 128	52	1.62
129	52	1.63
130	52	1.64

Percent of Slope	Degree of Slope	Correction Factor
131	53	1.65
132 to 133	53	1.66
134	53	1.67
135	53	1.68
136	54	1.69
137 to 138	54	1.70
139	54	1.71
140	54	1.72
141	55	1.73
142 to 143	55	1.74
144	55	1.75
145	55	1.76
146	56	1.77
147	56	1.78
148 to 149	56	1.79
150	56	1.80

APPENDIX J: VARIABLE RADIUS PLOT

INTRODUCTION

In our determination is made at the DBH or DRC of each tree. For information on the theory and mathematics of variable plot cruising, and formulas for determining the plot radius factor for any given BAF, the reader is referred to **Log Scaling and Timber Cruising**, 1973, J.R. Dilworth. OSU Book Stores, Inc., Corvallis, Oregon.

The experienced field person using a wedge prism, angle gauge, or relaskop can quickly tell in which case trees are “in” or “out” on the variable plot. However, there are certain trees that are questionable (borderline) for tally because they are located at the outer limits of the variable plot radius. This narrative deals with the procedures needed to ascertain if these borderline trees should be tallied: the mechanics of using plot radius tables in the field, the associated measurements, and corrections of variable plot radii for slope.

MEASUREMENT OF BORDERLINE TREES TO DETERMINE “IN OR OUT” STATUS

In variable plot sampling, the plot radius varies according to the DBH or DRC of each tree. To determine whether a tree is to be sampled requires measurement of its DBH or DRC and its distance from plot center. [Table 35](#), _____

[Table 36](#), [Table 37](#), [Table 38](#), [Table 39](#), [Table 40](#), and [Table 41](#) display limiting distances (the maximum horizontal distance from plot center to the face of the tree at breast height for a tree to be considered “in”) for various tree diameters and commonly used basal area factors (BAF).

Once the DBH or DRC of the borderline tree is taken, the limiting distance is found by entering the table appropriate for the specified BAF. This limiting distance is then compared to the horizontal distance between plot center and the nearest **face of the tree** at breast height. If the measured horizontal distance from plot center is *less than or equal to* the limiting distance from the table, the tree in question is “in” and is tallied as a sample tree. However, if measured horizontal distance from plot center is greater than the limiting distance, then the tree in question is “out” and is not tallied.

1. Measure the diameter to the nearest tenth of an inch
2. Measure the percent slope from the face of the tree at DBH or DRC to plot center

If the slope is less than ten percent look up limiting distance in Tables 1 through 5 or use the BAF correction factors listed in Table 41 below.

Table 35: BAF correction factors

Type	Correction Factors								
BAF	10	15	20	25	30	35	40	50	60
Plot Radius Factor*	27.08	2.203	1.902	1.697	1.546	1.428	1.333	1.188	1.081

** This is a corrected plot radius factor, corrected for determining the limiting distance to the face of the tree. A standard plot radius factor was used to determine limiting distance to the center of a tree, and is computed by $8.696/\text{SQR}(\text{BAF})$. A corrected PRF subtracts $1/24$ (0.041666) from the standard plot radius factor.*

Example:

BAF = 40; DBH = 20.9 inches; Slope = 5%

Limiting Distance = Plot Radius Factor * DBH, $1.333 * 20.9 = 27.9$ feet

3. **If the slope is greater than ten percent**, first determine the slope correction factor. The slope correction factor and the slope corrected plot radius factor can be obtained by using the formula below or by referring to [Table 40](#). Then, multiply the slope correction factor by the plot radius factor identified in step #3 above to obtain the slope corrected plot radius factor. Finally, multiply the slope corrected plot radius factor by the diameter to obtain the limiting distance.

Example:

BAF = 40; DBH = 20.9 inches; Slope = 20%

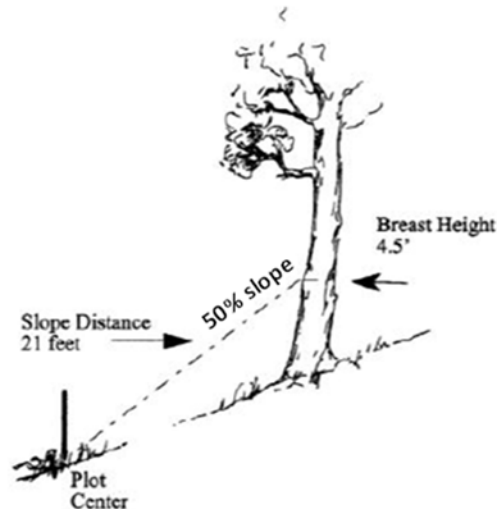
Slope Correction Factor = $\text{SQR}(1 + (\text{slope}/100)^2) = \text{SQR}(1 + (20/100)^2) = 1.0198$

Slope Corrected Plot Radius Factor = Slope Correction Factor * Plot Radius Factor = $1.0198 * 1.333 = 1.359$

Limiting Distance = Slope Corrected Plot Radius Factor * DBH = 1.359 * 20.9 = 28.4 feet

4. Measure the distance from plot center to the face of the tree, nearest plot center, at DBH or DRC. Both the slope measurement and distance measurement must be taken at plot center. If the measured distance is less than the limiting distance, the tree is "in."

Figure 4: Determining limiting distance on a slope



Example:

BAF = 40; DBH = 15.0; Slope = 50%; Slope Distance = 21.0 feet

Referring to [Table 40](#), the Combined Factor for a slope of 50% with a 4- BAF is 1.490.

Limiting Distance = DBH * Combined Factor = 15.0 * 1.490 = 22.35

Since 21.0 is less than or equal to the limiting distance of 22.35 feet, the tree is "in" and is tallied as a sample tree.

Measuring "In" or "Out" Down Trees

Down trees are "in" or "out" of the variable plot radius based on where the DBH or DRC now lies, not on where the tree once stood. The distance measurement is taken from plot center to the nearest face of the tree at breast height.

Table 36: BAF 10 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5	13.5	13.8	14.1	14.4	14.6	14.9	15.2	15.4	15.7	16.0
6	16.2	16.5	16.8	17.1	17.3	17.6	17.9	18.1	18.4	18.7
7	19.0	19.2	19.5	19.8	20.0	20.3	20.6	20.9	21.1	21.4
8	21.7	21.9	22.2	22.5	22.7	23.0	23.3	23.6	23.8	24.1
9	24.4	24.6	24.9	25.2	25.5	25.7	26.0	26.3	26.5	26.8
10	27.1	27.4	27.6	27.9	28.2	28.4	28.7	29.0	29.2	29.5
11	29.8	30.1	30.3	30.6	30.9	31.1	31.4	31.7	32.0	32.2
12	32.5	32.8	38.5	38.7	39.0	39.3	39.5	39.8	40.1	40.3
13	35.2	35.5	35.7	36.0	36.3	36.6	36.8	37.1	37.4	37.6
14	37.9	38.2	38.5	38.7	39.0	39.3	39.5	39.8	40.1	40.3
15	40.6	40.9	41.2	41.4	41.7	42.0	42.2	42.5	42.8	43.1
16	43.3	43.6	43.9	44.1	44.4	44.7	45.0	45.2	45.5	45.8
17	46.0	46.3	46.6	46.8	47.1	47.4	47.7	47.9	48.2	48.5
18	48.7	49.0	49.3	49.6	49.8	50.1	50.4	50.6	50.9	51.2
19	51.5	51.7	52.0	52.3	52.5	52.8	53.1	53.3	53.6	53.9
20	54.2	54.4	54.7	55.0	55.2	55.5	55.8	56.1	56.3	56.6
21	56.9	57.1	57.4	57.7	58.0	58.2	58.5	58.8	59.0	59.3
22	59.6	57.1	57.4	57.7	58.0	58.2	58.5	58.8	59.0	59.3
23	62.3	62.6	62.8	63.1	63.4	63.6	63.9	64.2	64.5	64.7
24	65.0	65.3	65.5	65.8	66.1	66.3	66.6	66.9	67.2	67.4
25	67.7	68.0	68.2	63.1	63.4	63.6	63.9	64.2	64.5	64.7
26	70.4	70.7	70.9	71.2	71.5	71.8	72.0	72.3	72.6	72.8
27	73.1	73.4	73.7	73.9	74.2	74.5	74.7	75.0	75.3	75.6
28	75.8	76.1	76.4	76.6	76.9	77.2	77.4	77.7	78.00	78.3

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
29	78.5	78.8	79.1	79.3	79.6	79.9	80.2	80.4	80.7	81.0
30	81.2	81.5	81.8	82.1	82.3	82.6	82.9	83.1	83.4	83.7
31	83.9	84.2	84.5	84.8	85.0	85.3	85.6	85.8	86.1	86.4
32	86.7	86.9	87.2	87.5	87.7	88.0	88.3	88.6	88.8	89.1
33	89.4	89.6	89.9	90.2	90.4	90.7	91.0	91.3	91.5	91.8
34	92.1	92.3	92.6	92.9	93.2	93.4	93.7	94.0	94.2	94.5
35	94.8	95.1	95.3	95.6	95.9	96.1	96.4	96.7	96.9	97.2
36	97.5	97.8	98.0	98.3	98.6	98.8	99.1	99.4	99.7	99.9
37	100.2	100.5	100.7	101.0	101.3	101.6	101.8	102.1	102.4	102.6
38	102.9	103.2	103.4	103.7	104.0	104.3	104.5	104.8	105.1	105.3
39	105.6	105.9	106.2	106.4	106.7	107.0	107.2	107.5	107.8	108.0
40	108.3	108.6	108.9	109.1	109.4	109.7	109.9	110.2	110.5	110.8
41	111.0	111.3	111.6	111.8	112.1	112.4	112.7	112.9	113.2	113.5
42	113.7	114.0	114.3	114.5	114.8	115.1	115.4	115.6	115.9	116.2
43	116.4	116.7	117.0	117.3	117.5	117.8	118.1	118.3	118.6	118.9
44	119.2	119.4	119.7	120.0	120.2	120.5	120.8	121.0	121.3	121.6
45	121.9	122.1	122.4	122.7	122.9	120.2	123.5	123.8	124.0	124.3
46	124.6	124.8	125.1	125.4	125.7	125.9	126.2	126.5	126.7	127.0
47	127.3	127.5	127.8	128.1	128.4	128.6	128.9	129.2	129.4	129.7
48	130.0	130.3	130.5	130.8	131.1	131.3	131.6	131.9	132.2	132.4
49	132.7	133.0	133.2	133.5	133.8	134.0	134.3	134.6	134.9	135.1
50	135.4	135.7	135.9	136.2	136.5	136.8	137.0	137.3	137.6	137.8

Prepared by multiplying the BAF 10 Plot Radius Factor 2.708 * DBH. For example, if DBH = 14.3 inches, then $14.3 * 2.708 = 38$.

Table 37: BAF 20 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5	9.5	9.7	9.9	10.1	10.3	10.5	10.7	10.8	11.0	11.2
6	11.4	11.6	11.8	12.0	12.2	12.4	12.6	12.8	12.9	13.1
7	13.3	13.5	13.7	13.9	14.1	14.3	14.5	14.7	14.8	15.0
8	15.2	15.4	15.6	15.8	16.0	16.2	16.4	16.6	16.8	16.9
9	17.1	17.3	17.5	17.7	17.9	18.1	18.3	18.5	18.6	18.8
10	19.0	19.2	19.4	19.6	19.8	20.0	20.2	20.4	20.6	20.7
11	20.9	21.1	21.3	21.5	21.7	21.9	22.1	22.3	22.5	22.6
12	22.8	23.0	23.2	23.4	23.6	23.8	24.0	24.2	24.4	24.5
13	24.7	24.9	25.1	25.3	25.5	25.7	25.9	26.1	26.3	26.5
14	26.6	26.8	27.0	27.2	27.4	27.6	27.8	28.0	28.2	28.4
15	28.5	28.7	28.9	29.1	29.3	29.5	29.7	29.9	30.1	30.3
16	30.4	30.6	30.8	31.0	31.2	31.4	31.6	31.8	32.0	32.2
17	32.4	32.5	32.7	32.9	33.1	33.3	33.5	33.7	33.9	34.1
18	34.3	34.4	34.6	34.8	35.0	35.2	35.4	35.6	35.8	36.0
19	36.2	36.3	36.5	36.7	36.9	37.1	37.3	37.5	37.7	37.9
20	38.1	38.3	38.4	38.6	38.8	39.0	39.2	39.4	39.6	39.8
21	40.0	40.2	40.3	40.5	40.7	40.9	41.1	41.3	41.5	41.7
22	41.9	42.1	42.2	42.4	42.6	42.8	43.0	43.2	43.4	43.6
23	43.8	44.0	44.1	44.3	44.5	44.7	44.9	45.1	45.3	45.5
24	45.7	45.9	46.1	46.2	46.4	46.6	46.8	47.0	47.2	47.4
25	47.6	47.8	48.0	48.1	48.3	48.5	48.7	48.9	49.1	49.3
26	49.5	49.7	49.9	50.0	50.2	50.4	50.6	50.8	51.0	51.2
27	51.4	51.6	51.8	52.0	52.1	52.3	52.5	52.7	52.9	53.1
28	53.3	53.5	53.7	53.9	54.0	54.2	54.4	54.6	54.8	55.0

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
29	55.2	55.4	55.6	55.8	55.9	56.1	56.3	56.5	56.7	56.9
30	57.1	57.3	57.5	57.7	57.9	58.0	58.2	58.4	58.6	58.8
31	59.0	59.2	59.4	59.6	59.8	59.9	60.1	60.3	60.5	60.7
32	60.9	61.1	61.3	61.5	61.7	61.8	62.0	62.2	62.4	62.6
33	62.8	63.0	63.2	63.4	63.6	63.8	63.9	64.1	64.3	64.5
34	64.7	64.9	65.1	65.3	65.5	65.7	65.8	6.0	66.2	66.4
35	66.6	66.8	67.0	67.2	67.4	67.6	67.7	67.9	68.1	68.3
36	68.5	68.7	68.9	69.1	69.3	69.5	69.6	69.8	70.0	70.2
37	70.4	70.6	70.8	71.0	71.2	71.4	71.6	71.7	71.9	72.1
38	72.3	72.5	72.7	72.9	73.1	73.3	73.5	73.6	73.8	74.0
39	74.2	74.4	74.6	74.8	75.0	75.2	75.4	75.5	75.7	75.9
40	76.1	76.3	76.5	76.7	76.9	77.1	77.3	77.5	77.6	77.8
41	78.0	78.2	78.4	78.6	78.8	79.0	79.2	79.4	79.5	79.7
42	79.9	80.1	80.3	80.5	80.7	80.9	81.1	81.3	81.4	81.6
43	81.8	82.0	82.2	82.4	82.6	82.8	83.0	83.2	83.4	83.5
44	83.7	83.9	84.1	84.3	84.5	84.7	84.9	85.1	85.3	85.4
45	85.6	85.8	86.0	86.2	86.4	86.6	86.8	87.0	87.2	87.3
46	87.5	87.7	87.9	88.1	88.3	88.5	88.7	88.9	89.1	89.3
47	89.4	89.6	89.8	90.0	90.2	90.4	90.6	90.8	91.0	91.2
48	91.3	91.5	91.7	91.9	92.1	92.3	92.5	92.7	92.9	93.1
49	93.2	93.4	93.6	93.8	94.0	94.2	94.4	94.6	94.8	95.0
50	95.2	95.3	95.5	95.7	95.9	96.1	96.3	96.5	96.7	96.9

Prepared by multiplying the BAF 20 Plot Radius Factor 1.902 * DBH. For example, if DBH = 14.3 inches, then $14.3 * 1.903 = 27$.

Table 38: BAF 30 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5	7.7	7.9	8.0	8.2	8.3	8.5	8.7	8.8	9.0	9.1
6	9.3	9.4	9.6	9.7	9.9	10.0	10.2	10.4	10.5	10.7
7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	12.1	12.2
8	12.4	12.5	12.7	12.8	13.0	13.1	13.3	13.5	13.6	13.8
9	13.9	14.1	14.2	14.4	14.5	14.7	14.8	15.0	15.2	15.3
10	15.5	15.6	15.8	15.9	16.1	16.2	16.4	16.5	16.7	16.9
11	17.0	17.2	17.3	17.5	17.6	17.8	17.9	18.1	18.2	18.4
12	18.6	18.7	18.9	19.0	19.2	19.3	19.5	19.6	19.8	19.9
13	20.1	20.3	20.4	20.6	20.7	20.9	21.0	21.2	21.3	21.5
14	21.6	21.8	22.0	22.1	22.3	22.4	22.6	22.7	22.9	23.0
15	23.2	23.3	23.5	23.7	23.8	24.0	24.1	24.3	24.4	24.6
16	24.7	24.9	25.0	25.2	25.4	25.5	25.7	25.8	26.0	26.1
17	26.3	26.4	26.6	26.7	26.9	27.1	27.2	27.4	27.5	27.7
18	27.8	28.0	28.1	28.3	28.4	28.6	28.8	28.9	29.1	29.2
19	29.4	29.5	29.7	29.8	30.0	30.1	30.3	30.5	30.6	30.8
20	30.9	31.1	31.2	31.4	31.5	31.7	31.8	32.0	32.2	32.3
21	32.5	32.6	32.8	32.9	33.1	33.2	33.4	33.5	33.7	33.9
22	34.0	34.2	34.3	34.5	34.6	34.8	34.9	35.1	35.2	35.4
23	35.6	35.7	35.9	36.0	36.2	36.3	36.5	36.6	36.8	36.9
24	37.1	37.3	37.4	37.6	37.7	37.9	38.0	38.2	38.3	38.5
25	38.7	38.8	39.0	39.1	39.3	39.4	39.6	39.7	39.9	40.00
26	40.2	40.4	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6
27	41.7	41.9	42.1	42.2	42.4	42.5	42.7	42.8	43.0	43.1
28	43.3	43.4	43.6	43.8	43.9	44.1	44.2	44.4	44.5	44.7

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
29	44.8	45.0	45.1	45.3	45.5	45.6	45.8	45.9	46.1	46.2
30	46.4	46.5	46.7	46.8	47.0	47.2	47.3	47.5	47.6	47.8
31	47.9	48.1	48.2	48.4	48.5	48.7	48.9	49.0	49.2	49.3
32	49.5	49.6	49.8	49.9	50.1	50.2	50.4	50.6	50.7	50.9
33	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.3	52.4
34	52.6	52.7	52.9	53.0	53.2	53.3	53.5	53.6	53.8	54.0
35	54.1	54.3	54.4	54.6	54.7	54.9	55.0	55.2	55.3	55.5
36	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	57.0
37	57.2	57.4	57.5	57.7	57.8	58.0	58.1	58.3	58.4	58.6
38	58.7	58.9	59.1	59.2	59.4	59.5	59.7	59.8	60.0	60.1
39	60.3	60.4	60.6	60.8	60.9	61.1	61.2	61.4	61.5	61.7
40	61.8	62.0	62.1	62.3	62.5	62.6	62.8	62.9	63.1	63.2
41	63.4	63.5	63.7	63.8	64.0	64.2	64.3	64.5	64.3	64.8
42	64.9	65.1	65.2	65.4	65.6	65.7	65.9	66.0	66.2	66.3
43	66.5	66.6	66.8	66.9	67.1	67.3	67.4	67.6	67.7	67.9
44	68.0	68.2	68.3	68.5	68.6	68.8	69.0	69.1	69.3	69.4
45	69.6	69.7	69.9	70.0	70.2	70.3	70.5	70.7	70.8	71.0
46	71.1	71.3	71.4	71.6	71.7	71.9	72.0	72.2	72.4	72.5
47	72.7	72.8	73.0	73.1	73.3	73.4	73.6	73.7	73.9	74.1
48	74.2	74.4	74.5	74.7	74.8	75.0	75.1	75.3	75.4	75.6
49	75.8	75.9	76.1	76.2	76.4	76.5	76.7	76.8	77.0	77.1
50	77.3	77.5	77.6	77.8	77.9	78.1	78.2	78.4	78.5	78.7

Prepared by multiplying the BAF 30 Plot Radius Factor 1.546 * DBH. For example, if DBH = 14.3 inches, then $14.3 * 1.546 = 22$.

Table 39: BAF 40 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5	6.7	6.8	6.9	7.1	7.2	7.3	7.5	7.6	7.7	7.9
6	8.0	8.1	8.3	8.4	8.5	8.7	8.8	8.9	9.1	9.2
7	9.3	9.5	9.6	9.7	9.9	10.0	10.1	10.3	10.4	10.5
8	10.7	10.8	10.9	11.1	11.2	11.3	11.5	11.6	11.7	11.9
9	12.0	12.1	12.3	12.4	12.5	12.7	12.8	12.9	13.1	13.2
10	13.3	13.5	13.6	13.7	13.9	14.0	14.1	14.3	14.4	14.5
11	14.7	14.8	14.9	15.1	15.2	15.3	15.5	15.6	15.7	15.9
12	16.0	16.1	16.3	16.4	16.5	16.7	16.8	16.9	17.1	17.2
13	17.3	17.5	17.6	17.7	17.9	18.0	18.1	18.3	18.4	18.5
14	18.7	18.8	18.9	19.1	19.2	19.3	19.5	19.6	19.7	19.9
15	20.0	20.1	20.3	20.4	20.5	20.7	20.8	20.9	21.1	21.2
16	21.3	21.5	21.6	21.7	21.9	22.0	22.1	22.3	22.4	22.5
17	22.7	22.8	22.9	23.1	23.2	23.3	23.5	23.6	23.7	23.9
18	24.0	24.1	24.3	24.4	24.5	24.7	24.8	24.9	25.1	25.2
19	25.3	25.5	25.6	25.7	25.9	26.0	26.1	26.3	26.4	26.5
20	26.7	26.8	26.9	27.1	27.2	27.3	27.5	27.6	27.7	27.9
21	28.0	28.1	28.3	28.4	28.5	28.7	28.8	28.9	29.1	29.2
22	29.3	29.5	29.6	29.7	29.9	30.0	30.1	30.3	30.4	30.5
23	30.7	30.8	30.9	31.1	31.2	31.3	31.5	31.6	31.7	31.9
24	32.0	32.1	32.3	32.4	32.5	32.7	32.8	32.9	33.1	33.2
25	33.3	33.5	33.6	33.7	33.9	34.0	34.1	34.3	34.4	34.5
26	34.7	34.8	34.9	35.1	35.2	35.3	35.5	35.6	35.7	35.9
27	36.0	36.1	36.3	36.4	36.5	36.7	36.8	36.9	37.1	37.2
28	37.3	37.5	37.6	37.7	37.9	38.0	38.1	38.3	38.4	38.5

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
29	38.7	34.8	34.9	35.1	35.2	35.3	35.5	35.6	35.7	35.9
30	40.0	40.1	40.3	40.4	40.5	40.7	40.8	40.9	41.1	41.2
31	41.3	41.5	41.6	41.7	41.9	42.0	42.1	42.3	42.4	42.5
32	42.7	42.8	42.9	43.1	43.2	43.3	43.5	43.6	43.7	43.9
33	44.0	44.1	44.3	44.4	44.5	44.7	44.8	44.9	45.1	45.2
34	45.3	45.5	45.6	45.7	45.9	46.0	46.1	46.3	46.4	46.5
35	46.7	46.8	46.9	47.1	47.2	47.3	47.5	47.6	47.7	47.9
36	48.0	48.1	48.2	48.4	48.5	48.7	48.	48.9	49.1	49.2
37	49.3	49.5	49.6	49.7	49.9	50.0	50.1	50.3	50.4	50.5
38	50.7	50.8	50.9	51.1	51.2	51.3	51.5	51.6	51.7	51.9
39	52.0	52.1	52.2	52.4	52.5	52.7	52.8	52.9	53.1	53.2
40	53.3	53.5	53.6	53.7	53.9	54.0	54.1	54.3	54.4	54.5
41	54.7	54.8	54.9	55.1	55.2	55.3	55.5	55.6	55.7	55.9
42	56.0	56.1	56.2	56.4	56.5	56.7	56.8	56.9	57.1	57.2
43	57.3	57.5	57.6	57.7	57.9	58.0	58.1	58.3	58.4	58.5
44	58.7	58.8	58.9	59.1	59.2	59.3	59.5	59.6	59.7	59.9
45	60.0	60.1	60.2	60.4	60.5	60.7	60.8	60.9	61.1	61.2
46	61.3	61.5	61.6	61.7	61.9	62.0	62.1	62.3	62.4	62.5
47	62.7	62.8	62.9	63.1	63.2	63.3	63.5	63.6	63.7	63.9
48	64.0	64.1	64.2	64.4	64.5	64.7	64.8	64.9	65.1	65.2
49	65.3	65.5	65.6	65.7	65.9	66.0	66.1	66.3	66.4	66.5
50	66.7	66.8	66.9	67.0	67.2	67.3	67.4	67.6	67.7	67.8

Prepared by multiplying the BAF 40 Plot Radius Factor 1.333 * DBH. For example, if DBH = 14.3 inches, then $14.3 * 1.333 = 19.1$ feet.

Table 40: BAF 60 Plot Radii in Feet and Tenths of Feet from Plot Center to Face of Tree at DBH for 0% Slope

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5	5.4	5.5	5.6	5.7	5.8	5.9	6.1	6.2	6.3	6.4
6	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.4	7.5
7	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5
8	8.6	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6
9	9.7	9.8	9.9	10.1	10.2	10.3	10.4	10.5	10.6	10.7
10	10.8	10.9	11.0	11.1	11.2	11.4	11.5	11.6	11.7	11.8
11	11.9	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.8	12.9
12	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9
13	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	15.0
14	15.1	15.2	15.4	15.5	15.6	15.7	15.8	15.9	16.0	16.1
15	16.2	16.3	16.4	16.5	16.6	16.7	16.9	17.0	17.1	17.2
16	17.3	17.4	17.5	17.6	17.7	17.8	17.9	18.1	18.2	18.3
17	18.4	18.5	18.6	18.7	18.8	18.9	19.0	19.1	19.2	19.3
18	19.5	19.6	19.7	19.8	19.9	20.0	20.1	20.2	20.3	20.4
19	20.5	20.6	20.8	20.9	21.0	21.1	21.2	21.3	21.4	21.5
20	21.6	21.7	21.8	21.9	22.1	22.2	22.3	22.4	22.5	22.6
21	22.7	22.8	22.9	23.0	23.1	23.2	23.3	23.5	23.6	23.7
22	23.8	23.9	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.8
23	24.9	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8
24	25.9	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9
25	27.0	27.1	27.2	27.3	27.5	27.6	27.7	27.8	27.9	28.0
26	28.1	28.2	28.3	28.4	28.5	28.6	28.8	28.9	29.0	29.1
27	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	30.1	30.2
28	30.3	30.4	30.5	30.6	30.7	30.8	30.9	31.0	31.1	31.2

Inches	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
29	31.3	31.5	31.6	31.7	31.8	31.9	32.0	32.1	32.2	32.3
30	32.4	32.5	32.6	32.8	32.9	33.0	33.1	33.2	33.3	33.4
31	33.5	33.6	33.7	33.8	33.9	34.1	34.2	34.3	34.4	34.5
32	35.7	35.8	35.9	36.0	36.1	36.2	36.3	36.4	36.5	36.6
33	35.7	35.8	35.9	36.0	36.1	36.2	36.3	36.4	36.5	36.6
34	36.8	36.9	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7
35	37.8	37.9	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8
36	38.9	39.0	39.1	39.2	39.3	39.5	39.6	39.7	39.8	39.9
37	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.8	40.9	41.0
38	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	42.1
39	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	43.0	43.1
40	43.2	43.3	43.5	43.6	43.7	43.8	43.9	44.0	44.1	44.2
41	44.3	44.4	44.5	44.6	44.8	44.9	45.0	45.1	45.2	45.3
42	45.4	45.5	45.6	45.7	45.8	45.9	46.1	46.2	46.3	46.4
43	46.5	46.6	46.7	46.8	46.9	47.0	47.1	47.2	47.3	47.5
44	47.6	47.7	47.8	47.9	48.0	48.1	48.2	48.3	48.4	48.5
45	48.6	48.8	48.9	49.0	49.1	49.2	49.3	49.4	49.5	49.6
46	49.7	49.8	49.9	50.1	50.2	50.3	50.4	50.5	50.6	50.7
47	50.8	50.9	51.0	51.1	51.2	51.3	51.5	51.6	51.7	51.8
48	51.9	52.0	52.1	52.2	52.3	52.4	52.5	52.6	52.8	52.9
49	53.0	53.1	53.2	53.3	53.4	53.5	53.6	53.7	53.8	53.9
50	54.1	54.2	54.3	54.4	54.5	54.6	54.7	54.8	54.9	55.0

Prepared by multiplying the BAF 60 Plot Radius Factor 1.081 * DBH. For example, if DBH = 14.3 inches, then $14.3 * 10.81 = 15.5$ feet.

Table 41: Limiting Distances to Face of Tree and Slope Correction Factors for Various Basal Area Factors

This table provides an expanded list of slope correction factors to the face of the tree for use with various basal area factors. To use the table, measure the slope and distance from plot-center to the face of the tree at DBH. To obtain the corrected limiting distance to a tree, multiply the tree's DBH by the "combined factor" shown under the appropriate BAF heading.

Slope	Factor	5 BAF	10 BAF	15 BAF	20 BAF	30 BF	40 BAF
1	1.00000	3.847	2.708	2.203	1.902	1.546	1.333
2	1.00020	3.848	2.709	2.203	1.902	1.546	1.333
3	1.00045	3.489	2.709	2.204	1.903	1.547	1.334
4	1.00080	3.850	2.710	2.205	1.904	1.547	1.334
5	1.00125	3.852	2.711	2.206	1.904	1.548	1.335
6	1.00180	3.854	2.713	2.207	1.905	1.549	1.335
7	1.00245	2.856	2.715	2.208	1.907	1.550	1.336
8	1.00319	3.859	2.717	2.210	1.908	1.551	1.337
9	1.00404	3.863	2.719	2.212	1.910	1.552	1.338
10	1.00499	3.866	2.722	2.214	1.911	1.554	1.340
11	1.00603	3.870	2.724	2.216	1.912	1.555	1.341
12	1.00717	3.875	2.727	2.219	1.916	1.557	1.341
13	1.00841	3.879	2.731	2.222	1.918	1.559	1.344
14	1.00975	3.884	2.734	2.224	1.921	1.567	1.346
15	1.01119	3.890	2.738	2.228	1.923	1.563	1/348
16	1.01272	3.896	2.742	2.231	1.926	1.566	1.350
17	1.01435	3.902	2.747	2.235	1.921	1.568	1.352
18	1.01607	3.909	2.752	2.238	1.933	1.571	1.354
19	1.01789	3.916	2.756	2.245	1.936	1.574	1.357
20	1.01980	3.923	2.762	2.245	1.940	1.577	1.359
21	1.02181	3.931	2.767	2.251	1.943	1.580	1.362

Slope	Factor	5 BAF	10 BAF	15 BAF	20 BAF	30 BF	40 BAF
22	1.02391	3.939	2.773	2.256	1.947	1.583	1.365
23	1.02611	3.947	2.779	2.261	1.952	1.586	1.368
24	1.02840	3.956	2.785	2.266	1.956	1.590	1.371
25	1.03078	3.965	2.791	2.271	1.967	1.594	1.374
26	1.03325	3.975	2.798	2.276	1.965	1.597	1.377
27	1.03581	3.985	2.805	2.282	1.970	1.601	1.381
28	1.03846	3.995	2.812	2.288	1.975	1.605	1.384
29	1.04120	4.005	2.820	2.294	1.980	1.610	1.388
30	1.04403	4.016	2.827	2.300	1.986	1.614	1.392
31	1.04695	4.028	2.835	2.306	1.991	1.619	1.396
32	1.04995	4.039	2.843	2.313	1.997	1.623	1.400
33	1.05304	4.051	2.852	2.320	2.003	1.628	1.404
34	1.05622	4.063	2.960	2.327	2.009	1.633	1.408
35	1.05948	4.076	2.869	2.334	2.015	1.638	1.412
36	1.06283	4.089	2.878	2.341	2.022	1.643	1.417
37	1.06626	4.102	2.887	2.349	2.028	1.648	4.421
38	1.06977	4.115	2.897	2.357	2.035	1.654	1.426
39	1.07336	4.129	2.907	2.365	2.042	1.659	1.431
40	1.07703	4.143	2.917	2.373	2.049	1.665	1.436
41	1.08079	4.158	2.927	2.381	2.056	1.671	1.441
42	1.08462	4.173	2.937	2.389	2.063	1.677	1.446
43	1.08853	4.188	2.948	2.398	2.070	1.683	1.451
44	1.09252	4.203	2.959	2.407	2.078	1.689	1.456
45	1.09659	4.219	2.970	2.416	2.086	1.695	1.462
46	1.10073	4.235	2.981	2.425	2.094	1.702	1.467

Slope	Factor	5 BAF	10 BAF	15 BAF	20 BAF	30 BF	40 BAF
47	1.10494	4.251	2.992	2.434	2.102	1.708	1.473
48	1.10923	4.267	3.004	2.444	2.110	1.715	1.479
49	1.11360	4.284	3.016	2.453	2.118	1.723	1.484
50	1.11803	4.301	3.028	2.463	2.126	1.728	1.490
51	1.12254	4.318	3.040	2.473	2.135	1.735	1.496
52	1.12712	4.336	3.052	2.483	2.144	1.743	1.502
53	1.13177	4.354	3.065	2.493	2.153	1.750	1.509
54	1.13649	4.372	3.078	2.504	2.162	1.757	1.515
55	1.14127	4.390	3.091	2.514	2.171	1.764	1.521
56	1.14612	4.409	3.104	2.525	2.180	1.772	1.528
57	1.15104	4.428	3.117	2.536	2.189	1.780	1.534
58	1.15603	4.447	3.131	2.547	2.199	1.788	1.541
59	1.16108	4.467	3.144	2.558	2.208	1.795	1.548
60	1.16619	4.486	3.158	2.569	2.218	1.803	1.555
61	1.17137	4.506	3.172	2.581	2.228	1.811	1.561
62	1.17661	4.526	3.186	2.592	2.238	1.819	1.568
63	1.18191	4.547	3.201	2.604	2.248	1.827	1.575
64	1.18727	4.567	3.215	2.616	2.258	1.836	1.583
65	1.19269	4.588	3.230	2.627	2.268	1.844	1.590
66	1.19817	4.609	3.245	2.640	2.279	1.852	1.597
67	1.20370	4.631	3.260	2.652	2.289	1.861	1.605
68	1.20930	4.652	3.275	2.664	2.300	1.870	1.612
69	1.21499	4.691	3.302	2.687	2.319	1.885	1.626
70	1.22066	4.696	3.306	2.689	2.322	1.887	1.627
71	1.22642	4.718	3.321	2.702	2.333	1.896	1.635

Slope	Factor	5 BAF	10 BAF	15 BAF	20 BAF	30 BF	40 BAF
72	1.23223	4.740	3.337	2.715	2.344	1.905	1.643
73	1.23810	4.763	3.353	2.728	2.355	1.914	1.650
74	1.24403	4.786	3.369	2.741	2.366	1.923	1.658
75	1.25000	4.809	3.385	2.754	2.378	1.933	1.666
76	1.25603	4.832	3.401	2.767	2.389	1.942	1.674
77	1.26210	4.855	3.418	2.780	2.401	1.951	1.682
78	1.26823	4.879	3.434	2.794	2.412	1.961	1.691
79	1.27440	4.903	3.451	2.808	2.424	1.970	1.699
80	1.28062	4.927	3.468	2.821	2.436	1.980	1.707
81	1.28690	4.951	3.485	2.835	2.448	1.990	1.715
82	1.29321	4.975	3.502	2.849	2.460	1.999	1.724
83	1.29958	4.999	3.519	2.863	2.472	2.009	1.732
84	1.30599	5.024	3.537	2.877	2.484	2.019	1.741
85	1.31244	5.049	3.554	2.891	2.496	2.029	1.749
86	1.31894	5.074	3.572	2.906	2.509	2.039	1.758
87	1.32548	5.099	3.589	2.920	2.521	2.049	1.767
88	1.33207	5.124	3.607	2.935	2.534	2.059	1.776
89	1.33870	5.150	3.625	2.949	2.546	2.070	1.784
90	1.34536	5.176	3.643	2.964	2.559	2.080	1.793
91	1.35207	5.201	3.661	2.979	2.572	2.090	1.802
92	1.35882	5.227	3.680	2.993	2.584	2.101	1.811
93	1.36561	5.254	3.698	3.008	2.597	2.111	1.820
94	1.37244	5.280	3.717	3.023	2.610	2.122	1.829
95	1.37931	5.306	3.735	3.039	2.623	2.132	1.839
96	1.38622	5.333	3.754	3.054	2.637	2.143	1.848

Slope	Factor	5 BAF	10 BAF	15 BAF	20 BAF	30 BF	40 BAF
97	1.39316	5.359	3.773	3.069	2.650	2.154	1.875
98	1.40014	5.386	3.792	3.085	2.663	2.165	1.866
99	1.40716	5.413	3.811	3.100	2.676	2.175	1.876
100	1.41421	5.440	3.830	3.116	2.690	2.186	1.885
102	1.42843	5.495	3.868	3.147	2.717	2.208	1.904
103	1.43558	5.523	3.888	3.163	5.730	2.219	1.914
104	1.44278	5.550	3.907	3.178	2.744	2.231	1.923
105	1.45000	5.578	3.927	3.194	2.758	2.242	1.933
106	1.45726	5.606	3.946	3.210	2.772	2.253	1.943
107	1.46455	5.634	3.966	3.226	2.876	2.264	1.952
108	1.47187	5.662	3.986	3.243	2.799	2.276	1.962
109	1.47922	5.691	4.006	3.259	2.813	2.287	1.972
110	1.48661	5.719	4.026	3.275	2.828	2.298	1.982
111	1.49402	5.747	4.046	3.291	2.842	2.310	1.992
112	1.50147	5.776	4.066	3.308	2.856	2.321	2.001
113	1.50894	5.805	4.086	3.324	2.870	2.333	2.011
114	1.51644	5.834	4.107	3.341	2.884	2.344	2.021
115	1.52498	5.863	4.127	3.357	2.899	2.356	2.031
116	1.53154	5.892	4.147	3.374	2.913	2.368	2.042
117	1.53912	5.921	4.168	3.391	2.927	2.379	2.052
118	1.54674	5.950	4.189	3.407	2.942	2.391	2.062
119	1.55438	5.980	4.209	3.424	2.956	2.403	2.072
120	1.56205	6.000	4.230	3.441	2.971	2.415	2.082
121	1.56975	6.039	4.251	3.458	2.985	2.427	2.092
122	1.57747	6.069	4.272	3.475	3.000	2.439	2.103

Slope	Factor	5 BAF	10 BAF	15 BAF	20 BAF	30 BF	40 BAF
123	1.58521	6.098	4.293	3.492	3.015	2.451	2.113
124	1.59298	6.128	4.314	3.509	3.030	2.463	2.123
125	1.60078	6.158	4.335	3.527	3.045	2.475	2.134
126	1.60860	6.188	4.356	3.544	3.060	2.487	2.144
127	1.61645	6.218	4.377	3.561	3.074	2.499	2.155
128	1.62432	6.249	4.399	3.578	3.089	2.511	2.165
129	1.63221	6.279	4.420	3.595	3.104	2.523	2.176
130	1.64012	6.310	4.441	3.613	3.120	2.536	2/186
131	1.64806	6.340	4.463	3.631	3.135	2.546	2.197
132	1.65602	6.370	4.485	3.648	3.150	2.560	2.207
133	1.66400	6.401	4.506	3.666	3.165	2.573	2.218
134	1.67200	6.432	4.528	3.683	3.180	2.585	2.229
135	1.68003	6.463	4.550	3.701	3.195	2.597	2.239
136	1.68808	6.494	4.571	3.719	3.211	2.261	2.250
137	1.69614	6.525	4.593	3.737	3.226	2.622	2.261
138	1.70423	6.556	4.615	3.754	3.241	2.635	2.272
139	1.71234	6.587	4.637	3.772	3.257	2.647	2.283
140	1.72047	6.619	4.659	3.790	3.272	2.660	2.293
141	1.72861	6.650	4.681	3.808	3.288	2.672	2.304
142	1.73678	6.681	4.703	3.826	3.303	2.685	2.315
143	1.74497	6.713	4.725	3.844	3.319	2.698	2.326
144	1.75317	6.744	4.748	3.862	3.335	2.710	2.337
145	1.76139	6.776	4.770	3.880	3.350	2.723	2.348
146	1.76963	6.808	4.792	3.898	3.366	2.736	2.359
147	1.77789	6.840	4.815	3.917	3.382	2.749	2.370

Slope	Factor	5 BAF	10 BAF	15 BAF	20 BAF	30 BF	40 BAF
148	1.78617	6.871	4.837	3.935	3.397	2.761	2.381
149	1.79446	6.903	4.859	3.953	3.413	2.774	2.392

APPENDIX K: DAMAGE CATEGORIES, AGENTS, SEVERITY RATINGS, AND TREE PARTS

DAMAGE CATEGORIES

Detailed descriptions and examples of the content in these tables is available using the Insect & Disease Codes links on the [FSVeg Documentation web page](#).

Table 42: Damage category codes

Code	Description
10	General Insects
11	Bark Beetles
12	Defoliators
13	Chewing Insects
14	Sucking Insects
15	Boring Insects
16	Seed/Cone/Flower/Fruit Insects
17	Gallmaker Insects
18	Insect Predators
19	General Diseases
20	Biotic Damage
21	Root/Butt Diseases
22	Stem Decays/Cankers
23	Parasitic/Epiphytic Plants
24	Decline Complexes/Dieback/Wilts

Code	Description
25	Foliage Diseases
26	Stem Rusts
27	Broom Rusts
30	Fire
40	Animal Damage, Source Unknown
41	Wild Animals
42	Domestic Animals
50	Abiotic Damage
60	Competition
70	Human Activities
71	Harvest
80	Multi-Damage (Insect-Disease)
90	Unknown
99	Physical Effects

DAMAGE AGENTS

Detailed descriptions and examples of the content in these tables is available using the Insect & Disease Codes links on the [FSVeg Documentation web page](#).

Table 43: Damage agent codes

Category	Agent	Common Name	Scientific Name
10	000	General insects	n / a
10	001	Thrips	<i>n/a</i>
10	002	Tip moth	<i>n/a</i>
10	003	Wasp	<i>n/a</i>
10	007	Clerid beetle	<i>Cleridae</i>
10	008	Weevil	<i>Curculionidae</i>

Category	Agent	Common Name	Scientific Name
10	011	Ant	<i>Formicidae</i>
10	017	Bagworm moth	<i>Psychidae</i>
10	019	Scarab	<i>Scarabaeidae</i>
10	023	Wood wasps	<i>Siricidae spp.</i>
11	000	Bark beetles	n / a
11	001	Roundheaded pine beetle	<i>Dendroctonus adjunctus</i>
11	002	Western pine beetle	<i>Dendroctonus brevicomis</i>
11	004	Jeffrey pine beetle	<i>Dendroctonus jeffreyi</i>
11	005	Lodgepole pine beetle	<i>Dendroctonus murrayanae</i>
11	006	Mountain pine beetle	<i>Dendroctonus ponderosae</i>
11	007	Douglas-fir beetle	<i>Dendroctonus pseudotsugae</i>
11	009	Spruce beetle	<i>Dendroctonus rufipennis</i>
11	012	Red turpentine beetle	<i>Dendroctonus valens</i>
11	015	Western balsam bark beetle	<i>Dryocoetes confuses</i>
11	016	Unknown	<i>Dryocoetes sechelti</i>
11	019	Pinon ips	<i>Ips confuses</i>
11	021	Sixspined ips	<i>Ips calligraphus</i>
11	022	Emarginated ips	<i>Ips emarginatus</i>
11	025	Arizona five-spined ips	<i>Ips lecontei</i>
11	029	Pine engraver	<i>Ips pini</i>
11	030	Ips engraver beetles	<i>Ips spp/</i>
11	031	Unknown	<i>Ips tridens</i>
11	032	Western ash bark beetle	<i>Leperisinus californicus</i>
11	035	Cedar bark beetle	<i>Phloeosinus spp.</i>
11	036	Western cedar bark beetle	<i>Phloeosinus punctatus</i>

Category	Agent	Common Name	Scientific Name
11	037	Tip beetles	<i>Pityogenes spp.</i>
11	038	Douglas-fir twig beetle	<i>Pityophthorus pseudotsugae</i>
11	039	Twig beetles	<i>Pityophthorus spp.</i>
11	040	Four-eyed spruce beetle	<i>Polygraphus rufipennis</i>
11	041	Fir root bark beetle	<i>Pseudohylesinus granulates</i>
11	043	Douglas-fir pole beetle	<i>Pseudohylesinus nebulosus</i>
11	045	Small European elm bark beetle	<i>Scolytus multistriatus</i>
11	046	Spruce engraver	<i>Scolytus piceae</i>
11	048	True fir bark beetle	<i>Scolytus spp.</i>
11	049	Douglas-fir engraver	<i>Scolytus unispinosus</i>
11	050	Fir engraver	<i>Scolytus ventralis</i>
11	055	Spruce ips	<i>Ips pilifrons</i>
11	056	Mexican pine beetle	<i>Dendroctonus mexicanus</i>
12	000	Defoliators	n / a
12	001	Casebearer	<i>n/a</i>
12	002	Leaftier	<i>n/a</i>
12	003	Looper	<i>n/a</i>
12	004	Needleminer	<i>n/a</i>
12	005	Sawfly	<i>n/a</i>
12	006	Skeletonizer	<i>n/a</i>
12	009	Webworm	<i>n/a</i>
12	011	Western blackheaded budworm	<i>Acleris gloverana</i>
12	013	Whitefly	<i>Aleyrodoidae</i>
12	014	Fall cankerworm	<i>Alsophila pometaria</i>
12	016	Mountain mahogany looper	<i>Anacamptodes clivinaria profanata</i>

Category	Agent	Common Name	Scientific Name
12	020	Western larch sawfly	<i>Anoplonyx occidentis</i>
12	023	Boxelder defoliator	<i>Archips negundanus</i>
12	024	Oak leafroller	<i>Archips semiferana</i>
12	025	Birch sawfly	<i>Arge pectoralis</i>
12	033	Boxelder leafroller	<i>Caloptilia negundella</i>
12	037	Large aspen tortrix	<i>Choristoneura conflictana</i>
12	039	Sugar pine tortrix	<i>Choristoneura lambertiana</i>
12	040	Western spruce budworm	<i>Choristoneura occidentalis</i>
12	043	Aspen leaf beetle	<i>Chrysomela crotchii</i>
12	044	Cottonwood leaf beetle	<i>Chrysomela scripta</i>
12	045	Leafhopper	<i>Cicadellidae</i>
12	047	Larch casebearer	<i>Coleophora laricella</i>
12	049	Lodgepole needleminer	<i>Coleotechnites milleri</i>
12	050	Ponderosa needleminer	<i>Coleotechnites spp.</i>
12	052	Pandora moth	<i>Coloradia Pandora</i>
12	056	Dusky birch sawfly	<i>Croesus latitarus</i>
12	060	Spruce coneworm	<i>Dioryctria reniculelloides</i>
12	066	White fir needleminer	<i>Epinotia meritana</i>
12	069	Pine needleminer	<i>Exoteleia pinifoliella</i>
12	072	Geometrid moth	<i>Geometridae</i>
12	073	Leafblotch miner	<i>Gracillariidae</i>
12	074	Spotted tussock moth	<i>Halisidota maculate</i>
12	077	Brown day moth	<i>Hemileuca eglanderina</i>
12	082	Fall webworm	<i>Hyphantria cunea</i>
12	084	Unknown	<i>Lambdina punctate</i>

Category	Agent	Common Name	Scientific Name
12	087	Willow leafblotch miner	<i>Lithocolletis spp.</i>
12	089	Gypsy moth	<i>Lymantria dispar</i>
12	094	Western tent caterpillar	<i>Malacosoma californicum</i>
12	096	Forest tent caterpillar	<i>Malacosoma disstria</i>
12	099	Blister beetle	<i>Meloidae</i>
12	116	Pine butterfly	<i>Neophasia menapia</i>
12	121	Rusty tussock moth	<i>Orgyia antiqua</i>
12	123	Douglas-fir tussock moth	<i>Orgyia pseudotsugata</i>
12	124	Western tussock moth	<i>Orgyia vetusta</i>
12	125	Spring cankerworm	<i>Paleacrita vernata</i>
12	128	Pine tussock moth	<i>Parorygia griseofacta</i>
12	135	Aspen leafminer	<i>Phyllocnistis populiella</i>
12	139	Larch sawfly	<i>Pristiphora erichsonii</i>
12	140	Mountain-ash sawfly	<i>Pristiphora geniculate</i>
12	141	Elm leaf beetle	<i>Prrhalta luetola</i>
12	143	Giant silkworm moth	<i>Saturniidae</i>
12	144	Redhumped caterpillar	<i>Schizura concinna</i>
12	150	Spruce needleminer (west)	<i>Taniva albolineana</i>
12	155	Leafroller/seed moth	<i>Tortricidae</i>
12	156	Willow defoliation	<i>Tortricidae</i>
12	160	Pine needle sheathminer	<i>Zelleria haimbachi</i>
12	178	Western oak looper	<i>Lambdina discellaria somniaria</i>
12	181	Tent Caterpillar	<i>Malacosoma spp.</i>
12	190	Hickory tussock moth	<i>Halisidota caryae</i>
12	191	Pin oak sawfly	<i>Caliroa lineata</i>

Category	Agent	Common Name	Scientific Name
12	192	Palmerworm	<i>Dichomeris ligulella</i>
12	193	Pitch pine looper	<i>Lambdina athasaria pellucidaria</i>
12	194	Red pine sawfly	<i>Neodiprion annulus annulus</i>
12	195	Pine tip moth	<i>Argyrotaenia pinatubana</i>
12	196	Baldcypress leafroller	<i>Archips goyerana</i>
12	197	Winter moth	<i>Operophtera</i>
12	198	Basswood thrip	<i>Neohydatothrips</i>
12	199	Noctuid moth	<i>Xylomyges simplex (walker)</i>
12	200	Pyralid moth	<i>Palpita magniferalis</i>
13	000	Chewing insects	n / a
13	001	Grasshopper	<i>n/a</i>
13	006	Cicadas	<i>Cicadidae</i>
13	008	Cutworms	<i>Euxoa excellens</i>
13	021	Ponderosa pine tip moth	<i>Rhyacionia zozana</i>
13	022	Pine needle weevil	<i>Scythropus spp.</i>
13	030	Adana tip moth	<i>Rhyacionia adana</i>
14	000	Sucking insects	n / a
14	001	Scale insect	<i>n/a</i>
14	002	Western larch wooly aphid	<i>Adelges oregonensis</i>
14	003	Balsam woolly adelgid	<i>Adelges piceae</i>
14	006	Aphid	<i>Aphididae</i>
14	008	Western pine spittlebug	<i>Aphrophora permutata</i>
14	012	Pine needle scale	<i>Chionaspis pinifoliae</i>
14	014	Giant conifer aphid	<i>Cinara spp.</i>
14	017	Spruce aphid	<i>Elatobium anatinum</i>

Category	Agent	Common Name	Scientific Name
14	018	Woolly apple aphid	<i>Eriosoma lanigerum</i>
14	024	Honeysuckle aphid	<i>Hyadaphis tataricae</i>
14	026	Lecanium scale	<i>Lecanium spp.</i>
14	028	Oystershell scale	<i>Lepidosaphes ulmi</i>
14	029	Pinyon needle scale	<i>Matsucoccus acalyptus</i>
14	035	Treehoppers	<i>Membracidae</i>
14	039	Black pineleaf scale	<i>Nuculaspis California</i>
14	040	Spruce spider mite	<i>Oligonychus ununquis</i>
14	043	Maple aphid	<i>Periphyllus spp.</i>
14	050	Mealybug	<i>Pseudococcidae</i>
14	054	Spruce mealybug	<i>Puto sandini</i>
14	069	Elm scurfy scale	<i>Chionaspis Americana</i>
15	000	Boring insects	n / a
15	001	Shoot borer	<i>n/a</i>
15	002	Termite	<i>n/a</i>
15	003	Ponderosa pine bark borer	<i>Acanthocinus princeps</i>
15	004	Bronze birch borer	<i>Agrilus anxius</i>
15	006	Bronze poplar borer	<i>Agrilus liragus</i>
15	007	Carpenter bees	<i>Apidae</i>
15	008	Flatheaded borer	<i>Buprestidae</i>
15	009	Golden buprestid	<i>Buprestis aurulenta</i>
15	010	Carpenter ants	<i>Camponotus spp.</i>
15	011	Gouty pitch midge	<i>Cecidomyia piniinopis</i>
15	013	Roundheaded borer	<i>Cermbycidae</i>
15	018	Carpenterworm moth	<i>Cossidae</i>

Category	Agent	Common Name	Scientific Name
15	019	Poplar and willow borer	<i>Cryptorhynchus lapathi</i>
15	021	Douglas-fir twig weevil	<i>Cylindrocopturus furnissi</i>
15	027	Ponderous borer	<i>Ergates spiculatus</i>
15	029	Western pine shoot borer	<i>Eucosma sonomana</i>
15	030	Eucosma species	<i>Eucosma spp.</i>
15	035	Powderpost beetle	<i>Lyctidae</i>
15	039	Locust borer	<i>Megacyclene robiniae</i>
15	041	Flatheaded fir borer	<i>Melanophila drummondi</i>
15	042	Whitespotted sawyer	<i>Monochamus scutellatus</i>
15	044	Western ash borer	<i>Neoclytus conjunctus</i>
15	050	White pine weevil	<i>Pissodes radiatae</i>
15	051	Lodgepole terminal weevil	<i>Pissodes terminalis</i>
15	052	Ambrosia beetles	<i>Platypus spp.</i>
15	057	Lilac borer	<i>Podosesia syringae</i>
15	060	Western subterranean termite	<i>Reticulitermes Hesperus</i>
15	064	Western pine tip moth	<i>Rhyacionia bushnelli</i>
15	068	Poplar borer	<i>Saperda calcarata</i>
15	070	Saperda shoot borer	<i>Saperda spp.</i>
15	071	Clearwing moths	<i>Sesiidae</i>
15	073	Roundheaded fir borer	<i>Tetropium abietis</i>
15	076	Douglas-fir pitch moth	<i>Vespamima novaroensis</i>
15	077	Sequoia pitch moth	<i>Vespamima sequoia</i>
15	087	Emerald ash borer	<i>Agrilus planipennis</i>
16	000	Seed / Cone / Flower / Fruit Insects	n / a
16	001	Douglas-fir cone moth	<i>Barbara colfaxiana</i>

Category	Agent	Common Name	Scientific Name
16	002	Lodgepole cone beetle	<i>Conophthorus contortae</i>
16	003	Limber pine cone beetle	<i>Conophthorus flexilis</i>
16	004	Mountain pine cone beetle	<i>Conophthorus monticolae</i>
16	005	Ponderosa pine cone beetle	<i>Conophthorus ponderosae</i>
16	010	Douglas-fir cone midge	<i>Contarinia oregonesis</i>
16	015	Fir coneworm	<i>Dioryctria abietivorella</i>
16	017	Pine cone worm	<i>Dioryctria merkeli</i>
16	019	Ponderosa twig moth	<i>Dioryctria ponderosae</i>
16	020	Unknown	<i>Dioryctria pseudotsugella</i>
16	021	Dioryctria moths	<i>Dioryctria spp.</i>
16	022	Lodgepole cone moth	<i>Eucosma rescissoriana</i>
16	023	Seed chalcid	<i>Eurytomidae</i>
16	025	Cone maggot	<i>Hylemya anthracina</i>
16	027	Ponderosa pine seed worm/moth	<i>Laspeyresia piperana</i>
16	028	Spruce seed moth	<i>Laspeyresia youngana</i>
16	029	Boxelder bug	<i>Leptocoris trivittatus</i>
16	031	Western conifer seed bug	<i>Leptoglossus occidentalis</i>
16	034	Spruce seed chalcid	<i>Magastigmus piceae</i>
16	035	Ponderosa pine seed chalcid	<i>Megastigmus albifrons</i>
16	036	Fir seed chalcid	<i>Megastigmus pinus</i>
16	037	Douglas-fir seed chalcid	<i>Megastigmus spermotrophs</i>
16	042	Coneworm	<i>Phycitidae</i>
16	043	Harvester ants	<i>Pogonomyrmex spp.</i>
16	049	Prairie tent caterpillar	<i>Malacosoma lutescens</i>
16	050	Jack pine tip beetle	<i>Conophthorus banksianae</i>

Category	Agent	Common Name	Scientific Name
17	000	Gallmarker insects	n / a
17	003	Cooley spruce gall adelgid	<i>Adelges cooleyi</i>
17	007	Douglas-fir needle gall midge	<i>Contarinia pseudotsugae</i>
17	010	Hackberry nipplegall maker	<i>Pachypsylla celtidismamma</i>
17	013	Gall aphid	<i>Phylloxera</i>
17	018	Gouty pitch midge	<i>Cecidomyia piniinopsis</i>
17	019	Spider mites	<i>Oligonychus spp.</i>
18	000	Insect predators	n / a
18	001	Lacewing	<i>n/a</i>
18	002	Blackbellied clerid	<i>Enoclerus lecontei</i>
18	003	Redbellied clerid	<i>Enoclerus sphegeus</i>
18	004	Unknown	<i>Formica rufa</i>
18	005	Western yellowjacket	<i>Vespula pennsylvanica</i>
19	000	General diseases	n / a
20	000	Biotic damage	n / a
20	001	Damping off	<i>n/a</i>
20	002	Gray mold	<i>Botrytis cinerea</i>
21	000	Root / butt diseases	n / a
21	001	Armillaria root disease	<i>Armillaria spp.</i>
21	004	Brown crumbly rot	<i>Fomitopsis pinicola</i>
21	007	White mottled rot	<i>Ganoderma applanatum</i>
21	008	Ganoderma rot of hardwoods	<i>Ganoderma lucidum</i>
21	009	Ganoderma rot of conifers	<i>Ganoderma tsugae</i>
21	010	Annosus root disease	<i>Heterobasidion annosum</i>
21	012	Tomentosus root disease	<i>Inonotus tomentosus</i>

Category	Agent	Common Name	Scientific Name
21	013	Charcoal root rot	<i>Macrophomina phaseolina</i>
21	014	Black stain root disease	<i>Ophiostoma wagneri</i>
21	015	Schweinitzii butt rot	<i>Phaeolus schweinitzii</i>
21	018	Phytophthora root rot	<i>Phytophthora cinnamomi</i>
21	022	Pythium root rot	<i>Pythium spp.</i>
21	024	Crown gall	<i>Agrobacterium tumefaciens</i>
21	027	Brown cubical rot	<i>Laetiporus sulphureus</i>
22	000	Stem decays/cankers	n/a
22	006	Black knot of cherry	<i>Apiosporina morbosa</i>
22	007	Atropellis canker	<i>Atropellis piniphila</i>
22	012	Black canker of aspen	<i>Ceratocystis fimbriata</i>
22	025	Cryptosphaeria canker of aspen	<i>Cryptosphaeria populina</i>
22	026	Cytospora canker of fir	<i>Cytospora abietis</i>
22	028	Rust-red stringy rot	<i>Echinodontium tinctorium</i>
22	029	Sooty-bark canker	<i>Encoelia pruinosa</i>
22	034	Scleroderris canker	<i>Gremmeniella abietina</i>
22	035	Amelanchier rust	<i>Gymnosporangium harknessianum</i>
22	036	Cedar apple rust	<i>Gymnosporangium juniper-virginianae</i>
22	038	Hypoxylon canker of aspen	<i>Hypoxylon mammatum</i>
22	047	Red ring rot	<i>Phellinus pini</i>
22	048	Aspen trunk rot	<i>Phellinus tremulae</i>
22	057	Cytospora canker of aspen	<i>Cytospora chrysosperma</i>
22	058	Dothichiza canker	<i>Dothichiza populae</i>
22	059	Red belt fungus	<i>Fomitopsis pinicola</i>

Category	Agent	Common Name	Scientific Name
22	060	Leucocytospora canker of spruce	<i>Leucocytospora kunzei</i>
22	061	Sooty bark canker	<i>Phialis singular</i>
22	064	Tinder fungus	<i>Fomes formntarius</i>
22	066	Pinyon black stain	<i>Leptographium wagnerii</i>
22	068	False tinder fungus	<i>Phellinus igniarius</i>
22	071	Oyster mushroom	<i>Pleurotus ostreatus</i>
22	074	Cedar brown pocket rot	<i>Poria serceomollis</i>
22	075	Lachnellula canker	<i>Lachnellula flavovirens</i>
22	076	Strumella canker	<i>Strumella coryneoidea</i>
22	077	Phomopsis blight	<i>Phomopsis juniperovora</i>
22	078	Fusarium canker of yellow poplar	<i>Fusarium solani</i>
22	079	Sterile conk of maple and beech	<i>Inonotus glomeratus</i>
22	080	Canker of spruce	<i>Aleurodiscus spp.</i>
22	081	Birch conk	<i>Piptoporus betulinusai</i>
22	082	Canker	<i>Discocainia treleasei</i>
23	000	Parasitic	Epiphytic plants
23	005	White fir dwarf mistletoe	<i>Arceuthobium abietinum f. sp. Concoloris</i>
23	006	Lodgepole pine dwarf mistletoe	<i>Arceuthobium americanum</i>
23	008	Western dwarf mistletoe	<i>Arceuthobium compylopodum</i>
23	009	Limber pine dwarf mistletoe	<i>Arceuthobium cyanocarpum</i>
23	010	Pinyon dwarf mistletoe	<i>Arceuthobium divaricatum</i>
23	011	Douglas-fir dwarf mistletoe	<i>Arceuthobium douglasii</i>
23	013	Larch dwarf mistletoe	<i>Arceuthobium laricis</i>
23	017	Southwestern dwarf mistletoe	<i>Arceuthobium vaginatum subsp. Cryptopodum</i>

Category	Agent	Common Name	Scientific Name
23	021	Red fir dwarf mistletoe	<i>Arceuthobium abietinum f. sp. Pauciflorum</i>
23	022	Juniper true mistletoe	<i>Phoradendron junipeum</i>
24	000	Decline complexes / dieback / wilts	n / a
24	004	Ash decline/yellows	<i>n/a</i>
24	011	Larch decline	<i>n/a</i>
24	017	True fir pest complex	<i>n/a</i>
24	018	Western X disease	<i>n/a</i>
24	019	Pinewood nematode	<i>Bursaphelenchus xylophilus</i>
24	030	Elm phloem necrosis	<i>Mycoplasma</i>
25	000	Foliage diseases	n / a
25	009	True fir needlecast	<i>n/a</i>
25	011	Cercospora blight of juniper	<i>Cercospora sequoia</i>
25	014	Ink spot of aspen	<i>Ciborinia whetzellii</i>
25	015	Pine needle rust	<i>Coleosporium spp.</i>
25	022	Elytroderma disease	<i>Elytroderma deformans</i>
25	027	Brown felt blight	<i>Herpotrichia juniper</i>
25	029	Hardwood anthracnose	<i>Kabatiella apocrypta</i>
25	031	Spruce needle cast	<i>Lirula macrospora</i>
25	033	White pine needle cast	<i>Lophodermella arcuata</i>
25	034	Lophodermella needle cast	<i>Lophodermella spp.</i>
25	035	Lophodermium needle cast	<i>Lophodermium spp.</i>
25	036	Marssonina blight	<i>Marssonina populi</i>
25	037	Melampsora rusts	<i>Melampsora medusa</i>
25	039	Larch needle cast	<i>Meria laricis</i>

Category	Agent	Common Name	Scientific Name
25	040	Dothistroma needle blight	<i>Mycosphaerella pini</i>
25	041	Brown felt blight of pines	<i>Neopeckia coulteri</i>
25	042	Snow blight	<i>Phacidum abietis</i>
25	050	Douglas-fir needle cast	<i>Rhabdocline spp.</i>
25	055	Septoria leaf spot	<i>Septoria alnifolia</i>
25	056	Septoria leaf spot and canker	<i>Septoria musiva</i>
25	057	Sirococcus tip blight	<i>Sirococcus conigenus</i>
25	058	Diplodia blight	<i>Sphaeropsis sapinea</i>
25	059	Leaf blister of oak	<i>Taphrina caerulescens</i>
25	060	Venturia leaf blight of maple	<i>Venturia acerina</i>
25	061	Shepherd's crook	<i>Venturia tremulae</i>
25	062	Dothistroma needle blight	<i>Dothistroma septospora</i>
25	064	Broom rust	<i>Chrysomyxa arctostaphyli</i>
25	065	Spruce needle rust	<i>Lophodermium picea</i>
25	067	Spruce needle cast	<i>Lophodermium picea</i>
25	068	Hardwood leaf rust	<i>Rhizosphaera pini</i>
25	071	Spruce needle cast	<i>Rhizosphaera pini</i>
25	073	Shepards crook	<i>Ventirua populina</i>
25	074	Delphinella shoot blight	<i>Delphinella abietis</i>
25	075	Tar spot	<i>Rhytisma acerinum</i>
26	000	Stem rusts	n/a
26	001	White pine blister rust	<i>Cronartium ribicola</i>
26	002	Western gall rust	<i>Peridermium harknessii</i>
26	003	Stalactiform blister rust	<i>Cronartium coleosporioides</i>
26	004	Comandra blister rust	<i>Cronartium comandrae</i>

Category	Agent	Common Name	Scientific Name
26	005	Pinyon blister rust	<i>Cronartium occidentale</i>
26	011	Bethuli rust	<i>Peridermium bethuli</i>
26	012	Limb rust	<i>Peridermium filamentosum</i>
26	013	Southern cone rust	<i>Cronartium strobilinum</i>
27	000	Broom rusts	n / a
27	001	Spruce broom rust	<i>Chrysomyxa arctostaphyll</i>
27	002	Incense cedar broom rust	<i>Gymnosporangium libocedri</i>
27	003	Juniper broom rust	<i>Gymnosporangium nidus-avis</i>
27	004	Fir broom rust	<i>Melampsorella caryophyllacearum</i>
30	000	Fire	n / a
30	031	Wild-fire	<i>n/a</i>
30	032	Human caused fire	<i>n/a</i>
30	033	Crown fire damage	<i>n/a</i>
30	034	Ground fire damage	<i>n/a</i>
40	000	Animal damage, source unknown	n / a
41	000	Wild animals	n / a
41	001	Bear	<i>n/a</i>
41	002	Beaver	<i>n/a</i>
41	003	Big game (deer)	<i>n/a</i>
41	004	Mice or voles	<i>n/a</i>
41	005	Pocket gophers	<i>n/a</i>
41	006	Porcupines	<i>n/a</i>
41	007	Rabbits or hares	<i>n/a</i>
41	008	Sapsucker	<i>n/a</i>

Category	Agent	Common Name	Scientific Name
41	009	Squirrels	<i>n/a</i>
41	010	Woodpeckers	<i>n/a</i>
41	011	Moose	<i>n/a</i>
41	012	Elk	<i>n/a</i>
41	013	Deer	<i>n/a</i>
41	014	Feral pigs	<i>n/a</i>
41	015	Mountain beaver	<i>n/a</i>
41	016	Deer or elk	<i>n/a</i>
41	017	Earthworm	<i>Lumbricidae</i>
42	000	Domestic animals	n / a
42	001	Cattle	<i>n/a</i>
42	002	Goats	<i>n/a</i>
42	003	Horses	<i>n/a</i>
42	004	Sheep	<i>n/a</i>
50	000	Abiotic damage	n / a
50	001	Air pollutants	<i>n/a</i>
50	002	Chemical	<i>n/a</i>
50	003	Drought	<i>n/a</i>
50	004	Flooding/high water	<i>n/a</i>
50	005	Frost	<i>n/a</i>
50	006	Hail	<i>n/a</i>
50	007	Heat	<i>n/a</i>
50	008	Lightning	<i>n/a</i>
50	009	Nutrient imbalances	<i>n/a</i>
50	010	Radiation	<i>n/a</i>

Category	Agent	Common Name	Scientific Name
50	011	Snow/ice	<i>n/a</i>
50	013	Wind-tornado	<i>n/a</i>
50	014	Winter injury	<i>n/a</i>
50	015	Avalanche	<i>n/a</i>
50	016	Mud-land slide	<i>n/a</i>
50	017	Volcano	<i>n/a</i>
50	018	Other geologic events	<i>n/a</i>
50	019	Mechanical (non-human caused)	<i>n/a</i>
60	000	Competition	n / a
70	000	Human activities	n / a
70	001	Herbicides	<i>n/a</i>
70	003	Imbedded objects	<i>n/a</i>
70	004	Improper planting technique	<i>n/a</i>
70	005	Land clearing	<i>n/a</i>
70	006	Land use conversion	<i>n/a</i>
70	007	Logging damage	<i>n/a</i>
70	008	Mechanical	<i>n/a</i>
70	009	Pesticides	<i>n/a</i>
70	010	Roads	<i>n/a</i>
70	011	Soil compaction	<i>n/a</i>
70	012	Suppression	<i>n/a</i>
70	013	Vehicle damage	<i>n/a</i>
70	014	Road salt	<i>n/a</i>
71	000	Harvest	n / a
80	000	Multi-damage (insect / disease)	n / a

Category	Agent	Common Name	Scientific Name
80	001	Aspen defoliation	<i>n/a</i>
80	002	Subalpine fir mortality	<i>n/a</i>
80	004	Pinion pine decline	<i>n/a</i>
90	000	Unknown	n / a
99	000	Physical effects	n / a
99	001	Broken or top missing	<i>n/a</i>
99	002	Dead top	<i>n/a</i>
99	003	Limby (large limbs top to ground)	<i>n/a</i>
99	004	Forked top	<i>n/a</i>
99	005	Forked below merch top	<i>n/a</i>
99	006	Crook or sweep	<i>n/a</i>
99	007	Checks, bole cracks	<i>n/a</i>
99	008	Foliage discoloration	<i>n/a</i>
99	009	Mortality (for plantation surveys only)	<i>n/a</i>
99	010	Lack of seed source or dieback (for plantation surveys only)	<i>n/a</i>
99	011	Poor planting stock (for plantation surveys only)	<i>n/a</i>
99	012	Poor growth/fading/foliage is yellowing and loss of needles is occurring	<i>n/a</i>
99	013	Total board foot volume loss	<i>n/a</i>
99	014	Total cubic foot volume loss	<i>n/a</i>
99	015	Bark removal	<i>n/a</i>
99	016	Foliage loss	<i>n/a</i>
99	017	Sunscauld	<i>n/a</i>
99	018	Uproot	<i>n/a</i>

Category	Agent	Common Name	Scientific Name
99	019	Scorched foliage	<i>n/a</i>
99	020	Scorched bark	<i>n/a</i>
99	021	Dieback (for plantation surveys only)	<i>n/a</i>
99	022	Poor crown form	<i>n/a</i>
99	023	Severe forking	<i>n/a</i>
99	026	Open wound	<i>n/a</i>
99	031	Broken or dead branches	<i>n/a</i>
99	033	Damaged shoots, buds, or foliage (for plantation surveys only)	<i>n/a</i>
99	034	Excessively deformed sapling	<i>n/a</i>
99	036	Fire scar	<i>n/a</i>
99	037	Leaning tree	<i>>15% and self-supporting</i>
99	038	Charred bark	<i>Not recorded unless cambium is killed from heating</i>

DAMAGE SEVERITY RATINGS

Table 44: Damage severity rating codes

Category	Severity	Description
10	n / a	General insects
10	1	Minor: bottlebrush or shortened leaders, 0-2 forks on stem, OR <20% of branches affected, OR <50% of bole with visible larval galleries
10	2	Severe: 3 or more forks on bole, OR 20% or more branches affected, OR terminal leader dead, OR 50% or more of bole with visible larval galleries
11	n / a	Bark beetles

Category	Severity	Description
11	1	Unsuccessful bole attack: pitchout and beetle brood absent
11	2	Strip attacks: galleries and brood present
11	3	Successful current bole attack
11	4	Topkill
11	5	Successful attack last year
11	6	Older dead
12	n / a	Defoliators
12	1	Light defoliation (1-25%), no topkill
12	2	Light defoliation (1-25%), topkill $\leq 10\%$
12	3	Light defoliation (1-25%), topkill $> 10\%$
12	4	Moderate defoliation (26-75%), no topkill
12	5	Moderate defoliation (26-75%), topkill $\leq 10\%$
12	6	Moderate defoliation (26-75%), topkill $> 10\%$
12	7	Heavy defoliation (76-100%), no topkill
12	8	Heavy defoliation (76-100%), topkill $\leq 10\%$
12	9	Heavy defoliation (76-100%), topkill $> 10\%$
13	n / a	Chewing insects
13	1	Minor: bottlebrush or shortened leaders, 0-2 forks on stem, OR $< 20\%$ of branches affected
13	2	Severe: 3 or more forks on bole, OR 20% or more branches affected, OR terminal leader dead
14	n / a	Sucking insects
14	1	Minor: bottlebrush or shortened leaders, 0-2 forks on stem, OR $< 20\%$ of branches affected
14	2	Severe: 3 or more forks on bole, OR 20% or more branches affected, OR terminal leader dead

Category	Severity	Description
15	n / a	Boring insects
15	1	Minor: bottlebrush or shortened leaders, 0-2 forks on stem, OR <20% of branches affected
15	2	Severe: 3 or more forks on bole, OR 20% or more branches affected, OR terminal leader dead
16	n / a	Seed / cone / flower / fruit insects
16	1	Minor
16	2	Severe
17	n / a	Gallmaker insects
17	1	Minor
17	2	Severe
18	n / a	Insect predators
18	1	Minor
18	2	Severe
19	n / a	General diseases
19	1	Minor
19	2	Severe
20	n / a	Biotic damage
20	1	Minor
20	2	Severe
21	n / a	Root / butt diseases
21	1	(for individual trees) Tree within 30 feet of tree with deteriorating crown, tree with diagnostic symptoms or signs, or tree killed by root disease
21	2	(for individual trees) Pathogen (sign) or diagnostic symptom detected – no crown deterioration

Category	Severity	Description
21	3	(for individual trees) Crown deterioration detected – no diagnostic symptom or signs
21	4	(for individual trees) Both crown deterioration and diagnostic signs symptoms detected
21	5	(for individual trees) Bleeding present on bole
21	6	(for individual trees) Bleeding present on bole and adjacent mortality present
21	7	(for individual trees) Laboratory confirmed Sudden Oak Death
21	G2	(for setting level) Minor evidence of RDS on plot
21	G3	(for setting level) RDS present, canopy reduction less than 20%
21	G4	(for setting level) RDS present, canopy reduction 20-30%
21	G5	(for setting level) RDS present, canopy reduction 30-50%
21	G6	(for setting level) RDS present, canopy reduction 50-75%, most ground area infested
21	G7	(for setting level) RDS present, 76+ % canopy reduction
21	G8	(for setting level) Entire area infested with RDS, one or very few susceptible overstory trees
21	G9	(for setting level) Entire area infested with RDA, no susceptible overstory trees present
22	n / a	Stem decay/canker
22	0	0-4% rotten
22	1	5-15% rotten
22	2	16-25% rotten
22	3	26-35% rotten
22	4	36-45% rotten
22	5	46-55% rotten

Category	Severity	Description
22	6	56-65% rotten
22	7	66-75% rotten
22	8	76-85% rotten
22	9	86-100% rotten
23	n / a	Parasitic / epiphytic plants
23	1	Hawksworth tree DMR rating = 1; light infection
23	2	Hawksworth tree DMR rating = 2; light infection
23	3	Hawksworth tree DMR rating = 3; medium infection
23	4	Hawksworth tree DMR rating = 4; medium infection
23	5	Hawksworth tree DMR rating = 5; heavy infection
23	6	Hawksworth tree DMR rating = 6; heavy infection
23	7	Vine damage: less than 50% of crown involved
23	8	Vine damage: 50% or more of crown involved
24	n / a	Decline complexes / diebacks / wilts
24	1	Minor: minor crown symptoms
24	2	Severe: severe crown symptoms
25	n / a	Foliage diseases
25	1	Minor: <20% of foliage affected or <20% of crown in brooms
25	2	Severe: >20% of foliage affected or >20% of crown in brooms
26	n / a	Rust Stems
26	1	Branch infections located greater than 2 feet from tree bole

Category	Severity	Description
26	2	Branch infections located between 6 inches and 2 feet from tree bole
26	3	Bole infections or branch infections located within 6 inches of bole
26	4	Topkill
27	n / a	Broom rusts
27	1	Minor: <20% of crown in brooms
27	2	Severe: >20% of crown in brooms
30	n / a	Fire
30	1	Minor: <20% of crown affected
30	2	Severe: >20% of crown affected or any damage to the bole
40	n / a	Animal damage, source unknown
40	1	Minor
40	2	Severe
41	n / a	Wild animals
41	1	Minor: <20% of crown affected, bole damage is <50% circumference
41	2	Severe: >20% of crown affected, bole damage is >50% circumference, upper 1/3 of crown is killed
41	5	Earthworms are present
41	6	Earthworms are absent
50	n / a	Abiotic damage
50	1	Minor: <20% of crown affected, bole damage is <50% circumference
50	2	Severe: >20% of crown affected, bole damage is >50% circumference, upper 1/3 of crown is killed

Category	Severity	Description
60	n / a	Competition
60	1	Minor: tree slightly deformed and has some lie, terminal growth
60	2	Severe: tree extremely deformed or has no live terminal, growth severely reduced relative to neighbors
70	n / a	Human activities
70	1	Minor
70	2	Severe
71	n / a	Harvest
71	1	Minor
71	2	Severe
80	n / a	Multi-damage (insect / disease)
80	1	Minor
80	2	Severe
90	n / a	Unknown
90	0	0 – 9% affected
90	1	10 – 19% affected
90	2	20 – 29% affected
90	3	30 – 39% affected
90	4	40 – 49% affected
90	5	50 – 59% affected
90	6	60 – 69% affected
90	7	70 – 79% affected
90	8	80 – 89% affected
90	9	90 – 100% affected

Category	Severity	Description
99	n / a	Physical effects
99	001	Broken top
99	002	Dead top

Table 45: Category 99 damage severity rating codes

Category	Severity	Description	Actual percent of tree affected
99	n / a	Physical effects	n / a
99	001	Broken top	% of original height that is missing; for example, if a tree was originally 100 feet high, but 15 feet of the top is broken or missing; enter "15" in the severity code
99	002	Dead top	% of total tree height that is dead
99	003	Limby (large limbs top to bottom)	% of total tree height with many limbs/knots
99	004	Forked top	% of total tree height above fork
99	005	Forked below merch top	% of the total length of the bole affected
99	006	Crook or sweep	% of total tree height, which contains the crook or sweep
99	007	Checks, bole cracks	% of total tree height, which contains a crack or check
99	008	Foliage discoloration	% of foliage discolored
99	009	Mortality	1 = dead tree
99	010	Lack of seed source	If present, 100%
99	011	Poor planting stock source	If present, 100%
99	012	Poor growth	1 = minor (reduced growth); 2 = severe (affecting survival)
99	013	Total board foot volume loss	%of total board foot volume loss

Category	Severity	Description	Actual percent of tree affected
99	014	Total cubic foot volume loss	% of total cubic foot volume loss
99	015	Bark removal	% of tree circumference missing bark
99	016	Foliage loss	1 = minor; 2 = severe
99	017	Sunscald	1 = minor; 2 = severe
99	018	Uproot	1 = uprooted
99	019	Scorched foliage	% of foliage scorched
99	020	Scorched bark	% of bark scorched
99	021	Dieback source	1 = minor; 2 = severe
99	022	Poor crown form	1 = minor; 2 = severe
99	023	Severe forking	% of bole with forks
99	026	Open wound	% of bole or trunk affected using the height and width of the wound; for example, if a tree is 100 feet tall and the wound covers 15 feet of the bole, enter a value of "15"
99	031	Broken or dead branches	% of branches broken or dead
99	033	Damage shoots, buds, or foliage source	1 = minor; 2 = severe
99	034	Excessively deformed sapling	% of sapling deformed
99	036	Fire scar	% of bole covered by fire scar
99	037	Leaning tree	% lean from vertical
99	038	Charred bark	Not recorded unless cambium is killed from heating

TREE PARTS

Table 46: Tree part codes

Code	Description
UN	Unspecified
TO	Top
FO	Foliar (crown)
LI	Limb
BO	Bole, other than Top or Base
BA	Base
RO	Roots
WT	Whole tree
TT	Top third of crown
MT	Middle third of crown
BT	Bottom third of crown

APPENDIX L: ACCURACY STANDARDS

Table 47: Settings Measurements

Field	Tolerance
Project Name	No errors
Region	No errors
Proclaimed Forest	No errors
District	No errors
Location	No errors
Stand Number	No errors
Ownership	No errors

Field	Tolerance
State	No errors
County	No errors
Administrative Forest	No errors
Date	No errors
Photo ID	No errors
Exam Level	No errors
Exam Purpose	No errors
Stratum	No errors
Existing Vegetation Composition Type	No errors
Potential Vegetation Reference	No errors
Potential Vegetation	No errors
Structure	No errors
Capable Growing Area	± 10 percent
Fuel Model	No errors
Elevation	± 2 contour intervals
Aspect	± 45 degrees
Slope	± 10 percent
Slope Position	± 1 class
Acres	No errors
Radial Growth Interval	No errors
Radial Growth Interval #2	No errors
Height Growth Interval	No errors
Fuel Photo Reference	No errors
Precision Protocol	No errors
Examiner	No errors

Field	Tolerance
Stand Remarks	No errors
Damage Category	No errors
Damage Agent	No errors
Damage Severity	No errors
Species of Management Interest	No errors
Sketch Map and Traverse Notes	n/a

Table 48: Sample Design Criteria

Field	Tolerance
Form Type	n/a
Selection Method Type	No errors
Sample Expansion Factor	No errors
Plots Installed	No errors
Sub-population Filter	No errors
Starting Azimuth	No errors
Sample Design Remarks	No errors
Selection Criteria Number	No errors
Sub-pop Variable	No errors
Sub-pop Minimum Value	No errors
Sub-pop Maximum Value	No errors

Table 49: Plot Data

Field	Tolerance
Plot Number	No errors
Plot Latitude	No errors
Plot Longitude	No errors

Field	Tolerance
Capable Grow Area	± 10 percent
Plot Aspect	± 45
Plot Scope	± 10 percent
Slope Position	± 1 class
Slope Horizontal Shape	± 1 class
Slope Vertical Shape	± 1 class
Plot Elevation	± 2 contour intervals
Existing Vegetation	No errors
Potential Vegetation	Accurate to series understory union and phases
Plot History	No errors
Plot History Date	Year required in field 12 is other than code 10 or blank
Fuel Model	No errors
Residual Descriptive Code	No errors
Distance to Seed Wall	± 100 feet
Plot Remarks	n/a

Table 50: Tree Data

Field	Tolerance
Plot Number	No errors
Tag ID Number	No errors
Tree Status	No errors allowed in recognizing and coding down trees
Site/Growth Trees	No errors
Tree Species	No errors
Tree Count	See specifics in Table 51

Field	Tolerance
Number Stems	No errors
DBH/DRC Intensive Exam	See specifics in Table 52
DBH/DRC Extensive Exam	See specifics in Table 53
DBH/DRC Quick Exam	See specifics in Table 54
Height	10 percent
Height to Crown	10 percent
Radial Growth	1/20 th inch
Radial Growth #2	1/20 th inch
Height Growth	See specifics in Table 55
Tree Age	10 percent (based on actual tree ring count at breast height for trees ≥ 3.0" DBH otherwise based on total age recorded)
Crown Ratio	10 percent
Crown Class	No errors
Crown Width	No errors
Wildlife Use	No errors
Log/Snag Decay	No errors
Cone Serenity	No errors
Damage Category	No errors, specifics listed in Table 56
Damage Agent	No errors
Damage Part	No errors
Damage Severity	No errors
Tree Remarks	n/a

Table 51: Tree Data, Tree Count

Height Range	Diameter Range	Trees on Point	Tolerance
*All	All	0	0 trees
≤ 0.5 feet	All	1-5	± 2 trees
≤ 0.5 feet	All	6+	± 50 percent
> 0.5 feet	< 0.5 in.	1-5	± 1 tree
> 0.5 feet	< 0.5 in.	6+	± 20 percent
All	.5" – breakpoint DBH	1-5	± 1 tree
All	.5" – breakpoint DBH	6+	± 10 percent
All	Breakpoint DBH +	1+	0 trees

* There is no tolerance for recording a tree when none are actually present in any of the above size classes. The recording of a fixed plot tree when none are present will result in a single discrepancy. The recording of a variable plot tree when none are present will result in an unacceptable unit.

Group criteria are standardized to facilitate stand exam contract inspection and payment. However, distinguishing characteristics other than tree class, species, and size class may warrant individual tree recording or more refined grouping criteria. Such characteristics include: age, crown ratio, crown class, or incident of damage.

Table 52: Tree Data, DBH/DRC Intensive Exam

Tolerance	Diameter
No errors	<.5 inch
± .1 inch	.5 inch – 13.9 inches
± .2 inch	14.0 inches – 23.9 inches
± .3 inch	24.0 inches – 34.9 inches
± .5 inch	35.0 inches +
± .1 inch	Borderline variable plot trees
± .1 inch	Estimated DRC

Table 53: Tree Data, DBH/DRC Extensive Exam

Tolerance	Diameter
± 1 inch	≤ 20 inches
± 5% of diameter	> 20 inches

Table 54: Tree Data, DBH/DRC Quick Exam

Tolerance	Diameter
± 2 inches	≤ 20 inches
± 10% of diameter	> 20 inches

Table 55: Tree Data, Height Growth

Tolerance	Diameter
± 1 foot	Trees > 6 feet
± 0.1 foot	Trees ≤ 6 feet

Table 56: Tree Data, Damage Category

Damage Category	Damage Category Description	Tolerance
11	Bark Beetles	No misses on live trees with a severity of 2 or greater
12	Defoliators	No misses on live trees with a severity of 3 or greater
13-17	Other Insects	No misses of shoot moths or weevils on live trees
21	Root/Butt Diseases	No misses on live trees with a severity of 2 or greater
22	Stem Decays/Cankers	No misses on live trees with a severity of 3 or greater
25	Foliage Diseases	No misses on Elytroderma on live trees

Damage Category	Damage Category Description	Tolerance
41-42	Animal Damage	No misses on live trees with terminal leader damage or with greater than $\frac{1}{4}$ of bole circumference affected
50	Abiotic Damage	No misses on wind, snow, or ice bending, breakage, or bole cracks and frost damage to shoots on trees less than 1-inch diameter and lightning
70	Human Damage	No misses on live trees for logging damage or fire if the damage affects greater than $\frac{1}{4}$ of the bole circumference or if an open wound is in contact with the ground

Table 57: Ground Surface Cover

Field	Tolerance
Plot Number	No errors
Cover Type	No errors
Cover Percent	± 10 percent

Table 58: Vegetation Composition

Field	Tolerance
Plot Number	No errors
Live/Dead	No errors
Layer	No errors
Life form	No errors
Species	No error in species-level identification for dominant, common, or community type indicator plants; no plant name can be repeated within a layer
Minimum Height	± 10 percent of height

Field	Tolerance
Average Height	± 10 percent of height
Maximum Height	± 10 percent of height
Canopy Cover	± 10 percent
Average Diameter	No errors
Maturity	No errors
Cover Remarks	n/a
User Field	n/a

Table 59: Down Woody

Field	Tolerance
Plot Number	No errors
First Duff	± ½ inch
Second Duff	± ½ inch
Fuel Depth	No errors
Twigs 0 – .24	± 40 percent
Twigs .25 - .99	± 30 percent
Twigs 1.0 – 2.99	± 20 percent
Volume 1	n/a
Weight 1	n/a
Volume 2	n/a
Weight 2	n/a
Volume 3	n/a
Weight 3	n/a
Volume 4	n/a
Weight 4	n/a
Piece Count	No missed pieces

Field	Tolerance
Decay Class	No errors
Diameter	± 1 inch on measurements
Piece Length	No errors

APPENDIX M: GLOSSARY OF TERMS

Table 60: Glossary

Term	Definition
Aspect	A position facing or commanding a given direction; exposure. Aspect is the compass direction of the prevailing slope with respect to true north.
Azimuth	A horizontal angular measure from true north to an object of interest.
Basal Area	The cross-sectional area of the stem or stems of a plant or of all plants in a stand; generally expressed as square units per unit area. For trees, measured at 4.5 feet above ground; forbs and grasses are measure at the root crown
Bole Length	The straight-line distance measured parallel to the main bole of a tree, from its base to its tip.
Breast Height	A point located on the uphill side of the main stem, by measuring 4.5 feet along the uphill side of the bole from ground level or the predominant root collar. Preclude slight, non-compacted litter accumulations when establishing breast height.
CALVEG	Classification and Assessment with LANDSAT of Visible Ecological Groupings. It is a California-wide system for classifying vegetative and non-vegetative cover types. The primary cover type relates to life form and uses a 3-character alpha code.
Canopy Cover	The percent of a fixed area covered by the crown of an individual plant species or delimited by the vertical projection of its outermost perimeter; small openings in the crown are included.

Term	Definition
Compacted Live Crown Ratio	The percent of the total height of the tree that supports a full, live crown. For trees that have uneven length crowns, occularly transfer lower branches to fill holes in the upper portions of the crown, until a full, even crown is created.
Compartment	A land area, usually between 3,000 and 8,000 acres, easily identified on the ground by physical features. A compartment tis comparable in size to a sub-watershed, or landscape management unit. It is used as a convenience for maintaining stand records and planning vegetation management projects.
Crown Class	The relative position of the tree or shrub crown with respect to the competing vegetation around it. Crown class for each tree or shrub is judged in the context of its immediate environment, that is those trees or shrubs which are competing for sunlight with the subject tree or shrub.
Crown Length	The vertical distance from the top of the leader to the base of the crown, measured to the lowest live branch-whorl with live branches in at least three quadrants, and continuous with the main crown.
Crown Ratio	The ratio of compacted live crown length to bole length. Lengths are measured parallel to the bole from the base of the tree to the tip.
DEM	Digital Elevation Model. USGS geographic elevation data distributed in raster form. Digital representation of the shape of the earth's surface. Typically, digital elevation data consists of arrays of values that represent topographic elevations measured at equal intervals on the Earth's surface.
Diameter	The length of a straight-line segment passing through the center of an item and terminating at its periphery.
Diameter at Breast Height (DBH)	A measure at breast height (4.5 feet), outside bark, of the tree bole, perpendicular to the tree bole.
Diameter at Root Collar (DRC)	The straight line passing through the center of a cross section of a bole measured at the root collar of a shrub or tree.
Down Log	Stem material (conifer or hardwood) that is lying on the ground. If a stem material is leaning more than 45 degrees from vertical, is not self-supporting, and/or in contact with the ground, it is considered a down log.

Term	Definition
Down Woody Material	Woody pieces of trees and shrubs that have been uprooted (no longer supporting growth) or severed from their root system, not self-supporting, and are lying on the ground.
Duff Layer	Duff is the fermentation and humus layer of the forest floor. It does not include the freshly cast material in the litter layer. The top of the duff is where needles, leaves, and other cast-off vegetative material have noticeably begun to decompose. Individual particles usually will be bound by fungi mycelium. When moss is present, the top of the duff is just below the green portion of the moss. The bottom of the duff is the start of the soil ("A" horizon).
Elevation	Vertical distance from a datum, usually mean sea level, to a point or object on the earth's surface. Not to be confused with altitude, this refers to points above the earth's surface.
Fuel Bed	The fuel bed is accumulation of dead, woody residue on the forest floor. It begins at the top of the duff layer and above. It includes litter, dead limb wood, and bole wood from tree species, as well as dead material from shrub, herbaceous, and grass species.
Fuel Model	Mathematical descriptions of fuel properties (e.g., fuel load and fuel depth) that are used as inputs to calculations of fire danger indices and fire behavior potential.
GPS	Global Positioning System. A network of radio-emitting satellites deployed by the U.S. Department of Defense. Ground-based GPS receivers can automatically derive accurate surface coordinates for all kinds of GIS, mapping, and surveying data collection.
Ground Level	The forest floor, made up by soil and duff layer. It does not include unincorporated woody debris that may rise above the ground line. In reference to a point of measure, it is the highest point of the ground touching the base of the object being referenced.
Group Tally	A count of one or more items of the same type or species and recorded as a single line entry.
Growth	A measure of the increase in growth layers for a specified time frame.
Height Growth	The increase in height over a set period of time.

Term	Definition
Intersect Diameter	Measurement of diameter at a point where the sampling plane intersects the geometric center of the object being tallied. No adjustment is made for stem irregularities at the point of intersection.
Lean (Tree)	The deflection from vertical, > 15 degrees of a straight line passing through the geometric center of the base and top of the main stem.
Length	The measurement of the extent of something along its greatest dimension.
Life Form	Species and individuals that are grouped into classes on the basis of their similarities in structure and function. A growth form that displays an obvious relationship to important environmental factors.
Limiting Distance	A comparative measurement between the subplot radius and the distance from the subplot center to the center of the object. The comparison is used to determine whether the object is in or out of the fixed area subplot. The object is "IN" if the measured distance is equal to or less than the subplot radius. The object is "OUT" if the measured distance is greater than the subplot radius.
Live Crown Length	The straight-line distance measured parallel to the main bole of a tree, from the top of the live crown to the base of the live crown.
Ownership	The identification of the legal owner/administrator on both the surface and subsurface estates.
Plant Species	The major subdivision of a genus or subgenus of a plant being described or measured.
Plot Configuration	The size and shape of the sampling unit (plot) and the spatial arrangement of subplots within that unit.
Plot	A sub-sample of a plot or stand exam. This is the unit on which data are recorded to individual trees, snags, logs, understory vegetation, and fuels. Data can be collected on either a fixed area or variable radius area.
Proclaimed Forest	Units of the National Forest System as originally proclaimed or designated by Congress.
Quadratic Mean Diameter	The diameter of the tree of average basal area.

Term	Definition
Radial Growth Increment	The increase in tree radius over a period of time at breast height, or occasionally at the base.
Random Sample	Any method of sample selection based on the theory of probability (degree of certainty). At any stage of the operation of selection, the probability of any set of units being selected must be known. It is the only method that can provide a measure of precision of the estimate.
Reconciliation Code	A code used to reflect the status of an individually tallied item with regards to previous surveys.
Slope	A deviation from the horizontal.
Species	A code that represents a fundamental category of taxonomic classification of an organism.
Stand	A spatially continuous group of trees and associated vegetation having similar structures and growing under similar soil and climatic conditions.
Stand Exam Grid	Basic data collection method for stand exams. It consists of a set of plots, separated by equal distances on a grid pattern. The lines of the grid (transects) are oriented in cardinal directions. There is a predetermined distance between plots. The number of transects and grid plots will vary depending upon the size and shape of the stand.
Stratified Sample	A method of sampling forest resources where stands or polygons of similar properties are lumped into strata. This improves the efficiency of an inventory by reducing the variability within a given population. The less variability there is within a strata, the fewer samples will need to be taken to achieve a statistically valid result.
Stratum	A group of stands within a condition class; similar characteristics such as forest type, tree size class, and canopy density.
Stump	The woody base of a tree remaining in contact with the soil after the trunk or main stem has been severed at a point less than 4.5 feet above ground height (measured on the uphill side).
Tree	A woody perennial plant, typically large, with a single well-defined stem carrying a more or less definite crown.

Term	Definition
Tree Age	Total age of the above-ground stem of a tree (not age of the root stock or the total age from seed). Total age is usually the annual ring count to the pith of the tree at breast height plus an estimate of the number of years it took the tree to reach breast height.

APPENDIX N: FUEL MODELS

The original 13 fuel models are from “Aids to Determining Fuel Models for Estimating Fire Behavior,” Hal E. Anderson, INT-122, 1982. The remaining fuel models are from “Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model” by Joe H. Scott and Robert E. Burgan. RMRS – GTR-153. June 2005.

Table 61: Fuel Models

Fuel Model	Fuel Model Code	Fuel Model Name	Fuel Type	Model Set	Fuel 1-hr	Fuel 10-hr	Fuel 100-hr	Fuel Bed Depth
1	n/a	Short grass (1 foot)	Grass and grass-dominated	Original 13	0.74	0	0	1
2	n/a	Timber (grass and understory)	Grass and grass-dominated	Original 13	2	1	0.500	1
3	n/a	Tall grass (2.5 feet)	Grass and grass-dominated	Original 13	3.01	0	0	2.50
4	n/a	Chaparral (6 feet)	Chaparral and shrub fields	Original 13	5.01	4.010	2	6
5	n/a	Brush (2 feet)	Chaparral and shrub fields	Original 13	1	0.500	0	2
6	n/a	Dormant brush, hardwood slash	Chaparral and shrub fields	Original 13	1.50	2.500	2	2.50
7	n/a	Southern rough	Chaparral and shrub fields	Original 13	1.13	1.870	1.500	2.50

Fuel Model	Fuel Model Code	Fuel Model Name	Fuel Type	Model Set	Fuel 1-hr	Fuel 10-hr	Fuel 100-hr	Fuel Bed Depth
8	n/a	Closed timber litter	Timber litter	Original 13	1.50	1	2.500	0.20
9	n/a	Hardwood litter	Timber litter	Original 13	2.92	0.410	0.150	0.20
10	n/a	Timber (litter and understory)	Timber litter	Original 13	3.01	2	5.010	1
11	n/a	Light logging slash	Slash	Original 13	1.50	4.51	5.510	1
12	n/a	Medium logging slash	Slash	Original 13	4.01	14.03	16.53	2.30
13	n/a	Heavy logging slash	Slash	Original 13	7.01	23.04	28.05	3
91	NB1	Urban/ Developed	Non-burnable	Scott and Burgan	0	0	0	0
92	NB2	Snow/Ice	Non-burnable	Scott and Burgan	0	0	0	0
93	NB3	Agricultural	Non-burnable	Scott and Burgan	0	0	0	0
98	NB4	Open Water	Non-burnable	Scott and Burgan	0	0	0	0
99	NB5	Bare Ground	Non-burnable	Scott and Burgan	0	0	0	0
101	GR1	Short, Sparse Dry Climate Grass (Dynamic)	Grass	Scott and Burgan	0.10	0	0	0.40
102	GR2	Low Load, Dry Climate (Dynamic)	Grass	Scott and Burgan	0.10	0	0	1

Fuel Model	Fuel Model Code	Fuel Model Name	Fuel Type	Model Set	Fuel 1-hr	Fuel 10-hr	Fuel 100-hr	Fuel Bed Depth
103	GR3	Low Load, Very Coarse, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	0.10	0.40	0	2
104	GR4	Moderate Load, Dry Climate Grass (Dynamic)	Grass	Scott and Burgan	0.25	0	0	2
105	GR5	Low Load, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	0.40	0	0	1.50
106	GR6	Moderate Load, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	0.10	0	0	1.50
107	GR7	High Load, Dry Climate Grass (Dynamic)	Grass	Scott and Burgan	1	0	0	3
108	GR8	High Load, Very Coarse, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	0.50	1	0	4
109	GR9	Very High Load, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	1	1	0	5
121	GS1	Low Load, Dry Climate Grass-Shrub (Dynamic)	Grass-Shrub	Scott and Burgan	0.20	0	0	0.90
122	GS2	Moderate load, Dry Climate Grass-Shrub (Dynamic)	Grass-Shrub	Scott and Burgan	0.50	0.500	0	1.50
123	GS3	Moderate Load, Humid Climate Grass-Shrub (Dynamic)	Grass-Shrub	Scott and Burgan	0.30	0.250	0	1.80

Fuel Model	Fuel Model Code	Fuel Model Name	Fuel Type	Model Set	Fuel 1-hr	Fuel 10-hr	Fuel 100-hr	Fuel Bed Depth
124	GS4	High Load, Humid Climate Grass-Shrub (Dynamic)	Grass-Shrub	Scott and Burgan	1.90	0.300	0.100	2.10
141	SH1	Low Load, Dry Climate Shrub (Dynamic)	Shrub	Scott and Burgan	0.25	0.250	0	1
142	SH2	Moderate Load, Dry Climate Shrub	Shrub	Scott and Burgan	1.35	2.400	0.750	1
143	SH3	Moderate Load, Humid Climate Shrub	Shrub	Scott and Burgan	0.45	3	0	2.40
144	SH4	Low Load, Humid Climate Timber-Shrub	Shrub	Scott and Burgan	0.85	1.150	0.200	3
145	SH5	High Load, Dry Climate Shrub	Shrub	Scott and Burgan	3.60	2.100	0	6
146	SH6	Low Load, Humid Climate Shrub	Shrub	Scott and Burgan	2.90	1.450	0	2
147	SH7	Very High Load, Dry Climate Shrub	Shrub	Scott and Burgan	3.5	5.300	2.200	6
148	SH8	High Load, Humid Climate Shrub	Shrub	Scott and Burgan	2.05	3.400	0.850	3
149	SH9	Very High Load, Humid Climate Shrub (Dynamic)	Shrub	Scott and Burgan	4.50	2.450	0	4.40
161	TU1	Low Load, Dry Climate Timber-Grass-Shrub (Dynamic)	Timber - Understory	Scott and Burgan	0.20	0.900	1.500	0.60

Fuel Model	Fuel Model Code	Fuel Model Name	Fuel Type	Model Set	Fuel 1-hr	Fuel 10-hr	Fuel 100-hr	Fuel Bed Depth
162	TU2	Moderate Load, Humid Climate Timber-Grass-Shrub (Dynamic)	Timber - Understory	Scott and Burgan	0.95	1.800	1.250	1
163	TU3	Moderate Load, Humid Climate Timber-Grass-Shrub (Dynamic)	Timber – Understory	Scott and Burgan	1.10	0.150	0.250	1.30
164	TU4	Dwarf Conifer with Understory	Timber – Understory	Scott and Burgan	4.50	0	0	0.50
165	TU5	Very High Load, Dry Climate Timber-Shrub	Timber – Understory	Scott and Burgan	4	4	3	1
181	TL1	Low Load Compact Conifer Litter	Timber Litter	Scott and Burgan	1	2.200	3.600	0.20
182	TL2	Low Load Broadleaf Litter	Timber Litter	Scott and Burgan	1.40	2.300	2.200	0.200
183	TL3	Moderate Load Conifer Litter	Timber Litter	Scott and Burgan	0.50	2.200	2.800	0.30
184	TL4	Small Downed Logs	Timber Litter	Scott and Burgan	0.50	1.500	4.200	0.40
185	TL5	High Load Conifer Litter	Timber Litter	Scott and Burgan	1.15	2.500	4.400	0.60
186	TL6	Moderate Load Broadleaf Litter	Timber Litter	Scott and Burgan	2.40	1.200	1.200	0.30
187	TL7	Large Downed Logs	Timber Litter	Scott and Burgan	0.30	1.400	8.100	0.40

Fuel Model	Fuel Model Code	Fuel Model Name	Fuel Type	Model Set	Fuel 1-hr	Fuel 10-hr	Fuel 100-hr	Fuel Bed Depth
188	TL8	Long-Needle Litter	Timber Litter	Scott and Burgan	5.80	1.400	1.100	0.30
189	TL9	Very High Load Broadleaf Litter	Timber Litter	Scott and Burgan	6.65	3.300	4.150	0.60
201	SB1	Low Load Activity Fuel	Slash-Blowdown	Scott and Burgan	1.50	3	11	1
202	SB2	High Load Activity Fuel or Moderate Load Blowdown	Slash-Blowdown	Scott and Burgan	4.50	4.250	4	1
203	SB3	High Load Activity Fuel or Moderate Load Blowdown	Slash-Blowdown	Scott and Burgan	5.50	2.750	3	1.20
204	SB4	High Load Blowdown	Slash-Blowdown	Scott and Burgan	5.25	3.500	5.250	2.70

Table 62: Detailed Descriptions of the Fuel Models

Code	Detailed Description
1	Contains fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Generally less than one-third of the area contains shrubs or timber. Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations. Annual and perennial grasses are included in this fuel model.
2	Herbaceous material with litter and dead-down stem wood from the open shrub or timber overstory. Open shrub lands and pine stands or scrub oak stands that cover one-third to two-thirds of the area. Stand many include clumps and may include pinyon-juniper.
3	Stands are tall, averaging about three feet, but considerable variation may occur. Approximately one-third or more of the stand is considered dead and cured. May include cultivated grains that have not been harvested, tall prairie, and marshland grasses.

Code	Detailed Description
4	Stands of mature shrubs, 6 feet or more tall such as California mixed chaparral, the high pocosin along the east coast, the pine barrens of New Jersey, or the closed jack pine stands of the north-central states. Besides flammable foliage, stand may contain dead woody material. May contains a deep litter layer.
5	Shrubs are young with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead wood qualify: laurel, vine maple, alder, or even chaparral, manzanita, or chamise.
6	The shrubs are older, but not as tall as model 4, nor do they contain as much fuel as model 4. This model covers a broad range of shrub conditions: intermediate stands of chamise, chaparral, oak brush, low pocosin, Alaskan spruce taiga, and shrub tundra. May include hardwood slash that has been cured. Pinyon-juniper shrub lands may be represented.
7	Stands of shrubs are generally between 2 and 6 feet high. Palmetto-galliberry understory, with a pine overstory are typical. Low pocosin may be represented. Black spruce shrub combinations in Alaska may also be represented.
8	Contains closed canopy stands of short needle conifers or hardwoods that have leafed out. The compact litter layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present. Representative conifer types are white pine, lodgepole pine, spruce, fir, and larch.
9	Both long-needle conifer stands and hardwood stands, especially the oak-hickory types, are typical. Closed stands of long-needled pine like ponderosa, Jeffrey, red pines, or southern pine plantations are grouped in this model. May contain concentrations of dead-down woody material.
10	Dead-down fuels include quantities of 3-inch or larger limb wood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Any forest type may be considered if heavy down material is present; examples are insect- or disease-ridden stands, wind thrown stands, over-mature situations with deadfall, and aged light thinning or partial cut slash.
11	Contains slash and herbaceous material intermixed with slash. Light partial cuts or thinning operations in mixed conifer stands, hardwood stands, and southern pine harvests are considered. Clearcuts generally produce more slash than represented here. The less than 3-inch material load is less than 12 tons per acre. The greater than 3 inch is represented by not more than 10 pieces, 4 inches in diameter, along a 60 foot transect.
12	The visual impression is dominated by slash and much of it is less than 3 inches in diameter. The fuels are well distributed. Heavily thinned conifer stands, clearcuts, and medium or heavy partial cuts are represented. The material larger than 3 inches is represented by encountering 11 pieces, 6 inches in diameter along a 50 foot transect.

Code	Detailed Description
13	There is a continuous layer of slash. Large quantities of material larger than 3 inches are present. Clearcuts and heavy partial cuts in mature and over-mature stands are depicted where the slash load is dominated by the greater than 3 inch diameter material. Fuels less than 3 inches are generally only 10 percent of the total load. May include situations where the slash still has “red” needles attached.
91	Land covered by urban and suburban development. The area must not support wildland fire spread. In some cases the area may experience structural fire losses during a wildland fire incident; however, structure ignition in those cases is either house-to-house or by firebrands, neither of which is directly modeled using fire behavior fuel models. If sufficient vegetation surrounds structures such that wildland fire spread is possible, then choose a fuel model appropriate for the wildland vegetation.
92	Land covered by permanent snow and ice. Areas covered by seasonal snow and ice can be mapped to two different fuel models.
93	Agricultural land maintained in a non-burnable condition, examples include irrigated annual crops, mowed or tilled orchards, and so forth. However, there are many agricultural areas that are not kept in a non-burnable condition. For example, grass is often allowed to grow beneath vines or orchard trees, and wheat and similar crops are allowed to cure before harvest; in those cases use a different fuel model.
98	Land covered by open bodies of water such as lakes, rivers, and oceans.
99	Land devoid of enough fuel to support wildland fire spread. Such areas include: gravel pits, arid deserts with little vegetation, sand dunes, rock outcroppings, beaches, and so forth.
101	The primary carrier of fire in sparse grass, though small amounts of fine fuel may be present. The grass is generally short, either naturally or by grazing, and may be sparse or discontinuous. The moisture extraction is indicative of a dry climate fuelbed, but may also be applied in high-extinction moisture fuelbeds because in both cases predicted spread rate and flame length are low compared to other grass models.
102	The primary carrier of fire is grass, though small amounts of fine dead fuel may be present. Load is greater than 101, and fuelbed may be more continuous. Shrubs, if present, do not affect fire behavior.
103	The primary carrier of fire is continuous, coarse, humid-climate grass. Grass and herb fuel load is relatively light; fuelbed depth is about 2 feet. Shrubs are not present in significant quantity to affect fire behavior.
104	The primary carrier of fire is continuous, dry-climate grass. Load and depth are greater than 102; fuelbed depth is about 2 feet.
105	The primary carrier of fire is humid-climate grass. Load is greater than 103 but depth is lower, about 1-2 feet.

Code	Detailed Description
106	The primary carrier of fire is continuous humid-climate grass. Load is greater than 105 but depth is about the same. Grass is less coarse than 105.
107	The primary carrier of fire is continuous dry-climate grass. Load and depth are greater than 104. Grass is about 3 feet tall.
108	The primary carrier of fire is continuous, very coarse, humid-climate grass. Load and depth are greater than 106. Spread rate and flame length can be extreme if grass is fully cured.
109	The primary carrier of fire is dense, tall, humid-climate grass. Load and depth are greater than 108, about 6 feet tall. Spread rate and flame length can be extreme if grass is fully more mostly cured.
121	The primary carrier of fire is grass and shrubs combined. Shrubs are about 1 foot height, grass load is low. Spread rate is moderate; flame length is low. Moisture of extinction is low.
122	The primary carrier of fire is grass and shrubs combined. Shrubs are 1 to 3 feet high, grass load is moderate. Spread rate is high; flame length moderate. Moisture of extinction is low.
123	The primary carrier of fire is grass and shrubs combined. Moderate grass/shrub load, average grass/shrub depth less than 2 feet. Spread rate is high; flame length moderate. Moisture of extinction is high.
124	The primary carrier of fire is grass and shrubs combined. Heavy grass/shrub load, depth greater than 2 feet. Spread rate high; flame length very high. Moisture of extinction is high.
141	The primary carrier of fire is woody shrubs and shrub litter. Low shrub fuel load, fuelbed about 1 foot; some grass may be present. Spread rate is very low; flame length very low.
142	The primary carrier of fire is woody shrubs and shrub litter. Moderate shrub fuel load (higher than 141), depth about 1 foot, no grass fuel present. Spread rate is very low; flame length low.
143	The primary carrier of fire is woody shrubs and shrub litter. Moderate shrub load, possibly with pine overstory or herbaceous fuel, fuel bed depth 2 to 3 feet. Spread rate is low; flame length low.
144	The primary carrier of fire is woody shrubs and shrub litter. Low to moderate shrub and litter load, possibly with pine overstory, fuel bed depth about 3 feet. Spread rate is high; flame length moderate.
145	The primary carrier of fire is woody shrubs and shrub litter. Heavy shrub load, depth 4-6 feet. Spread rate is very high; flame length very high. Moisture of extinction is high.

Code	Detailed Description
146	The primary carrier of fire is woody shrubs and shrub litter. Dense shrubs, little or no herbaceous fuel, fuelbed depth about 2 feet. Spread rate is high; flame length high.
147	The primary carrier of fire is woody shrubs and shrub litter. Very heavy shrub load, depth 4 to 6 feet. Spread rate lower than 146, but flame length similar. Spread rate is high, flame length is very high.
148	The primary carrier of fire is woody shrubs and shrub litter. Dense shrubs, little or no herbaceous fuel, fuelbed depth about 3 feet. Spread rate is high; flame length high.
149	The primary carrier of fire is woody shrubs and shrub litter. Dense, finely branched shrubs with significant fine dead fuel, about 4 to 6 feet tall; some herbaceous fuel may be present. Spread rate is high; flame length is very high.
161	The primary carrier of fire is low load of grass and/or shrub with litter. Spread rate is low; flame length is low.
162	The primary carrier of fire is moderate litter load with shrub component. High extinction moisture. Spread rate is moderate; flame length is low.
163	The primary carrier of fire is moderate forest litter. High extinction moisture. Spread rate is high; flame length is moderate.
164	The primary carrier of fire is short conifer trees with grass or moss understory. Spread rate is moderate; flame length is moderate.
165	The primary carrier of fire is heavy forest litter with a shrub or small tree understory. Spread rate is moderate; flame length is moderate.
181	The primary carrier of fire is compact forest litter. Light to moderate loads, fuels 1 to 2 inches deep. May be used to represent a recently burned forest. Spread rate is very low; flame length is very low.
182	The primary carrier of fire is broadleaf (hardwood) litter. Low load, compact broadleaf litter. Spread rate is very low; flame length is very low.
183	The primary carrier of fire is moderate load conifer litter, light load of coarse fuels. Spread rate is very low; flame length low.
184	The primary carrier of fire is moderate load of fine litter and coarse fuels. Includes small diameter downed logs. Spread rate is low; flame length low.
185	The primary carrier of fire is high load of fine litter; light slash or mortality fuel. Spread rate is low; flame length low.
186	The primary carrier of fire is moderate load broadleaf litter, less compact than 182. Spread rate is very moderate; flame length is low.

Code	Detailed Description
187	The primary carrier of fire is heavy load of forest litter, includes large diameter downed logs. Spread rate is low; flame length low.
188	The primary carrier of fire is moderate load long-needle pine litter, may include small amount of herbaceous load. Spread rate is moderate; flame length low.
189	The primary carrier of fire is very high load, fluffy broadleaf litter. This can also be used to represent heavy needle-drape. Spread rate is very moderate; flame length moderate.
201	The primary carrier of fire is light dead and down activity fuel. Fine fuel load is 10 to 20 t/ac weighted towards fuels 1 to 3 inch diameter class; depth is less than 1 foot. Spread rate is moderate; flame length moderate.
202	The primary carrier of fire is moderate dead and downed activity fuel or light blowdown. Fine fuel load is 7 to 12 t/ac, evenly distributed across 0 to 0.25, 0.25 to 1, and 1 to 3 inch diameter classes, depth is about 1 foot. Blowdown is scattered, with many trees still standing. Spread rate is moderate; flame length moderate.
203	The primary carrier of fire is heavy dead and down activity fuel or moderate blowdown. Fine fuel load is 7 to 12 t/ac, weighted toward 0 to 0.25 inch diameter class, depth is more than 1 foot. Blowdown is moderate; trees compacted to near the ground. Spread rate is high; flame length high.
204	The primary carrier of fire is heavy blowdown fuel. Blowdown is total, fuelbed is not compacted, most foliage and fine fuel still attached to blowdown. Spread rate is very high; flame length very high.