The Academy
18200 Highway 238
Grants Pass, OR 97527
846-6817 Fax or phone

August 5, 1998

Regulations Department(Attn Marjorie D. Ruhf)
Bureau of Alcohol, Tobacco and Firearms
650 Massachusetts Avenue NW
Washington, D.C. 20226

Dear Sir:

In accordance with the procedures delineated in 27 CFR, Section 4.25a(c)(2), I hereby petition the BATF to establish a viticultural area within the State of Oregon to be known as "Applegate Valley." The undersigned is owner / winemaker of a winery as well as owner of an associated vineyard within the proposed viticultural area.

It is my purpose in this petition to show that "Applegate Valley" is a widely known name for this area, that the area is well defined, and that the area is distinguished from other areas by its soil and climate.

General Information

The Applegate Valley is mainly within the State of Oregon and within Jackson and Josephine Counties, and largely within the existing Rogue Valley American Viticultural Area (AVA).

The Applegate Valley has been a grape growing region since 1870 when A. H. Carson began planting some 30 acres of grapes along North Applegate Road. With the arrival of the railroad, grapes were shipped to both Portland and New York. Jacksonville was a winemaking center where Peter Britt established the original Valley View Vineyards. Prohibition brought an end to the local industry until 1972, when Frank Wisnovsky reestablished Valley View Vineyards in Ruch.

Since then, grape growing and winemaking have expanded in the Applegate Valley. There are now 6 bonded wineries in the valley as well as 23 vineyards. In total, over 235 acres have been planted to grapes.

The Willamette Valley and the Umpqua Valley are known for cool region grapes, including Pinot noir, Pinot Gris and Reisling. These require less than 2500 degree days to ripen (Winkler's Climate Region I). In contrast, varieties such as Cabernet Sauvignon, Merlot, Zinfandel and Syrah all grown in the Applegate Valley require 2500 to 3000 degree days (Climate Region II). With 2680 degree days, Grants Pass is more similar in climate to areas of the Sonoma and Napa valleys than to the climate of northern Oregon.

"(a) Evidence that the name of the viticultural area is locally and/or nationally known as referring to the area specified in the petition":

The Applegate River was named for one or more of the Applegate brothers who explored the area in 1846 (See Ruch and the Upper Applegate Valley, They Settled in Applegate Country and the memoirs of Jesse Applegate). The USGA. map used to show the boundaries of the area (Medford 1:250000) uses the name Applegate River and the town of Applegate is within the valley. The map The Wine Appellations of Oregon published by the Oregon Wine Marketing Coalition shows the Applegate Valley and mentions it in its notes. The internationally acclaimed The Oxford Companion to Wine (first edition) mentions the Applegate Valley on page 693. The Oregon Winegrape Grower's Guide devotes several paragraphs to discussion of the Applegate Valley as one of Oregon's grape growing areas.

"(b) Historical or current evidence that the boundaries of the viticultural area are as specified in the petition":

The Applegate Valley is surrounded by the Siskiyou Mountains. The watershed of the Applegate River is the defining feature of the appellation. These boundaries have been identified by the US Forest Service in minute detail but do not show on published maps. However, these boundaries can be closely approximated by straight line segments drawn between prominent physical features of the terrain, mostly mountaintops. A small portion of the valley, located within California, is excluded in this petition. Locally, this area is called Elliot Creek, a tributary to the Applegate River.

Some areas included within the boundaries of the proposed viticultural area are presently viewed as unsuitable to viticulture, primarily due to elevation. These have been included because future viticultural practices, such as site orientation and frost protection could make grape growing feasible.

"(c) Evidence relating to geographical features (Climate, soil, elevation, physical features, etc.) which distinguish the viticultural features of the proposed area from the surrounding areas":

The Rogue Valley viticultural area (AVA) has three distinct sub regions: Illinois Valley, Applegate Valley and Bear Creek valley. The grape growing region around Cave Junction is about 70 miles closer to the Pacific Ocean than the grape growing region around Medford. The Siskiyou Mountains that separate these valleys further accentuate climate differences among the valleys.

The Applegate Valley is approximately 50 miles long running from its origins near the California border generally northwest to where it joins the Rogue River just west of Grants Pass. The surrounding Siskiyou Mountains are believed to have been created in the Jurassic period by upthrusts of the ocean floor as plate forced its way under the continental shelf. Soil types are generally granitic of origin as opposed to the volcanic origin of the Cascade Mountains to the east.

Most of the Applegate Valley vineyards are planted on stream terraces or alluvial fans providing deep well drained soils. More than 60 inches of soil provide the plants with an ample root zone. Although available water capacity is sufficient to carry the vines though the summers without irrigation, many vineyards have installed irrigation for frost protection and supplemental water.

While soil origin is an important factor in determining differences between the Applegate and the larger Rogue Valley AVA, its role is secondary to climate. Within the Rogue Valley AVA, annual precipitation decreases west to east-from 58.9 inches per year at Cave Junction, to 31.1 inches at Grants Pass, to 25.2 inches at Applegate, and 18.3 inches at Medford. These dramatic differences clearly influences current viticultural practices such as irrigation and just as important, have had a cumulative effect over the eons.

Leaching of the more basic soil components has left the western soils slightly acid while the eastern soils tend to be slightly basic. Soils in the Applegate Valley have a pH between 6.1 and 6.5. Ken Brown writing in the Oregon Wine grower's Guide says a pH of 6.0 to 6.5 is ideal for desirable microbiological activity, nutrient availability, and nutrient balance.

In Illinois Valley, the average temperature through the growing season (April to October) is 2.5 degrees lower than in the eastern valleys. This may not seem important but cumulatively it means that the degree days rise from 4971 in Cave Junction to 5602 in Grants Pass (based on 40 degrees and do not compare with Winkler's values). Writing in the Oregon Wine Grower's Guide, Ted Gerber sums this up as follows, "As you move from west to east or from the Illinois River Valley including Selma to the Applegate Valley and into the Rogue Valley, good grape growing sites generally become warmer due to the lessening of the marine air influence." He goes on to point out that earlier ripening varieties such as Pinot noir, Early Muscat and Gewurztraminer, do well in the Illinois Valley. In contrast the Applegate Valley with it's Region II temperature range can ripen Cabernet Sauvignon, Merlot and Chardonnay and do so two to three weeks earlier than is possible in the Illinois Valley.

"(d) A description of the specific boundaries of the viticultural area, based on features which can be found on United States Geological Survey (USGS) maps of the largest applicable scale."

Enclosed is the USGS map scaled 1:250,000 entitled "Medford," NK 10-5 (1955, revised 1976) on which the boundaries of the proposed Applegate viticultural area have been drawn.

The Applegate Valley viticultural area is located entirely within Jackson and Josephine Counties in southwestern Oregon. The boundaries are as follows:

(1) Beginning at the confluence of the Applegate River with the Rogue River approximately 5 miles west of Grants Pass, the boundary proceeds southwesterly to an unnamed mountain peak with an elevation of approximately 2400 feet.

(2) Then northerly and westerly to the lookout tower on Onion Mountain (4438 feet).

(3) Then southerly and westerly to the lookout tower on Squaw Mountain.

(4) Then easterly to the peak of Roundtop Mountain (4693 feet).

(5) Then easterly and southerly to the peak of Mungers Butte.

(6) Then southerly and westerly to Holcomb Peak.

(7) Then in a generally southwesterly direction (with many diversions) along the eastern boundary of the Siskiyou National Forest to the California state line.

(8) Then easterly along the California state line to Pacific Crest Trail.

(9) Then easterly and northerly along the Pacific Crest Trail to McDonald Peak.

(10) Then northerly to the lookout tower on Wagner Butte.

(11) Then northerly and westerly to the peak of Bald Mountain (5635 feet).

(12) Then northerly and westerly to the lookout tower on Anderson Butte.

(13) Then northerly and westerly to the peak of an unnamed mountain with an elevation of 3181 feet.

(14) Then northerly and westerly to the peak of Timber Mountain.

(15) Then westerly and southerly to the middle peak of Billy Mountain.

(16) Then northerly and westerly through a series of five unnamed peaks with elevations of approximately 3600, 4000, 3800, 3400, and 3800 feet, respectively.

(17) Then northerly and westerly to Grants Pass Peak.

(18) Then westerly to Jerome Prairie.

(19) Then westerly and northerly to the confluence of the Applegate River and the Rogue River and the point of the beginning.

Thank you for the privilege of submitting this petition.

Sincerely,

[redacted]

Barnard E. Smith, Winemaker, BW-OR-182

References

Adams, L.D., Wines of America, 4th edition, 1990.

Applegate, J. A., A Day with the Cow Column / by Jesse A. Applegate 1811-1888, Ye Galleon Press, Fairfield, WA,1990.

Carson, A. H., "Better Fruit", July 1908.

Black, J & M, Ruch and the Upper Applegate Valley, an Oregon Documentary, Josephine County Historical Society, Grants Pass, OR, 1991.

Brown, K., Soils and Fertilization, in Oregon Winegrape Growers' Guide, 4th edition, The Oregon Winegrowers Association, Portland, OR, 1992.

Gerber, T., Site Selection in the Rogue Region, in Winegrape Growers' Guide, 4th edition, The Oregon Winegrowers Association, Portland, OR, 1992.

Johnson, O., They Settled in Applegate Country, Pacific NW Books, Medford, OR, 1979.

Meridith, T. J., Northwest Wines: Winegrowing Alchemy Along the Pacific Rim of Fire, 4th edition, Nexus Press, Kirkland, WA, 1990.

Merrill, K., No Sour Grapes, Just Applegate Wine, The Mail Tribune, Sunday, April 16, 1978, pp 1-16.

The Oxford Companion to Wine, Jancis Robinson, Editor, Oxford University Press, Oxford, 1994.

The Resources of Southern Oregon, The Southern Oregon State Board of Agriculture, Salem, OR,1890.

Soil Survey of Jackson County Oregon, Soil Conservation Service, US Department of Agriculture, 1989.

Soil Survey of Josephine County Oregon, Soil Conservation Service, US Department of Agriculture, 1979.

Taylor,G. H., Map of Oregon Annual Precipitation 1961-1990, Oregon Climate Service, Oregon State University, Corvallis, OR.

Winkler, A.J., J. A. Cook, W.M. Kliewer, and L. A. Lider, General Viticulture, University of California, Berkeley, CA, 1974.

The Academy
18200 Highway 238
Grants Pass, OR 97527
541-846-6817 Fax or phone

November 19, 1999

Regulations Department(Attention: Timothy Devanney)
Bureau of Alcohol, Tobacco and Firearms
650 Massachusetts Ave NW   Room 5000
Washington, D.C. 20226

Dear Mr. Devanney:

Enclosed is our analysis of the soil types in the Rogue Valley. Included are soil maps showing the location of each vineyard. We have also provided a list of the vineyards by valley along with the soil type for each.

The vineyards were identified from the members of the Oregon Winegrowers Association(OWA), the members of the Rogue Valley chapter of the OWA and nonmembers responding to prior surveys. Vineyards for which data could not be located are omitted.

Soil types have been identified from the maps of the USDA Soil Survey of Jackson County Oregon and the USDA Soil Survey of Josephine County Oregon. These surveys were completed in about 1990 and were based on aerial photographs taken from 1974-1979. Changes in the features such as buildings, roads, forest or crop cover may have led to small errors in location.

Soil names are consistent between the counties but soil numbers are not. Therefore numbers from Josephine county are marked with an (*).

Within the Applegate Valley vineyards are often located on soils of the Ruch (Roosh) series. Within Bear Creek Valley they are often located on soils of the Medford or Carney series. Within the Illinois Valley they are often located on soils of the Takilma, Pollard and Frohlin series.

I hope this information will help your office to reach a favorable decision on our petition.

Sincerely,

[redacted]

Barnard E. Smith, Winemaker, BW-OR-182

Vineyard	Owner	Postal Address	Post Office	Zip
Academy	Barnard Smith	[redacted]	Grants Pass	97527
Applegate	Richard Sharp	[redacted]	Jacksonville	97530
D & L Vineyards	Don Tyler	[redacted]	Grants Pas	97527
Dead End	Jim Clover	[redacted]	Grants Pass	97527
Ironbird	Robert Finley	[redacted]	Grants Pass	97527
John Michael Cellars	John Guidici	[redacted]	Jacksonville	97530
Layne	Roger Layne	[redacted]	Grants Pass	97527
Palmer	David Palmer	[redacted]	Jacksonville	97530
Pioneer Ridge	Joseph Ginet	[redacted]	Grants Pass	97527
Ramsgate	(Young)	[redacted]	Grants Pass	97527
Rosellla's Vineyard	Rex Garoutte	[redacted]	Grants Pass	97527
Silver Stars	David Trump	[redacted]	Grants Pass	97527
Slagle Creek	Denman	[redacted]	Grants Pass	97527
Sorenson Ranch	Robert Kerivan	[redacted]	Grants Pass	97527
South Hill Vineyards	Elaine Lewellyn	[redacted]	Grants Pass	97527
Steelhead Run	Ron Burley	[redacted]	Jacksonville	97530
Stepping Stone	Gary Wood	[redacted]	Jacksonville	97530
The Farm	Frank Ferreira	[redacted]	Grants Pass	97527
Troon	Richard Troon	[redacted]	Grants Pass	97527
Valley View	Anna Wisnovsky	[redacted]	Jacksonville	97530
Verdezza	Richard Lorelli	[redacted]	Grants Pass	97527
Woolridge Creek	Ted Warrick	[redacted]	Grants Pass	97527
Wright	Dwain Wright	[redacted]	Grants Pass	97527
Aguile Vineyard	Sherman Lamb	[redacted]	Talent	97540
Ashland Vineyards	Philip Kodak	[redacted]	Ashland	97520
Butte Creek	Gil Weis	[redacted]	Eagle Point	97524
Daisy Creek Farm	Russ Lyon	[redacted]	Jacksonville	97530
Del Rio Vineyards	Lee Trayham	[redacted]	Gold Hill	97502

Valley	Acres	Principal Soil Type	Other Soil Types	No.	Map
Applegate Valley	5	97A Kerby loam 0-3%		1	86
Applegate Valley	10	158B Ruch gravelly silt loam 2-7%		2	98
Applegate Valley	2	53C* Manita loam 7-12%		4	78
Applegate Valley	7.8	108D Manita loam 7-20%		5	78
Applegate Valley	5.5	164B Shefflein loam 2-7%	127A	6	78
Applegate Valley	5	158D Ruch gravelly silt loam 2-7%		7	86
Applegate Valley	30	164B Shefflein loam 2-7%		8	78
Applegate Valley	10	158B Ruch gravelly silt loam 2-7%		9	98
Applegate Valley	0.9	67B* Ruch gravelly silt loam 2-12%	4*	10	61
Applegate Valley	7	35A Cove clay 0-3%	127A	11	78
Applegate Valley	7	67B* Ruch gravelly silt loam 2-7%	68B, 18B	12	72B
Applegate Valley	3	164B Shefflein loam 2-7%		13	78
Applegate Valley	6	158D Ruch gravelly silt loam 7-20%		14	78
Applegate Valley	100	31A Central Point sandy loam 0-3%	22A	15	86
Applegate Valley	2	67B* Ruch gravelly silt loam 2-7%		16	72B
Applegate Valley	7	31A Central Point sandy loam 0-3%	23A	17	86
Applegate Valley	15	158A Ruch gravelly silt loam	1C	18	98
Applegate Valley	15	53C* Manita loam 7-12%	18B*, 68B*	19	72B
Applegate Valley	10	164B Shefflein Loam 2-7%		20	78
Applegate Valley	25.5	158B Ruch gravelly silt loam 2-7%	33A	21	98
Applegate Valley	3.9	158D Ruch gravelly silt loam 2-7%		22	78
Applegate Valley	58	158D Ruch gravelly silt loam 7-20%	196E,164B,164D	23	78
Applegate Valley	5	53C Manita loam 7-12%		24	72B
Bear Creek Valley	12.5	34B Coleman loam 0-7%		25	89
Bear Creek Valley	26.3	128B Medford clay loam 0-7%	27 B & D	26	112
Bear Creek Valley	20	151C Provig-Agate complex 5-15%		27	60
Bear Creek Valley	3.5	127A Medford silty clay loam 0-3%		28	80
Bear Creek Valley	177.5	31A Central Point sandy loam 0-3%	187A	29	58

Dunbar Orchards	Dunbar Carpenter	[redacted]	Medford	97504
Eagle Mill Farm	Ron Roth	[redacted]	Ashland	97520
Evans Family Farm	Fred Evans	[redacted]	Medford	97501
Gold Vineyards	Randolph Gold	[redacted]	Talent	97540
Griffen Creek Vineyards	Ken Pratt	[redacted]	Talent	97540
Hillcrest Orchard	Jon Meadors	[redacted]	Medford	97504
Kitchen Creek Vineyards	Richard Schultz	[redacted]	Ashland	97520
Ousterhout Vineyards	John Ousterhout	[redacted]	Eagle Point	97524
Pheasant Hill Farm	Kurt Lotspeich	[redacted]	Talent	97540
Pitchfork Ranch	Glenn Wintemute	[redacted]	Eagle Point	97524
Pompadour Vineyard	Arnold Kohnert	[redacted]	Ashland	97520
Quail Run	Robert Moore	[redacted]	Talent	97540
Rancho Vista	Larry Gamache	[redacted]	Grants Pass	97526
Richie	Larry Richie	[redacted]	Medford	97501
Rising Sun	Richard Fujas	[redacted]	Phonix	97535
Scholer	Julia Scholer	[redacted]	Central Point	97502
Sky Ranch	Louis Petralli	[redacted]	Grants Pass	97526
Somers Hardy Vineyards	Nancy Somers	[redacted]	Rogue River	97537
Venture Vineyards	Nancy Tappen	[redacted]	Rogue River	97537
Weisinger's of Ashland	John Weisinger	[redacted]	Ashland	97520
	James Kenney	[redacted]	Grants Pass	97527
Bear Creek	Rene Eichmann	[redacted]	Cave Junction	97538
Bridgeview	Robert Kerivan	[redacted]	Cave Junction	97538
Deer Creek Vineyard	Gary Garnett	[redacted]	Selma	97538
Flaming Grape	Bob LaFlamme	[redacted]	Selma	97538
Foris Vineyards & Winery	Ted Gerber	[redacted]	Cave Junction	97538
LaFlamme Vineyards	Walley LaFlamme	[redacted]	Selma	97538
Maple Ranch Vineyard	Ted Gerber	[redacted]	Cave Junction	97538
River Crest Vineyard	Ed Podoll	[redacted]	Cave Junction	97523

Bear Creek Valley	5	27A Carney clay	33A	30	81
Bear Creek Valley	5.5	27D Carney clay 5-20%		31	101
Bear Creek Valley	14.7	157B Ruch silt loam 2-7%		32	89
Bear Creek Valley	19	127A Medford silty clay loam 0-3%		33	100
Bear Creek Valley	19	55A Evans loam 0-3%	127A	34	88
Bear Creek Valley	9.5	27B Carney clay 1-5%	33C	35	81
Bear Creek Valley	2	127D Medford clay loam		36	101
Bear Creek Valley	7	151C Provig-Agate complex 5-15%	6B	37	60
Bear Creek Valley	18	43D Darrow silty clay loam 5-20%		38	100
Bear Creek Valley		6B Agate-Winlo complex 0-5%		39	60
Bear Creek Valley	5.8	27B Carney clay 1-5%		40	112
Bear Creek Valley	104.1	43D Darrow silty clay loam 5-20%		41	100
Bear Creek Valley	5	11C* Brockman clay loam 7-12%		42	43
Bear Creek Valley	0.9	127B Medford silty clay loam		43	80
Bear Creek Valley		34B Coleman loam 0-7%	127A	44	89
Bear Creek Valley		164D Sheflein loam 7-20%		45	73
Bear Creek Valley		42B* Holland sandy loam, cool 2-7%		46	19
Bear Creek Valley	7	31A Central Point sandy loam 0-3%	22A	47	37
Bear Creek Valley	13	196E Vannoy silt loam 12-35%	157B	48	50
Bear Creek Valley	5	162D Selmac loam 7-20%		49	112
Bear Creek Valley	12	83* Wapato silt loam		50	41
Illinois Valley	5	61C*,61D* Pollard loam 7-20%	1B*,68B*	51	80
Illinois Valley	60	61 Pollard loam		52	80
Illinois Valley	40	38A* Foehlin gravelly loam 0-3%	73*	53	64
Illinois Valley	6	38A* Foehlin gravelly loam 0-3%		54	64
Illinois Valley	27.5	19D* Cornutt-Dubakelia 7-20%	30* Dumps	55	85
Illinois Valley	20	38A* Foehlin gravelly loam 0-3%		56	64
Illinois Valley	31	61C* Pollard loam 7-12%	1B*,58F*	57	80
Illinois Valley		52* Kerby loam		58	74

Rockdale Vineyards	M. Manderson	[redacted]	Cave Junction	97523
Sommers Hardy Vineyard	Dan Somers	[redacted]	Cave Junction	97538
Stonefield Vineyard	Bill Wendover	[redacted]	Cave Junction	97523
Three Creeks Vineyard	Russell Beard	[redacted]	Cave Junction	97523
Twin Creeks Viineyard	Bill Reid	[redacted]	Cave Junction	97538
Villanova	Gayle Werden	[redacted]	Selma	97538

Illinois Valley	7	**73* Takilma cobbly loam**		59	85
Illinois Valley	1	**73* Takilma cobbly loam**	15*	60	80
Illinois Valley	12	**73* Takilma cobbly loam**	4*	61	85
Illinois Valley	50	**11B* Brockman clay loam 2-7%**		62	80
Illinois Valley		**61C* Pollard loam 7-12%**		63	80
Illinois Valley	18	**61B* Pollard loam 2-7%**	61C	64	64

THE APPLEGATE *area, in the southwest corner of Jackson County, Oregon, and a portion of southeast Josephine County, is reached via State Hwy. 238 from either Medford through historic Jacksonville, or Grants Pass at junction of the Redwood Hwy. 199.*

THE APPLEGATE RIVER *flows from the Siskiyou Mts. northerly toward Ruch, (pronounced Roosh), then westerly toward Grants Pass, a distance of about 40 miles. Good paved roads (see map) follow the river, and most of its tributaries, all the way through wide fertile valleys and wooded areas. There are little parks and picnic spots by the wayside, inviting one to spend a leisurely day in the cool, clean air of the Applegate. There are many interesting side trips, e.g. a good forest-service road from the Applegate Lake through the mountains along Carberry Creek, past old mining claims and wooded areas down Thompson Creek to Hwy. 238 at Applegate; or the loop from the top of Jacksonville hill along Sterling Creek, famous for early day gold mining, to the remains of the settlement of Buncom at the junction with the Little Applegate Road. History buffs could browse for days investigating pioneer sites and old cemeteries throughout the area.*

AS TO WEATHER, *there are 4 definite seasons. A crisp spring, with weeks of alternate sunny and showery days, characterized by early wild flowers, blossoming fruit trees, returning flocks of birds, and an urge to make a garden; followed by a short, warm summer (most nights are cool and comfortable); then a long colorful autumn with everything ready to harvest at once before a short winter of rain and varying amounts of snow. Some years it is necessary to protect water pipes from freezing, but extremes of climate are usually mild in the Applegate. Snow is seldom a problem. Roads are kept open and there is excellent school bus service. Annual rainfall is about 20 to 25 inches, increasing to 40 inches or more at higher elevations and close to high mountains. There is considerable variation within a few miles.*

SOIL TYPES *vary, most are fertile and well drained. Pastures are of good feeding quality and many varieties of wine grapes ripen to perfection, as evidenced by the award winning wines of the Valley View Vineyard, where informal tours and tasting are available daily in summer, and on weekends in the winter.*

WATER: *Many people coming to Oregon want to buy land on a stream, expecting to use the water. All surface water in Oregon is under State control and may not be used without proper legal authority. Most farms in southern Oregon have water rights appurtenant to the land. Water is applied by gravity flood or by pump and sprinkler. Many farms have their own ponds which provide irrigation water and fishing. We recommend a consultation with the State Water Master in the County Court House whenever water rights are involved. Domestic wells vary in depth.*

STORES, SCHOOLS & COMMUNITY CHURCHES *are marked on the accompanying map. There are no incorporated towns in the Applegate. Community activities are varied, sponsored by schools, churches, Granges, Garden Clubs, Home Economic units of the County Extension Service, 4-H clubs, Scouts, etc. The map shows principal picnic and camping spots. There are many good fishing places in the valley.*

We welcome your questions about this delightful rural area.

See map for location of our office.

RANCHES • HOMES • ACREAGES

****

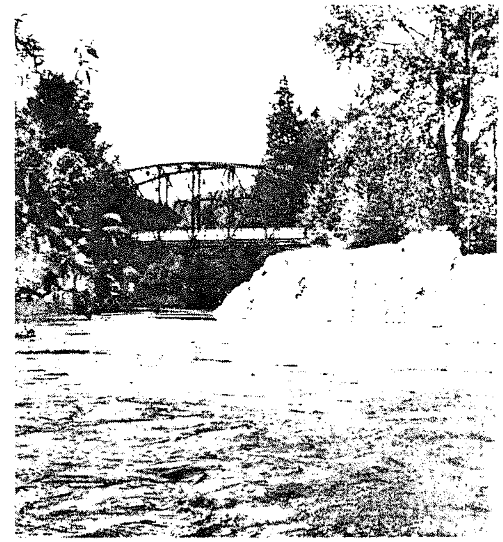
Ramsay Realty

(541) 899-1184

Member of Southern Oregon and Grants Pass Multiple Listing Services

****

THE APPLEGATE

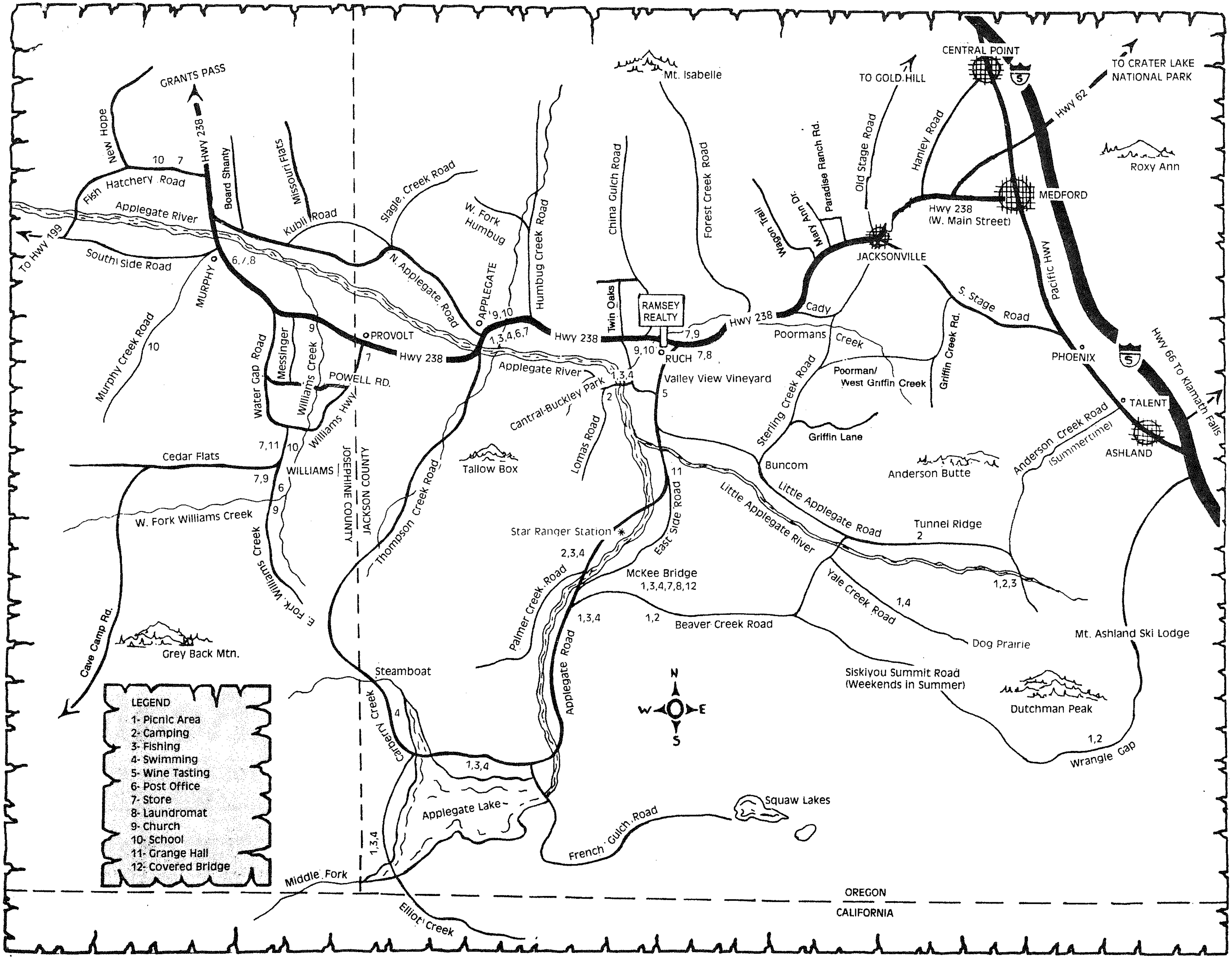


Compliments of

Ramsay Realty

YOUR REAL ESTATE CONNECTION

Applegate Valley office
7604 Hwy. 238
Jacksonville (Ruch), OR 97530
(541) 899-1184



GRANTS PASS
To HWY 199
New Hope
Fish Hatchery Road
Hwy 238
Board Shanty
Missouri Flats
Kubli Road
Slagle Creek Road
W. Fork Humbug
Humbug Creek Road
China Gulch Road
Mt. Isabelle
Forest Creek Road
Wagon Trail
Mary Ann Dr.
Paradise Ranch Rd.
Old Stage Road
TO GOLD HILL
Hanley Road
CENTRAL POINT
TO CRATER LAKE NATIONAL PARK
Hwy 62
Roxy Ann
MEDFORD
Hwy 238 (W. Main Street)
JACKSONVILLE
Applegate River
South Side Road
MURPHY
6,7,8
N. Applegate Road
APPLEGATE
9,10
1,3,4,6,7
Twin Oaks
RAMSEY REALTY
7,9
9,10
RUCH
7,8
Cady
Poormans Creek
S. Stage Road
Griffin Creek Rd.
Pacific Hwy
PHOENIX
Hwy 66 To Klamath Falls
TALENT
ASHLAND
Murphy Creek Road
Water Gap Road
Messinger
Williams Creek
PROVOLT
POWELL RD.
Williams Hwy
Cantral-Buckley Park
1,3,4
Valley View Vineyard
Sterling Creek Road
Poorman/ West Griffin Creek
Griffin Lane
Anderson Creek Road (Summertime)
Cedar Flats
7,11
WILLIAMS
JOSEPHINE COUNTY
JACKSON COUNTY
Tallow Box
Lomas Road
Buncom
Anderson Butte
Little Applegate Road
Tunnel Ridge
W. Fork Williams Creek
Thompson Creek Road
Star Ranger Station
East Side Road
Little Applegate River
E. Fork Williams Creek
2,3,4
McKee Bridge
1,3,4,7,8,12
Palmer Creek Road
Yale Creek Road
1,4
1,2,3
Cave Camp Rd.
Grey Back Mtn.
Beaver Creek Road
Applegate Road
Dog Prairie
Mt. Ashland Ski Lodge
Steamboat
Siskiyou Summit Road (Weekends in Summer)
Dutchman Peak
Carberry Creek
N
W
E
S
Applegate Lake
Wrangle Gap
1,2
Squaw Lakes
French Gulch Road
Middle Fork
OREGON
CALIFORNIA
Elliot Creek
LEGEND
1- Picnic Area
2- Camping
3- Fishing
4- Swimming
5- Wine Tasting
6- Post Office
7- Store
8- Laundromat
9- Church
10- School
11- Grange Hall
12- Covered Bridge

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-79 at Medford and Prospect, Oregon, and 1964-79 at Ruch, Oregon)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
MEDFORD:											
January----	45.0	30.3	37.7	63	14	70	3.45	1.81	4.87	8	3.5
February---	52.8	31.9	42.4	69	18	113	2.13	.90	3.16	6	1.4
March------	57.2	34.0	45.6	76	22	188	1.87	.81	2.77	6	1.3
April------	63.9	36.9	50.4	86	26	321	1.04	.49	1.51	4	.5
May--------	72.3	42.8	57.6	94	31	546	1.20	.36	1.88	4	.0
June-------	81.2	49.4	65.3	101	36	759	.66	.07	1.09	2	.0
July-------	90.7	54.3	72.5	106	41	1,008	.26	---	.43	1	.0
August-----	88.8	53.7	71.3	105	42	970	.48	.01	.81	2	.0
September--	82.8	47.5	65.2	102	34	756	.77	.20	1.22	2	.0
October----	68.6	39.6	54.1	92	26	437	1.68	.37	2.70	4	.1
November---	52.6	34.4	43.5	72	18	136	2.91	1.03	4.46	8	1.2
December---	44.2	31.3	37.8	63	14	72	3.52	1.56	5.19	8	2.2
Yearly:											
Average---	66.7	40.5	53.6	---	---	---	---	---	---	---	---
Extreme---	---	---	---	108	10	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,376	19.97	16.32	23.42	55	10.2
PROSPECT:											
January----	45.1	26.9	36.8	62	4	40	7.02	3.62	9.99	13	21.6
February---	51.2	29.0	40.1	71	11	86	4.62	2.48	6.50	10	10.8
March------	54.4	29.6	42.0	75	15	118	4.51	2.35	6.39	11	12.1
April------	61.3	32.0	46.7	83	21	218	2.62	1.58	3.55	7	4.1
May--------	70.0	37.5	53.8	92	25	428	2.28	.91	3.43	6	.3
June-------	78.0	43.0	60.5	97	30	615	1.22	.33	1.95	4	.0
July-------	87.7	46.5	67.1	102	33	840	.29	---	.50	1	.0
August-----	86.3	45.6	66.0	102	33	806	.92	---	1.60	2	.0
September--	81.1	41.4	61.3	99	27	639	1.25	.37	1.98	3	.1
October----	68.3	35.9	52.1	92	23	375	3.72	1.49	5.63	7	.6
November---	52.9	31.7	42.3	73	15	104	6.38	2.67	9.51	11	5.4
December---	45.5	28.4	37.0	61	8	54	7.18	3.53	10.34	13	15.3
Yearly:											
Average---	65.2	35.6	50.4	---	---	---	---	---	---	---	---
Extreme---	---	---	---	104	2	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,323	42.01	34.89	48.84	88	70.3

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days*	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Applegate Valley RUCH:											
January----	47.6	29.3	38.5	63	13	45	5.35	3.03	7.41	9	5.6
February---	54.8	30.4	42.6	71	17	106	2.45	1.10	3.60	6	5.1
March------	59.1	32.4	45.8	77	21	201	2.70	.95	4.14	7	2.9
April------	63.9	34.1	49.0	86	22	277	1.53	.80	2.16	5	.3
May--------	74.4	40.1	57.3	94	27	536	.94	.33	1.44	3	.0
June-------	82.0	46.7	64.4	100	34	732	.71	.21	1.12	3	.0
July-------	89.9	50.3	70.1	105	36	933	.28	---	.48	1	.0
August-----	88.1	49.9	69.0	104	38	899	.64	---	1.08	3	.0
September--	82.5	44.6	63.6	101	31	708	1.07	.10	1.80	3	.0
October----	69.7	38.1	53.9	91	24	431	1.85	.52	2.92	5	.0
November---	54.1	34.1	44.1	71	19	136	3.87	1.44	5.88	8	1.2
December---	46.5	30.6	38.6	65	12	74	5.34	2.42	7.83	10	7.3
Yearly:											
Average---	67.7	38.4	53.1	---	---	---	---	---	---	---	---
Extreme---	---	---	---	106	9	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,078	26.73	22.41	30.84	63	22.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

5

TABLE 2.--FREEZE DATES IN SPRING AND FALL--Continued

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Applegate Valley			
RUCH:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 1	May 25	June 5
2 years in 10 later than--	Apr. 20	May 15	May 30
5 years in 10 later than--	Mar. 30	Apr. 27	May 20
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 22	Sept. 28	Sept. 15
2 years in 10 earlier than--	Nov. 6	Oct. 6	Sept. 22
5 years in 10 earlier than--	Nov. 27	Oct. 20	Oct. 4

3

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-79 at Medford and Prospect, Oregon, and 1964-79 at Ruch, Oregon)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
MEDFORD:			
9 years in 10	230	177	138
8 years in 10	244	188	147
5 years in 10	271	209	163
2 years in 10	297	230	179
1 year in 10	311	241	187
PROSPECT:			
9 years in 10	173	121	46
8 years in 10	185	129	61
5 years in 10	208	145	90
2 years in 10	231	161	120
1 year in 10	243	169	135
Applegate Valley RUCH:			
9 years in 10	194	138	118
8 years in 10	210	151	124
5 years in 10	241	175	136
2 years in 10	273	200	148
1 year in 10	289	212	155

TABLE 1.--TEMPERATURE AND PRECIPITATION

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.1 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Recorded in the period 1962-77 at Cave Junction, Oregon											
January----	45.8	31.0	38.4	61	14	47	12.54	6.69	17.32	12	0.5
February---	53.4	32.6	43.0	71	19	126	6.04	2.19	9.13	9	4.1
March------	57.3	33.2	45.3	77	22	174	7.08	2.59	10.67	10	3.1
April------	63.2	34.9	49.1	85	25	283	3.19	.85	5.05	6	1.0
May--------	73.1	40.4	56.8	96	29	521	1.26	.80	8.01	3	.0
June-------	81.2	46.5	63.9	99	33	717	.36	.05	.60	1	.0
July-------	89.3	49.1	69.3	103	37	908	.13	---	.23	1	.0
August-----	87.8	48.4	68.1	103	36	871	.73	---	1.21	2	.0
September--	82.4	43.7	63.1	99	31	693	1.25	---	2.13	2	.0
October----	67.6	38.4	53.0	88	24	403	3.67	1.30	5.56	7	.0
November---	52.7	37.1	44.9	68	23	151	10.23	4.09	15.20	12	1.6
December---	45.8	33.0	39.4	63	15	77	12.14	5.25	17.74	13	5.8
Yearly:											
Average--	66.6	39.0	52.9	---	---	---	---	---	---	---	---
Extreme--	---	---	---	104	12	---	---	---	---	---	---
Total----	---	---	---	---	---	4,971	58.62	47.03	69.89	78	24.1

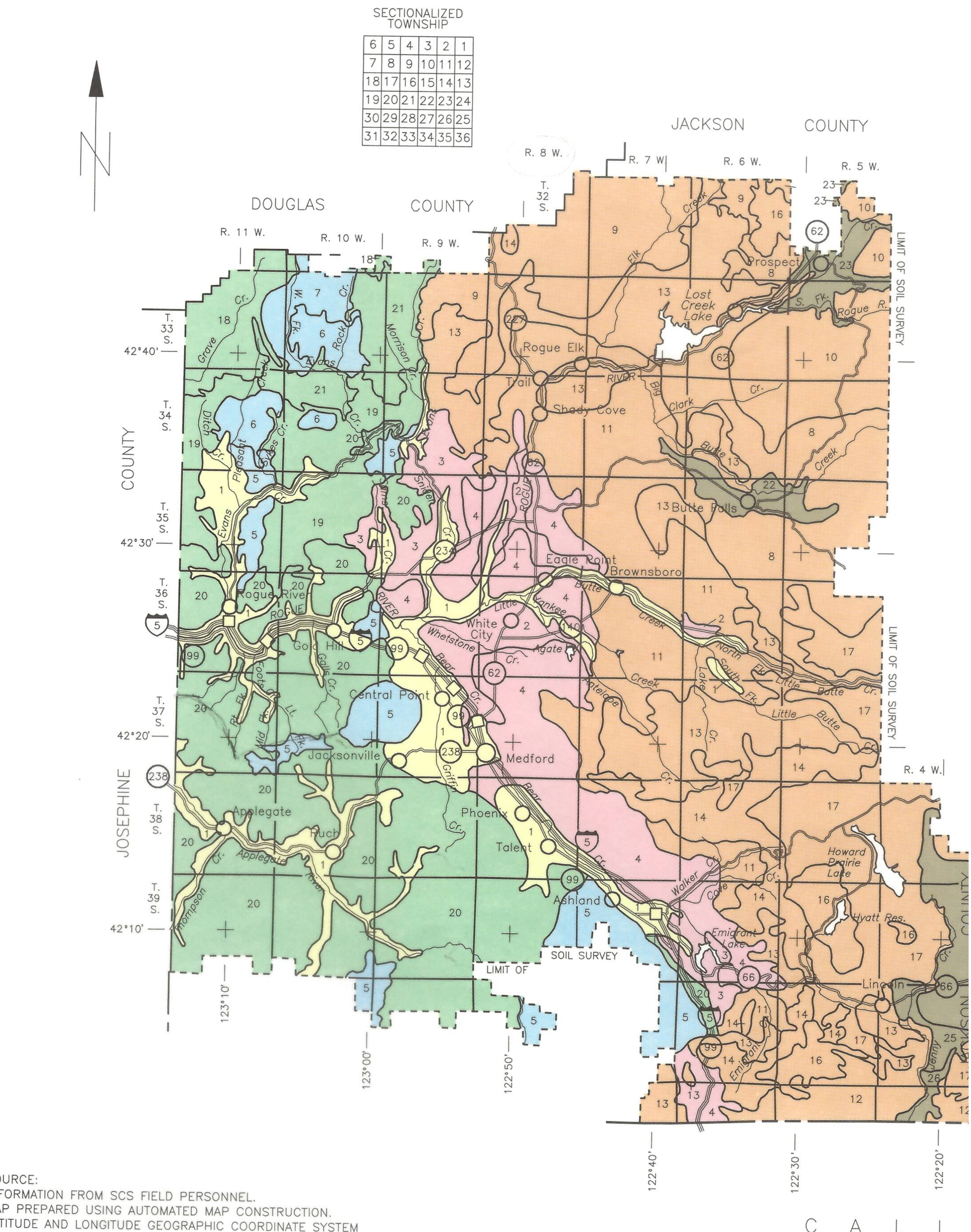
See footnote at end of table.

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Recorded in the period 1962-77 at Cave Junction, Oregon			
Last freezing temperature in spring:			
1 year in 10 later than--	April 10	May 15	May 31
2 years in 10 later than--	March 28	May 7	May 26
5 years in 10 later than--	March 4	April 22	May 16
First freezing temperature in fall:			
1 year in 10 earlier than--	October 27	September 24	September 15
2 years in 10 earlier than--	November 8	October 7	September 22
5 years in 10 earlier than--	December 2	October 31	October 5
Recorded in the period 1951-77 at Grants Pass, Oregon			
Last freezing temperature in spring:			
1 year in 10 later than--	March 23	April 26	May 15
2 years in 10 later than--	March 10	April 19	May 10
5 years in 10 later than--	February 13	April 4	May 1
First freezing temperature in fall:			
1 year in 10 earlier than--	October 27	October 23	September 25
2 years in 10 earlier than--	November 11	November 2	October 3
5 years in 10 earlier than--	December 10	November 20	October 18

TABLE 3.--GROWING SEASON

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
Recorded in the period 1962-77 at Cave Junction, Oregon			
9 years in 10	119	146	119
8 years in 10	236	162	126
5 years in 10	268	191	141
2 years in 10	305	221	156
1 year in 10	331	237	164
Recorded in the period 1951-77 at Grants Pass, Oregon			
9 years in 10	248	190	141
8 years in 10	264	204	151
5 years in 10	295	230	170
2 years in 10	333	255	188
1 year in 10	>365	269	198
Recorded in the period 1951-77 at Sexton Summit, Oregon			
9 years in 10	192	162	122
8 years in 10	209	172	131
5 years in 10	240	191	148
2 years in 10	272	211	165
1 year in 10	288	221	174



SOURCE:
INFORMATION FROM SCS FIELD PERSONNEL.
MAP PREPARED USING AUTOMATED MAP CONSTRUCTION.
LATITUDE AND LONGITUDE GEOGRAPHIC COORDINATE SYSTEM
CALCULATED BY THE APPLICATIONS SOFTWARE.
NATIONAL CARTOGRAPHY AND GEOGRAPHIC INFORMATION
SYSTEMS CENTER, FORT WORTH, TEXAS, 1993.

SOIL LEGEND

SOILS FORMED IN ALLUVIUM ON FLOOD PLAINS, STREAM TERRACES, AND ALLUVIAL FANS

1 — Ruch–Medford–Camas: Very deep, well drained, moderately well drained, and excessively drained soils that have a surface layer of gravelly silt loam, silty clay loam, or sandy loam

SOILS FORMED IN MATERIAL WEATHERED FROM SEDIMENTARY AND IGNEOUS ROCK AND MIXED ALLUVIUM ON FAN TERRACES, RIDGES, KNOLLS, HILLSLOPES, AND ALLUVIAL FANS

2 — Agate–Winlo–Provig: Well drained and somewhat poorly drained soils that are moderately deep or shallow to a hardpan or are very deep and that have a surface layer of loam, very gravelly clay loam, or very gravelly loam; on fan terraces

3 — Brader–Debenger–Langellain: Shallow and moderately deep, well drained and moderately well drained soils that have a surface layer of loam; on ridges and knolls

4 — Carney–Coker: Moderately deep and very deep, moderately well drained and somewhat poorly drained soils that have a surface layer of clay or cobbly clay; on alluvial fans and hillslopes

SOILS FORMED IN MATERIAL WEATHERED FROM GRANODIORITE ON ALLUVIAL FANS, RIDGES, AND HILLSLOPES

5 — Tallowbox–Shefflein: Moderately deep and deep, somewhat excessively drained and well drained soils that have a surface layer of gravelly sandy loam or loam and receive 25 to 40 inches of annual precipitation

6 — Wolfpeak–Tethrick–Siskiyou: Very deep and moderately deep, well drained and somewhat excessively drained soils that have a surface layer of sandy loam or gravelly sandy loam and receive 40 to 50 inches of annual precipitation

7 — Steinmetz–Lettia: Very deep and deep, somewhat excessively drained and well drained soils that have a surface layer of sandy loam and receive 45 to 60 inches of annual precipitation

SOILS FORMED IN MATERIAL WEATHERED FROM IGNEOUS ROCK ON PLATEAUS AND HILLSLOPES

8 — Freezener–Geppert: Very deep and moderately deep, well drained soils that have a surface layer of gravelly loam or very cobbly loam

9 — Straight–Freezener–Shippa: Moderately deep, very deep, and shallow, well drained soils that have a surface layer of extremely gravelly loam or gravelly loam

10 — Dumont–Coyata: Very deep and moderately deep, well drained soils that have a surface layer of gravelly loam

11 — Medco–McMullin: Moderately deep and shallow, moderately well drained and well drained soils that have a surface layer of cobbly clay loam or gravelly loam

12 — Skookum–McMullin–Rock outcrop: Rock outcrop and moderately deep and shallow, well drained soils that have a surface layer of very cobbly loam or gravelly loam

13 — McNull–McMullin–Medco: Moderately deep and shallow, well drained and moderately well drained soils that have a surface layer of loam, gravelly loam, or cobbly clay loam

14 — Tatouche–Bybee: Very deep, well drained and somewhat poorly drained soils that have a surface layer of gravelly loam or loam

15 — Oatman–Otwin: Very deep and moderately deep, well drained soils that have a surface layer of cobbly loam or stony sandy loam

16 — Rustlerpeak–Farva: Moderately deep, well drained soils that have a surface layer of gravelly loam or very cobbly loam

17 — Farva–Pinehurst: Moderately deep and very deep, well drained soils that have a surface layer of very cobbly loam or loam

SOILS FORMED IN MATERIAL WEATHERED FROM ALTERED SEDIMENTARY AND IGNEOUS ROCK ON RIDGES AND HILLSLOPES

18 — Acker–Norling–Kanid: Very deep, moderately deep, and deep, well drained soils that have a surface layer of gravelly loam or very gravelly loam

19 — Josephine–Beekman–Speaker: Deep and moderately deep, well drained soils that have a surface layer of gravelly loam or loam

20 — Vannoy–Caris–Offenbacher: Moderately deep, well drained soils that have a surface layer of silt loam or gravelly loam

21 — Goolaway–Beekman–Musty: Moderately deep, well drained soils that have a surface layer of silt loam or gravelly loam

SOILS FORMED IN MATERIAL WEATHERED FROM PYROCLASTICS AND IGNEOUS ROCK ON PLATEAUS AND HILLSLOPES

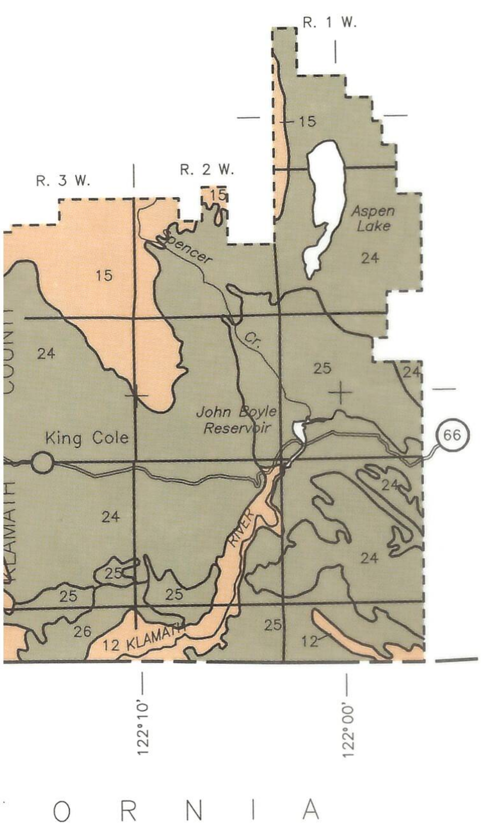
22 — Hukill–Geppert: Deep and moderately deep, well drained soils that are gravelly loam in the upper part of the surface layer or have a surface layer of very cobbly loam

23 — Crater Lake–Alcot–Barhiskey: Very deep, well drained, somewhat excessively drained, and excessively drained soils that have a surface layer of sandy loam, gravelly sandy loam, or gravelly loamy sand

24 — Pokegema–Woodcock: Deep and very deep, well drained soils that are loam or stony loam in the upper part of the surface layer

25 — Pinehurst–Greystoke–Bly: Very deep and deep, well drained soils that have a surface layer of loam or are stony loam in the upper part of the surface layer

26 — Campfour–Paragon: Very deep and moderately deep, well drained soils that have a surface layer of loam or cobbly loam



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON AGRICULTURAL EXPERIMENT STATION

GENERAL SOILS MAP
JACKSON COUNTY AREA, OREGON

APPROXIMATE SCALE – MILES

0 2 4 6 8 10

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped for broad interpretive purposes. Each of the broad groups and the map units in each group are described on the following pages.

Map Unit Descriptions

Soils Formed in Alluvium on Flood Plains, Stream Terraces, and Alluvial Fans

These soils make up about 6 percent of the survey area.

1. Ruch-Medford-Camas

Very deep, well drained, moderately well drained, and excessively drained soils that have a surface layer of gravelly silt loam, silty clay loam, or sandy loam

This map unit is on the flood plains, stream terraces, and alluvial fans along the Applegate River, Bear Creek, the Rogue River, and their tributaries. The vegetation in areas that have not been cultivated is mainly hardwoods or hardwoods and conifers and an understory of grasses, shrubs, and forbs. Slopes generally are 0 to 20 percent. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is about 18 to 40 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 125 to 180 days.

This unit makes up about 6 percent of the survey area. It is about 25 percent Ruch soils, 20 percent Medford soils, and 10 percent Camas soils (fig. 2). The remaining 45 percent is Barron, Central Point, Newberg, Evans, Foehlin, Kerby, Shefflein, Takilma, Abin, Coleman, Clawson, Kubli, Cove, and Gregory soils and Dumps and Riverwash. Abin, Cove, Evans, and Newberg soils and Riverwash are on flood plains. Central Point, Coleman, Foehlin, Gregory, Kerby, Kubli, and Takilma soils are on stream terraces. Barron, Clawson, and Shefflein soils are on alluvial fans. They formed in material derived from granitic rock. Dumps are in areas that have been mined.

Ruch soils are on alluvial fans and are well drained. The surface layer is gravelly silt loam. The subsoil is loam.

Medford soils are on stream terraces and are moderately well drained. The surface layer is silty clay loam. The subsoil is silty clay, silty clay loam, and clay loam. The substratum is sandy clay loam.

Camas soils are on flood plains and are excessively drained. The surface layer is sandy loam. The substratum is very gravelly loamy sand and extremely gravelly coarse sand. These soils are frequently flooded.

This unit is used mainly for cultivated crops, hay and pasture, tree fruit, or homesite development. A few areas are used for timber production or wildlife habitat.

This unit is well suited to crops. The main limitations affecting crop production are permeability, wetness in winter and spring, flooding, and seasonal droughtiness. In summer, irrigation is needed for the maximum production of most crops. Sprinkler and trickle irrigation systems are the best methods of applying water, particularly on the sloping parts of the landscape and on soils that have a rapid water intake rate. Unless protected, the Camas soils are poorly suited to crops, hay and pasture, and tree fruit because of the risk of

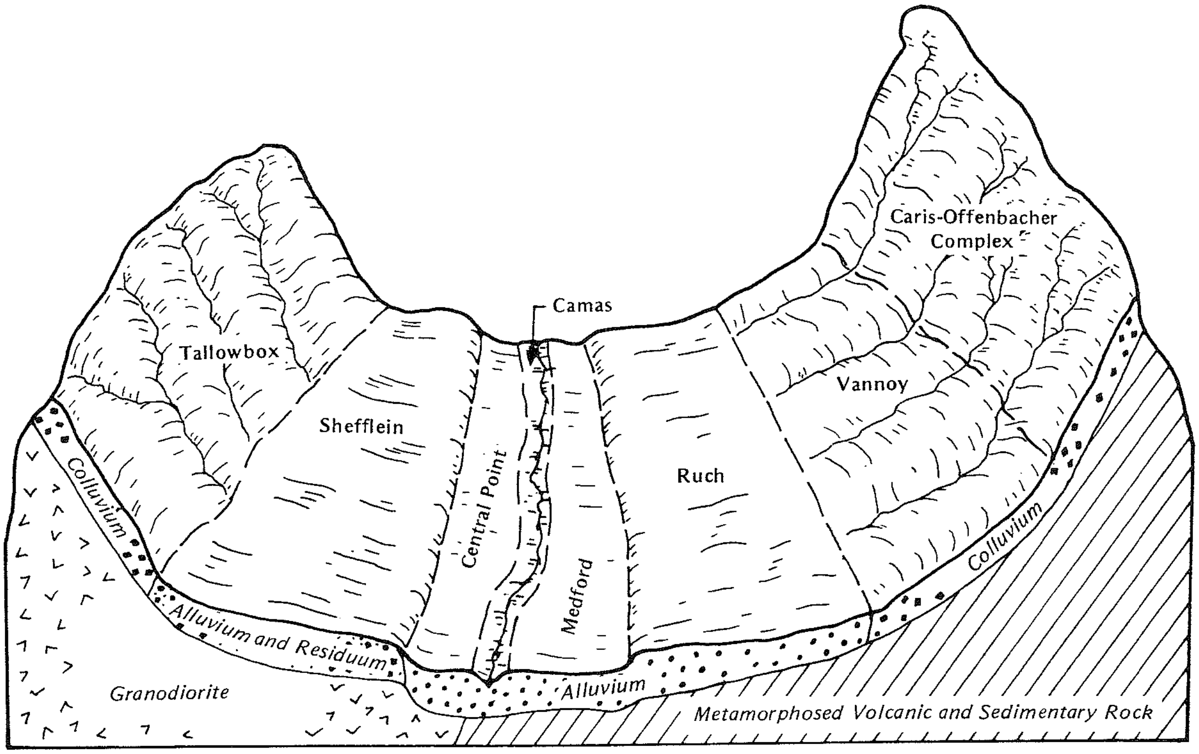


Figure 2.—Typical pattern of soils in the Ruch-Medford-Camas, Tallowbox-Shefflein, and Vannoy-Caris-Offenbacher general map units.

flooding. A subsurface drainage system can lower the water table in the Medford soils if suitable outlets are available.

The main limitations affecting homesite development are moderately slow permeability, wetness, and the shrink-swell potential in areas of the Medford soils and the hazard of flooding and very rapid permeability in areas of the Camas soils. The Ruch soils have few limitations.

Soils Formed in Material Weathered From Sedimentary and Igneous Rock and Mixed Alluvium on Fan Terraces, Ridges, Knolls, Hillslopes, and Alluvial Fans

These soils make up about 10 percent of the survey area.

2. Agate-Winlo-Provig

Well drained and somewhat poorly drained soils that are moderately deep or shallow to a hardpan or are very deep and that have a surface layer of loam, very gravelly clay loam, or very gravelly loam; on fan terraces

This map unit is on fan terraces in the valley of the Rogue River. The native vegetation on the Agate soils is mainly grasses, forbs, and shrubs. That on the Winlo soils is mainly grasses, sedges, rushes, and forbs. That on the Provig soils is mainly hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 0 to 15 percent but range to 35 percent. Elevation is 1,100 to 1,850 feet. The mean annual precipitation is about 18 to 30 inches, the mean annual temperature is 52 to 54 degrees F, and the average frost-free period is 150 to 180 days.

This unit makes up about 2 percent of the survey area. It is about 45 percent Agate soils, 25 percent Winlo soils, and 10 percent Provig soils. The remaining 20 percent is Brader and Debenger soils on low knolls; Abin, Medford, and Cove soils in drainageways; Coker and Padigan soils on concave slopes; and Carney soils.

Agate, Winlo, and Provig soils formed in poorly sorted, gravelly old stream alluvium.

Agate soils are moderately deep to a hardpan and are well drained. The surface layer is loam. The subsoil is clay loam over a hardpan. The substratum is extremely gravelly coarse sandy loam.

Winlo soils are shallow to a hardpan and are somewhat poorly drained. The surface layer is very gravelly clay loam. The subsoil is very gravelly clay over a hardpan. The substratum is extremely gravelly coarse sandy loam.

Provig soils are very deep and well drained. The surface layer is very gravelly loam. The subsoil is very gravelly clay loam. The substratum is extremely gravelly clay, extremely gravelly clay loam, and extremely gravelly sandy loam.

This unit is used mainly for hay and pasture, homesite development, livestock grazing, or wildlife habitat.

The main limitations in the areas used for hay and pasture or for livestock grazing are wetness in winter and spring, droughtiness in summer and fall, compaction, the depth to a hardpan in the Agate and Winlo soils, and the very gravelly surface layer in the Winlo and Provig soils. The Winlo soils remain wet for long periods in spring. If possible, grazing should be delayed until the soils are firm enough to withstand trampling by livestock. The use of ground equipment is limited in many areas by gravel and cobbles on the surface of the Winlo soils. In summer, irrigation is needed for maximum forage production. Because of the hardpan, overirrigation can result in a perched water table.

The main limitations affecting homesite development are wetness, the depth to a hardpan, slow permeability, and a high shrink-swell potential. The slope also is a major limitation in some areas. These soils are poorly suited to standard systems of onsite waste disposal because of wetness and the depth to a hardpan in the Winlo soils, the depth to a hardpan in the Agate soils, and slow permeability of the Provig soils.

3. Brader-Debenger-Langellain

Shallow and moderately deep, well drained and moderately well drained soils that have a surface layer of loam; on ridges and knolls

The native vegetation on this map unit is mainly hardwoods and some conifers and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 40 percent. Elevation is 1,000 to 3,500 feet. The mean annual precipitation is about 18 to 40 inches, the mean annual temperature is 48 to 54 degrees F, and the average frost-free period is 130 to 180 days.

This unit makes up about 2 percent of the survey area. It is about 35 percent Brader soils, 20 percent Debenger soils, and 15 percent Langellain soils. The remaining 30 percent is Shefflein soils on alluvial fans; Kerby, Medford, and Gregory soils on stream terraces; and Carney, Selmac, and Coker soils on concave slopes.

Brader and Debenger soils formed in colluvium derived from sedimentary rock. Langellain soils formed in colluvium and alluvium derived from sedimentary rock.

Brader soils are shallow and well drained. The surface layer and subsoil are loam.

Debenger soils are moderately deep and well drained. The surface layer is loam. The subsoil is clay loam.

Langellain soils are moderately deep and moderately well drained. The surface layer is loam. The subsoil is clay.

This unit is used mainly for hay and pasture or for livestock grazing. A few areas are used for homesite development or wildlife habitat.

The main limitations in the areas used for hay and pasture or for livestock grazing are wetness in winter and spring, the depth to bedrock, restricted permeability, droughtiness, and compaction. The slope also is a major limitation in some areas. The Langellain soils remain wet for long periods in spring. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock. In summer, irrigation is needed for maximum forage production. Because of the layer of clay in the Langellain soils and the depth to bedrock in the Brader soils, overirrigation can result in a perched water table.

The main limitations affecting homesite development are wetness, a high shrink-swell potential, and the depth to bedrock. The slope also is a major limitation in some areas.

4. Carney-Coker

Moderately deep and very deep, moderately well drained and somewhat poorly drained soils that have a surface layer of clay or cobbly clay; on alluvial fans and hillslopes

The native vegetation on the Carney soils in this map unit is mainly scattered hardwoods and an understory of grasses, shrubs, and forbs. That on the Coker soils is mainly grasses, sedges, and forbs. Slopes generally are 0 to 35 percent. Elevation is 1,200 to 4,000 feet. The mean annual precipitation is about 18 to 35 inches, the mean annual temperature is 45 to 54 degrees F, and the average frost-free period is 120 to 180 days.

This unit makes up about 6 percent of the survey area. It is about 55 percent Carney soils and 10 percent Coker soils. The remaining 35 percent is Brader and Debenger soils on knolls; Heppsie and McMullin soils on hillslopes; Padigan and Phoenix soils on concave slopes; Cove soils in drainageways; and Darow, Medco, and Tablerock soils.

Carney soils formed in alluvium and colluvium derived from igneous rock. Coker soils formed in clayey alluvium derived from igneous rock.

Carney soils are moderately deep and moderately well drained. The surface layer is clay or cobbly clay. The subsoil is clay.

Coker soils are very deep and somewhat poorly drained. The surface layer and subsoil are clay.

This unit is used mainly for tree fruit, hay and pasture, homesite development, livestock grazing, or wildlife habitat.

The main limitations in the areas used for hay and pasture or for tree fruit are the high content of clay, a slow rate of water intake, wetness in winter and spring, droughtiness in summer and fall, and the slope. The Coker soils remain wet for long periods in spring. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock. In summer, irrigation is needed for the maximum production of forage crops and tree fruit. Because of very slow permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Because of the slope in some areas, sprinkler and trickle irrigation systems are the best methods of applying water. The high content of clay severely limits tillage. The soils are well suited to permanent pasture.

The main limitations affecting homesite development are very slow permeability, a high shrink-swell potential, the depth to bedrock, low strength, and wetness. The slope also is a major limitation in some areas. These soils are poorly suited to standard systems of onsite waste disposal because of the very slow permeability and depth to bedrock in the Carney soils and the very slow permeability and wetness in the Coker soils. Properly designing the foundations and footings of buildings helps to prevent the structural damage caused by shrinking and swelling.

The more sloping areas of this unit are used for livestock grazing. The main limitations affecting livestock grazing are compaction, erosion, droughtiness, and the slope.

Soils Formed in Material Weathered From Granodiorite on Alluvial Fans, Ridges, and Hillslopes.

These soils make up about 5 percent of the survey area.

5. Tallowbox-Shefflein

Moderately deep and deep, somewhat excessively drained and well drained soils that have a surface layer of gravelly sandy loam or loam and receive 25 to 40 inches of annual precipitation

This map unit is on hillslopes, ridges, and alluvial fans. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 2 to 70 percent. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is about 25 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 3 percent of the survey area. It is about 55 percent Tallowbox soils and 30 percent Shefflein soils (fig. 2). The remaining 15 percent is Barron soils on alluvial fans, Clawson soils on concave slopes, and Rogue soils at elevations of more than 4,000 feet.

Tallowbox soils are moderately deep and somewhat excessively drained. The surface layer and subsoil are gravelly sandy loam.

Shefflein soils are deep and well drained. The surface layer is loam. The subsoil is clay loam and sandy clay loam.

This unit is used mainly for timber production or wildlife habitat. A few of the more gently sloping areas of the Shefflein soils are used for hay and pasture or for homesite development.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. Management that minimizes erosion is essential when timber is harvested. Site preparation is needed to ensure adequate reforestation. High-lead or other cable logging systems should be used on the steeper slopes.

Irrigation is needed in the areas used for hay and pasture. Sprinkler irrigation is the best method of applying water. This method helps to prevent excessive runoff and minimizes the risk of erosion.

The Shefflein soils are well suited to homesite development. The main limitation is moderately slow permeability.

6. Wolfpeak-Tethrick-Siskiyou

Very deep and moderately deep, well drained and somewhat excessively drained soils that have a surface layer of sandy loam or gravelly sandy loam and receive 40 to 50 inches of annual precipitation

This map unit is on hillslopes, ridges, and old slump benches. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 3 to 75 percent. Elevation is 1,200 to 4,000 feet. The mean annual precipitation is about 40 to 50 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 1 percent of the survey area. It is about 25 percent Wolfpeak soils, 25 percent Tethrick soils, and 25 percent Siskiyou soils. The remaining 25 percent is Beekman and Colestine soils on steep hillslopes; Josephine and Pollard soils on gently sloping hillslopes and on concave slopes; and Goolaway, Musty, and Speaker soils.

Wolfpeak soils are very deep and well drained. The surface layer is sandy loam. The subsoil is clay loam.

Tethrick soils are very deep and well drained. The surface layer, subsoil, and substratum are sandy loam.

Siskiyou soils are moderately deep and somewhat excessively drained. The surface layer is gravelly sandy loam. The subsoil and substratum are sandy loam.

This unit is used mainly for timber production or wildlife habitat. A few of the more gently sloping areas of the Wolfpeak soils are used for hay and pasture or for homesite development.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. Management that minimizes erosion is essential when timber is harvested. Site preparation is needed to ensure adequate reforestation. High-lead or other cable logging systems should be used on the steeper slopes.

Irrigation is needed in the areas used for hay and pasture. Sprinkler irrigation is the best method of applying water. This method helps to prevent excessive runoff and minimizes the risk of erosion.

The Wolfpeak soils are well suited to homesite development. The main limitation is moderately slow permeability.

7. Steinmetz-Lettia

Very deep and deep, somewhat excessively drained and well drained soils that have a surface layer of sandy loam and receive 45 to 60 inches of precipitation

This map unit is on hillslopes and old slump benches. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 12 to 75 percent. Elevation is 1,800 to 4,000 feet. The mean annual precipitation is about 45 to 60 inches, the mean annual temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 1 percent of the survey area. It is about 50 percent Steinmetz soils and 25 percent Lettia soils (fig. 3). The remaining 25 percent is Acker and Dumont soils on gently sloping hillslopes and on concave slopes; Atring and Kanid soils on steep hillslopes; Dubakella, Gravecreek, and Pearsoll soils, which formed in material derived from serpentinitic rock; Goolaway, Musty, and Norling soils; and Rogue soils at elevations of more than 4,000 feet.

Steinmetz soils are very deep and somewhat excessively drained. The surface layer and subsoil are sandy loam.

Lettia soils are deep and well drained. The surface layer is sandy loam. The subsoil is clay loam and loam. The substratum is loam.

This unit is used mainly for timber production or wildlife habitat. The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. Management that minimizes erosion is essential when timber is harvested. Site preparation is needed to ensure adequate reforestation. High-lead or other cable logging systems should be used on the steeper slopes.

Soils Formed in Material Weathered From Igneous Rock on Plateaus and Hillslopes

These soils make up about 40 percent of the survey area.

8. Freezener-Geppert

Very deep and moderately deep, well drained soils that have a surface layer of gravelly loam or very cobbly loam

This map unit is on plateaus and hillslopes. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 70 percent. Elevation is 1,500 to 4,000 feet. The mean annual precipitation is about 30 to 50 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 5 percent of the survey area. It is about 65 percent Freezener soils and 30 percent Geppert soils. The remaining 5 percent is McMullin soils on ridges and steep hillslopes and Terrabella soils on concave slopes and near drainageways.

Freezener soils are very deep. The surface layer is gravelly loam. The subsoil is clay loam and clay.

Geppert soils are moderately deep. The surface layer is very cobbly loam. The subsoil is extremely cobbly clay loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat. A few areas are used for hay and pasture.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Geppert soils increases the seedling mortality rate. High-lead or other cable logging systems should be used on the steeper slopes.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The slope limits access by livestock in some areas.

9. Straight-Freezener-Shippa

Moderately deep, very deep, and shallow, well drained soils that have a surface layer of extremely gravelly loam or gravelly loam

This map unit is on hillslopes and plateaus. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 70 percent. Elevation is 2,000 to 4,000 feet. The mean annual precipitation is about 35 to 55 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 4 percent of the survey area. It is about 30 percent Straight soils, 25 percent Freezener soils, and 10 percent Shippa soils. The remaining 35 percent is McMullin soils on ridges and steep hillslopes, Takilma soils in drainageways, Geppert and McNull soils, Medco soils on gently sloping hillslopes and on concave slopes, and Terrabella soils on concave slopes and near drainageways.

Straight soils are moderately deep. The surface layer is extremely gravelly loam. The subsoil is very gravelly loam and very cobbly clay loam.

Freezener soils are very deep. The surface layer is gravelly loam. The subsoil is clay loam and clay.

Shippa soils are shallow. The surface layer is extremely gravelly loam. The subsoil is extremely cobbly loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are erosion, compaction, plant competition, the slope, and the depth to bedrock in the Shippa soils. Seedling mortality also is a major management concern, particularly on south-facing slopes. Site preparation is needed to ensure optimum reforestation. The large number of rock fragments in the soils and the depth to bedrock in the Shippa soils increase the seedling

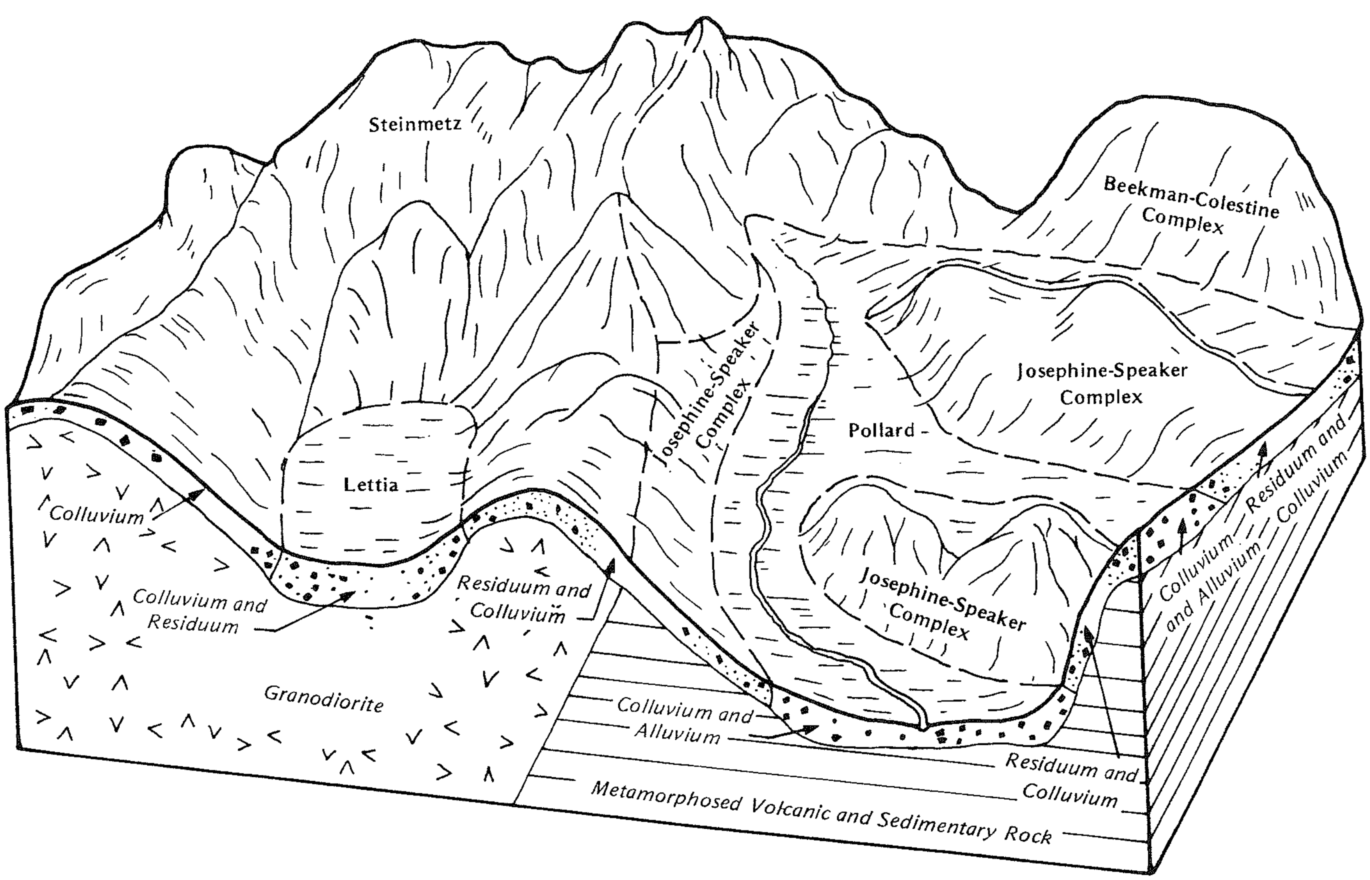


Figure 3.—Typical pattern of soils in the Steinmetz-Lettia and Josephine-Beekman-Speaker general map units.

mortality rate. High-lead or other cable logging systems should be used on the steeper slopes. Windthrow is a hazard on the Shippa soils because of the limited depth to bedrock, which restricts the rooting depth.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The slope limits access by livestock in some areas.

10. Dumont-Coyata

Very deep and moderately deep, well drained soils that have a surface layer of gravelly loam

This map unit is on plateaus and hillslopes. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 80 percent. Elevation is 2,000 to 4,000 feet. The mean annual precipitation is about 40 to 50 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 3 percent of the survey area. It is about 40 percent Dumont soils and 30 percent Coyata soils. The remaining 30 percent is Reinecke soils on nearly level plateaus, Donegan and Killet soils at elevations of more than 4,000 feet, and Sibannac and Terrabella soils on concave slopes and near drainageways.

Dumont soils are very deep. The surface layer is gravelly loam. The subsoil is clay.

Coyata soils are moderately deep. The surface layer is gravelly loam. The subsoil is very cobbly and extremely cobbly clay loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Coyata soils increases the seedling mortality rate. High-lead or other cable logging systems should be used on the steeper slopes.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The slope limits access by livestock in some areas.

11. Medco-McMullin

Moderately deep and shallow, moderately well drained and well drained soils that have a surface layer of cobbly clay loam or gravelly loam

This map unit is on hillslopes. The native vegetation on the Medco soils is mainly hardwoods, a few scattered conifers, and an understory of grasses, shrubs, and forbs. That on the McMullin soils is mainly grasses, shrubs, and forbs. Slopes generally are 3 to 60 percent. Elevation is 1,500 to 4,000 feet. The mean annual precipitation is about 20 to 35 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 8 percent of the survey area. It is about 40 percent Medco soils and 35 percent McMullin soils. The remaining 25 percent is Heppsie soils on steep hillslopes, McNull and Carney soils, Coker soils on concave slopes, and Rock outcrop.

Medco soils are moderately deep and moderately well drained. The surface layer is cobbly clay loam. The subsoil is clay.

McMullin soils are shallow and well drained. The surface layer is gravelly loam. The subsoil is gravelly clay loam.

This unit is used mainly for livestock grazing or wildlife habitat. A few of the more gently sloping areas of the Medco soils are used for hay and pasture. A few areas of the Medco soils that receive enough precipitation are used for timber production.

The main limitations affecting livestock grazing are compaction, erosion, the depth to bedrock, droughtiness, seasonal wetness, the Rock outcrop, stones and cobbles on the surface, and the slope. The use of ground equipment generally is not practical on the McMullin soils because of the stones on the surface, the Rock outcrop, and the slope. The Rock outcrop and the slope also limit access by livestock in some areas. The Medco soils remain wet for long periods in spring. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock.

The main limitations in the areas used for hay and pasture are wetness in winter and spring, droughtiness in summer and fall, and very slow permeability in the subsoil. In summer, irrigation is needed for maximum forage production.

The main limitations affecting timber production are erosion, compaction, slumping, seasonal wetness, and plant competition. Seedling mortality also is a major management concern, particularly on south-facing slopes.

12. Skookum-McMullin-Rock outcrop

Rock outcrop and moderately deep and shallow, well drained soils that have a surface layer of very cobbly loam or gravelly loam

This map unit is on hillslopes and plateaus. The native vegetation on the Skookum soils is mainly hardwoods, scattered conifers, and an understory of grasses, shrubs, and forbs. That on the McMullin soils is mainly grasses, shrubs, and forbs. Slopes generally are 1 to 70 percent. Elevation is 2,800 to 4,800 feet. The mean annual precipitation is about 18 to 35 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 150 days.

This unit makes up about 1 percent of the survey area. It is about 35 percent Skookum soils, 20 percent McMullin soils, and 20 percent Rock outcrop. The remaining 25 percent is Bogus soils on forested, north-facing slopes; Shoat soils on mounds in areas of patterned ground; Randcore soils between the mounds in areas of patterned ground; Carney soils on concave slopes; and Heppsie and Lorella soils.

Skookum soils are moderately deep. The surface layer is very cobbly loam. The subsoil is very cobbly clay loam, very cobbly clay, and extremely cobbly clay.

McMullin soils are shallow. The surface layer is gravelly loam. The subsoil is gravelly clay loam.

Rock outcrop consists of areas of exposed bedrock.

This unit is used mainly for livestock grazing or wildlife habitat. The main limitations affecting livestock grazing are compaction, erosion, the Rock outcrop, cobbles and stones on the surface, droughtiness, the depth to bedrock, and the slope. The use of ground equipment is not practical because of the cobbles and stones on the surface, the Rock outcrop, and the slope. The Rock outcrop and the slope also limit access by livestock in some areas. The suitability of this unit for range seeding is limited by the depth to bedrock in the McMullin soils, droughtiness, and the Rock outcrop.

13. McNull-McMullin-Medco

Moderately deep and shallow, well drained and moderately well drained soils that have a surface layer of loam, gravelly loam, or cobbly clay loam

The map unit is on hillslopes. The native vegetation on the McNull and Medco soils is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. That on the McMullin soils is mainly grasses, shrubs, and forbs. Slopes generally are 12 to 60 percent. Elevation is 1,500 to 4,000 feet. The mean annual precipitation is about 25 to 40 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 8 percent of the survey area. It is about 45 percent McNull soils, 20 percent McMullin soils, and 20 percent Medco soils. The remaining 15 percent is Coker soils on concave slopes, Carney soils, and Rock outcrop.

McNull soils are moderately deep and well drained. The surface layer is loam. The subsoil is clay loam and cobbly clay.

McMullin soils are shallow and well drained. The surface layer is gravelly loam. The subsoil is gravelly clay loam.

Medco soils are moderately deep and moderately well drained. The surface layer is cobbly clay loam. The subsoil is clay.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat. The McNull and Medco soils are used mainly for timber production or livestock grazing. The McMullin soils are used for livestock grazing.

The main limitations affecting timber production are erosion, compaction, slumping, plant competition, seasonal wetness, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. Site preparation is needed to ensure adequate reforestation. The Medco soils are subject to slumping. Road failure and landslides are likely to occur after road construction or clearcutting. The seasonal water table in the Medco soils restricts the use of equipment. High-lead or other cable logging systems should be used on the steeper slopes.

The main limitations affecting livestock grazing are compaction, erosion, the depth to bedrock, droughtiness, the Rock outcrop, stones and cobbles on the surface, seasonal wetness, and the slope. The use of ground equipment generally is not practical on the McMullin soils because of the stones on the surface, the Rock outcrop, and the slope. The Rock outcrop and the slope also limit access by livestock in some areas. The Medco soils remain wet for long periods in spring. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock.

14. Tatouche-Bybee

Very deep, well drained and somewhat poorly drained soils that have a surface layer of gravelly loam or loam

This map unit is on hillslopes and plateaus. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 65 percent. Elevation is 3,600 to 5,500 feet. The mean annual precipitation is about 30 to 50 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

This unit makes up about 3 percent of the survey area. It is about 45 percent Tatouche soils and 30 percent Bybee soils. The remaining 25 percent is Farva, Hobit, and Pinehurst soils; Woodseye soils on ridges and convex slopes; Kanutchan and Sibannac soils on concave slopes and near drainageways; and Rock outcrop.

Tatouche soils are well drained. The surface layer is gravelly loam. The subsoil is gravelly clay loam and clay.

Bybee soils are somewhat poorly drained. The surface layer is loam. The subsoil and substratum are clay.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are erosion, compaction, slumping, plant competition, seasonal wetness, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes and in areas where air drainage is restricted. Site preparation is needed to ensure adequate reforestation. Air drainage is restricted in some areas. Proper timber harvesting methods can reduce the effects of frost on regeneration. The Bybee soils are subject to slumping. Road failure and landslides are likely to occur on these soils after road construction or clearcutting. The seasonal high water table in the Bybee soils restricts the use of equipment. High-lead or other cable logging systems should be used on the steeper slopes.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The slope limits access by livestock in some areas.

15. Oatman-Otwin

Very deep and moderately deep, well drained soils that have a surface layer of cobbly loam or stony sandy loam

This map unit is on plateaus and hillslopes. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs. Slopes generally are 0 to 65 percent. Elevation is 4,800 to 6,600 feet. The mean annual precipitation is about 30 to 40 inches, the mean annual temperature is 40 to 44 degrees F, and the average frost-free period is less than 100 days.

This unit makes up about 2 percent of the survey area. It is about 75 percent Oatman soils and 10 percent Otwin soils. The remaining 15 percent is Hoxie and Klamath soils on concave slopes and near drainageways.

Oatman soils are very deep. The surface layer is cobbly loam. The subsoil and substratum are very cobbly sandy loam.

Otwin soils are moderately deep. The surface layer is stony sandy loam. The subsoil is very cobbly sandy loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes and in areas where air drainage is restricted. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the soils increases the seedling mortality rate. Air drainage is restricted in some areas. Proper timber harvesting methods can reduce the effects of frost on regeneration. High-lead or other cable logging systems should be used on the steeper slopes.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The slope limits access by livestock in some areas.

16. Rustlerpeak-Farva

Moderately deep, well drained soils that have a surface layer of gravelly loam or very cobbly loam

This map unit is on plateaus and hillslopes. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs. Slopes generally are 3 to 70 percent. Elevation is 3,600 to 6,100 feet. The mean annual precipitation is about 40 to 55 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

This unit makes up about 1 percent of the survey area. It is about 40 percent Rustlerpeak soils and 35 percent Farva soils. The remaining 25 percent is Woodseye soils on ridges and convex slopes; Hobit, Pinehurst, and Snowlin soils; Sibannac soils on concave slopes and near drainageways; and Rock outcrop.

Rustlerpeak soils have a surface layer of gravelly loam. The subsoil is very cobbly clay loam.

Farva soils have a surface layer of very cobbly loam. The subsoil and substratum are extremely cobbly loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes and in areas where air drainage is restricted. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the soils increases the seedling mortality rate. Air drainage is restricted in some areas. Proper timber harvesting methods can reduce the effects of frost on regeneration. High-lead or other cable logging systems should be used on the steeper slopes.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The slope limits access by livestock in some areas.

17. Farva-Pinehurst

Moderately deep and very deep, well drained soils that have a surface layer of very cobbly loam or loam

This map unit is on plateaus and hillslopes. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs. Slopes generally are 3 to 70 percent. Elevation is 3,600 to 5,500 feet. The mean annual precipitation is about 30 to 55 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

This unit makes up about 5 percent of the survey area. It is about 65 percent Farva soils and 20 percent Pinehurst soils. The remaining 15 percent is Woodseye soils on ridges and convex slopes, Tatouche soils, Bybee and Kanutchan soils on concave slopes, Sibannac soils on concave slopes and near drainageways, and Rock outcrop.

Farva soils are moderately deep. The surface layer is very cobbly loam. The subsoil and substratum are extremely cobbly loam.

Pinehurst soils are very deep. The surface layer is loam. The subsoil is clay loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes and in areas where air drainage is restricted. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Farva soils increases the seedling mortality rate. Air drainage is restricted in some areas. Proper timber harvesting methods can reduce the effects of frost on regeneration. High-lead or other cable logging systems should be used on the steeper slopes.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The slope limits access by livestock in some areas.

Soils Formed in Material Weathered From Altered Sedimentary and Igneous Rock on Ridges and Hillslopes

These soils make up about 23 percent of the survey area.

18. Acker-Norling-Kanid

Very deep, moderately deep, and deep, well drained soils that have a surface layer of gravelly loam or very gravelly loam

This map unit is on hillslopes. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 12 to 80 percent. Elevation is 2,400 to 4,100 feet. The mean annual precipitation is about 45 to 60 inches, the mean annual temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 1 percent of the survey area. It is about 30 percent Acker soils, 20 percent Norling soils, and 15 percent Kanid soils. The remaining 35 percent is Abegg soils on alluvial fans; Dumont soils on concave slopes and gently sloping hillslopes; Atring soils on steep hillslopes; Dubakella, Gravecreek, and Pearsoll soils, which formed in material derived from serpentinitic rock; Jayar soils at elevations of more than 4,000 feet; and Jayar Variant soils at elevations of more than 4,700 feet.

Acker soils are very deep. The surface layer is gravelly loam. The subsoil is gravelly clay loam.

Norling soils are moderately deep. The surface layer is very gravelly loam. The subsoil is gravelly and very cobbly clay loam.

Kanid soils are deep. The surface layer is very gravelly loam. The subsoil is very gravelly clay loam.

This unit is used mainly for timber production or wildlife habitat. The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Kanid soils increases the seedling mortality rate. High-lead or other cable logging systems should be used on the steeper slopes.

19. Josephine-Beekman-Speaker

Deep and moderately deep, well drained soils that have a surface layer of gravelly loam or loam

This map unit is on hillslopes. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 12 to 80 percent. Elevation is 1,200 to 4,000 feet. The mean annual precipitation is about 40 to 50 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 5 percent of the survey area. It is about 30 percent Josephine soils, 20 percent Beekman soils, and 20 percent Speaker soils (fig. 3). The remaining 30 percent is Camas, Evans, and Newberg soils on flood plains; Abegg and Pollard soils on alluvial fans and concave slopes; McMullin soils on ridges and steep hillslopes; Dubakella and Pearsoll soils, which formed in material derived from serpentinitic rock; and Colestine soils on steep hillslopes.

Josephine soils are deep. The surface layer is gravelly loam. The subsoil is gravelly clay loam.

Beekman soils are moderately deep. The surface layer is gravelly loam. The subsoil is extremely gravelly loam.

Speaker soils are moderately deep. The surface layer is loam. The subsoil is loam and gravelly clay loam.

This unit is used mainly for timber production or wildlife habitat. The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Beekman soils increases the seedling mortality rate. High-lead or other cable logging systems should be used on the steeper slopes.

20. Vannoy-Caris-Offenbacher

Moderately deep, well drained soils that have a surface layer of silt loam or gravelly loam

This map unit is on hillslopes. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 12 to 80 percent. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is about 20 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 15 percent of the survey area. It is about 35 percent Vannoy soils, 25 percent Caris soils, and 10 percent Offenbacher soils (fig. 2). The remaining 30 percent is Camas, Evans, and Newberg soils on flood plains; Abegg and Ruch soils on alluvial fans; Selmac soils on concave slopes; Manita and Shefflein soils on alluvial fans and gently sloping hillslopes; Dubakella soils, which formed in material derived from serpentinitic rock; McMullin soils on ridges and steep hillslopes; Tallowbox and Voorhies soils; and Jayar soils at elevations of more than 4,000 feet.

Vannoy soils have a surface layer of silt loam. The subsoil is clay loam, gravelly clay loam, and extremely gravelly clay loam.

Caris soils have a surface layer of gravelly loam. The subsoil is very gravelly clay loam and extremely gravelly loam.

Offenbacher soils have a surface layer of gravelly loam. The subsoil is loam.

This unit is used mainly for timber production or wildlife habitat. A few of the more gently sloping areas of the Vannoy soils are used for pasture or homesite development.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Caris soils increases the seedling mortality rate. High-lead or other cable logging systems should be used on the steeper slopes.

Irrigation can increase forage production on the Vannoy soils. The water supply, however, is limited.

The main limitations affecting homesite development on the Vannoy soils are the depth to bedrock, the slope, moderately slow permeability, and low strength.

21. Goolaway-Beekman-Musty

Moderately deep, well drained soils that have a surface layer of silt loam or gravelly loam

This map unit is on ridges and hillsides. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 12 to 80 percent. Elevation is 1,500 to 4,000 feet. The mean annual precipitation is about 40 to 50 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 2 percent of the survey area. It is about 25 percent Goolaway soils, 20 percent Beekman soils, and 10 percent Musty soils. The remaining 45 percent is Colestine soils on steep hillslopes; Pollard and Wolfpeak soils on concave slopes; Josephine, Speaker, Tethrick, and Steinmetz soils; and Snowbrier soils at elevations of more than 3,600 feet.

Goolaway soils have a surface layer and subsoil of silt loam.

Beekman soils have a surface layer of gravelly loam. The subsoil is extremely gravelly loam.

Musty soils have a surface layer of gravelly loam. The subsoil is very cobbly loam.

This unit is used mainly for timber production or wildlife habitat. The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes. The hazard of erosion is high. Management that minimizes erosion is essential when timber is harvested. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Beekman and Musty soils increases the seedling mortality rate. High-lead or other cable logging systems should be used on the steeper slopes.

Soils Formed in Material Weathered From Pyroclastics and Igneous Rock on Plateaus and Hillslopes

These soils make up about 16 percent of the survey area.

22. Hukill-Geppert

Deep and moderately deep, well drained soils that are gravelly loam in the upper part of the surface layer or have a surface layer of very cobbly loam

This map unit is on plateaus and hillslopes. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 35 percent but are as much as 70 percent. Elevation is 2,000 to 3,000 feet. The mean annual precipitation is about 30 to 45 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

This unit makes up about 1 percent of the survey area. It is about 70 percent Hukill soils and 10 percent Geppert soils. The remaining 20 percent is Terrabella soils on concave slopes and Freezener soils.

Hukill soils are deep. The upper part of the surface layer is gravelly loam, and the lower part is gravelly clay loam. The subsoil is gravelly clay loam and gravelly clay.

Geppert soils are moderately deep. The surface layer is very cobbly loam. The subsoil is extremely cobbly clay loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are compaction and plant competition on the Hukill soils and erosion, compaction, plant competition, and seedling mortality on the Geppert soils. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Geppert soils increases the seedling mortality rate. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction.

The main limitation affecting livestock grazing is compaction.

23. Crater Lake-Alcot-Barhiskey

Very deep, well drained, somewhat excessively drained, and excessively drained soils that have a surface layer of sandy loam, gravelly sandy loam, or gravelly loamy sand

This map unit is on plateaus, hillslopes, and outwash plains. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 0 to 35 percent but are as much as 70 percent. Elevation is 2,000 to 3,200 feet. The mean annual precipitation is about 40 to 50 inches, the mean annual temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 150 days.

This unit makes up about 1 percent of the survey area. It is about 35 percent Crater Lake soils, 20 percent Alcot soils, and 20 percent Barhiskey soils (fig. 4). The remaining 25 percent is Sibannac soils near drainageways and Barhiskey Variant, Coyata, Dumont, and Reinecke soils.

Crater Lake soils are well drained. The surface layer, subsoil, and substratum are sandy loam.

Alcot soils are somewhat excessively drained. The surface layer and subsoil are gravelly sandy loam. The substratum is very cobbly sandy loam.

Barhiskey soils are excessively drained. The surface layer is gravelly loamy sand. The substratum is gravelly sand.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat. A few areas are used for hay and pasture or for homesite development.

The main limitations affecting timber production are compaction, erosion, soil displacement, and plant competition. Seedling mortality also is a major management concern, particularly on south-facing slopes and in areas where air drainage is restricted. Site preparation is needed to ensure adequate reforestation. The sandy texture and low available water capacity of the Barhiskey soils increase the seedling mortality rate. Air drainage is restricted in some areas. Proper timber harvesting methods can reduce the effects of frost on regeneration. Displacement of the surface layer occurs most readily when the soils are dry. Compaction of the Crater Lake and Alcot soils can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction.

The main limitations affecting livestock grazing are compaction, soil displacement, and erosion.

The main limitations affecting homesite development are very rapid or rapid permeability, a high content of volcanic ash and pumice in the Crater Lake and Alcot soils, and a high content of sand in the Barhiskey soils.

24. Pokegema-Woodcock

Deep and very deep, well drained soils that are loam or stony loam in the upper part of the surface layer

This map unit is on hillslopes and plateaus. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 55 percent. Elevation is 3,800 to 6,600 feet. The mean annual precipitation is about 25 to 35 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

This unit makes up about 9 percent of the survey area. It is about 50 percent Pokegema soils and 35 percent Woodcock soils. The remaining 15 percent is Klamath soils on concave slopes and near drainageways and Aspenlake and Whiteface soils on alluvial fans.

Pokegema soils are deep. The upper part of the surface layer is loam, and the lower part is clay loam. The subsoil and substratum are gravelly clay.

Woodcock soils are very deep. The upper part of the surface layer is stony loam, and the lower part is very gravelly loam. The subsoil is very gravelly clay loam.

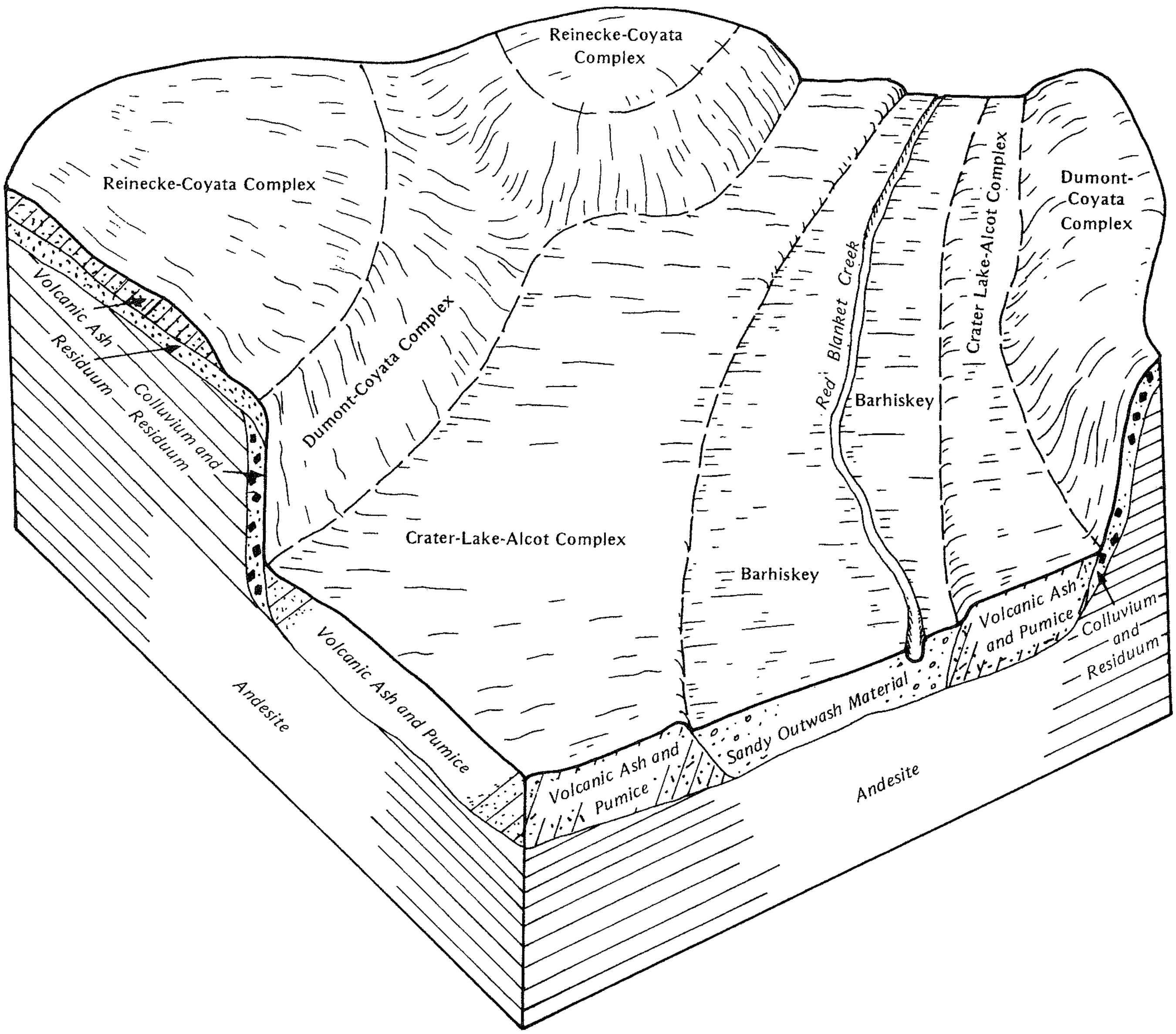


Figure 4.—Typical pattern of soils in the Crater Lake-Alcot-Barhiskey general map unit.

The substratum is gravelly clay loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes and in areas where air drainage is restricted. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Woodcock soils increases the seedling mortality rate. Air drainage is restricted in some areas. Proper timber harvesting methods can reduce the effects of frost on regeneration. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. High-lead or other cable logging systems should be used on the steeper slopes.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The slope limits access by livestock in some areas.

25. Pinehurst-Greystoke-Bly

Very deep and deep, well drained soils that have a surface layer of loam or are stony loam in the upper part of the surface layer

This map unit is on hillsides and plateaus. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 75 percent. Elevation is 3,000 to 5,200 feet. The mean annual precipitation is about 15 to 30 inches, the mean annual temperature is 42 to 46 degrees F, and the average frost-free period is less than 100 days.

This unit makes up about 4 percent of the survey area. It is about 40 percent Pinehurst soils, 25 percent Greystoke soils, and 10 percent Bly soils. The remaining 25 percent is Kanutchan soils on concave slopes and Booth, Kanutchan Variant, Lorella, Merlin, and Royst soils.

Pinehurst soils formed in colluvium derived from igneous rock. Greystoke soils formed in colluvium and residuum derived from igneous rock. Bly soils formed in sediment derived from igneous rock and volcanic ash.

Pinehurst soils are very deep. The surface layer is loam. The subsoil is clay loam.

Greystoke soils are deep. The upper part of the surface layer is stony loam, and the lower part is very cobbly loam. The subsoil is very cobbly loam and extremely gravelly clay loam.

Bly soils are very deep. The surface layer is loam. The subsoil is clay loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management concern, particularly on south-facing slopes and in areas where air drainage is restricted. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Greystoke soils increases the seedling mortality rate. Air drainage is restricted in some areas. Proper timber harvesting methods can reduce the effects of frost on regeneration. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. High-lead or other cable logging systems should be used on the steeper slopes.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The slope limits access by livestock in some areas.

26. Campfour-Paragon

Very deep and moderately deep, well drained soils that have a surface layer of loam or cobbly loam

This map unit is on plateaus and hillslopes. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 35 percent. Elevation is 3,000 to 4,400 feet. The mean annual precipitation is about 20 to 25 inches, the mean annual temperature is 45 to 51 degrees F, and the average frost-free period is 100 to 130 days.

This unit makes up about 1 percent of the survey area. It is about 35 percent Campfour soils and 30 percent Paragon soils. The remaining 35 percent is Shoat soils on mounds in areas of patterned ground, Randcore soils between the mounds in areas of patterned ground, McMullin soils on ridges and steep hillslopes, and Skookum soils.

Campfour soils are very deep. The surface layer is loam. The subsoil is clay loam and gravelly clay loam.

Paragon soils are moderately deep. The surface layer is cobbly loam. The subsoil is gravelly clay loam.

This unit is used mainly for timber production, livestock grazing, or wildlife habitat.

The main limitations affecting timber production are compaction and erosion. Seedling mortality also is a major management concern, particularly on south-facing slopes and in areas where air drainage is restricted. The large number of rock fragments in the Paragon soils increases the seedling mortality rate. Air drainage is restricted in some areas. Proper timber harvesting methods can reduce the effects of frost on regeneration. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction.

The main limitations affecting livestock grazing are compaction and erosion.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 115. The yield at culmination of the mean annual increment is 6,360 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 50,700 board feet per acre (Scribner rule) at 130 years. On the basis of a 50-year curve, the mean site index is 90.

The main limitations affecting timber production are compaction, seedling mortality, and plant competition. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. If the soil is excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer during summer and the low available water capacity increase the seedling mortality rate. The large number of rock fragments in the soil also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The vegetative site is Pine-Douglas Fir-Fescue.

1C—Abegg gravelly loam, 7 to 12 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 2,500 feet. The mean annual precipitation is 30 to 40 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface is covered with a layer of needles, leaves, and twigs about ½ inch thick. The surface layer is very dark grayish brown gravelly loam about 5 inches thick. The next layer is very dark grayish brown and brown very gravelly loam about 17 inches thick. The upper 16 inches of the subsoil is dark yellowish brown extremely gravelly loam. The lower 28 inches is brown and yellowish brown extremely gravelly clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is cobbly or stony.

Included in this unit are small areas of Xerorthents; Ruch and Vannoy soils; Camas, Evans, and Newberg soils on flood plains; and Takilma soils on terraces. Also included are small areas of soils that are similar to the Abegg soil but have bedrock at a depth of 40 to 60 inches, poorly drained soils near drainageways, and Abegg soils that have slopes of less than 7 or more than 12 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderate in the Abegg soil. Available water capacity is about 4 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for hay and pasture. It also is used for timber production and homesite development.

This unit is suited to hay and pasture. It is limited mainly by the slope, droughtiness, and the large number of rock fragments on and below the surface. The rock fragments limit the use of equipment and increase maintenance costs.

In summer, irrigation is needed for the maximum production of most forage crops. Because of the slope, sprinkler irrigation is the best method of applying water. This method permits an even, controlled application of water, helps to prevent excessive runoff, and minimizes the risk of erosion. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Because the soil is droughty, the applications should be light and frequent.

Seedbeds should be prepared on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth.

Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the large number of rock fragments on and below the surface and the slope. Cutbanks are not stable and are subject to slumping. To keep cutbanks from caving in, excavations may require special retainer walls. Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites.

Establishing plants is difficult in areas where the surface layer has been removed and the extremely gravelly subsoil exposed. Mulching and applying fertilizer help to establish plants in cut areas. Gravel and cobbles should be removed from disturbed areas, particularly areas used for lawns. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of droughtiness and a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

This unit is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, California black oak, and Pacific madrone. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and California fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 115. The yield at culmination of the mean annual increment is 6,360 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 50,700 board feet per acre (Scribner rule) at 130 years. On the basis of a 50-year curve, the mean site index is 90.

The main limitations affecting timber production are compaction, seedling mortality, and plant competition. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. If the soil is excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer during summer and the low available water capacity increase the seedling mortality rate. The large number of rock fragments in the soil also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The vegetative site is Pine-Douglas Fir-Fescue.

2A—Abin silty clay loam, 0 to 3 percent slopes. This very deep, moderately well drained soil is on flood plains. It formed in alluvium derived from mixed sources. Elevation is 1,000 to 2,500 feet. The mean annual precipitation is 18 to 35 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The native vegetation in areas that have not been cultivated is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is very dark grayish brown silty clay loam about 34 inches thick. The upper 10 inches of the substratum is very dark brown silty clay loam. The lower part to a depth of 65 inches is very dark grayish brown silty clay loam.

Included in this unit are small areas of Evans, Newberg, and Camas soils; Central Point, Gregory, and Medford soils on terraces; and Cove soils on concave slopes. Also included are small areas of Abin soils that have slopes of more than 3 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Abin soil. Available water capacity is about 11 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table fluctuates between depths of 3 and 5 feet from December through April. This soil is occasionally flooded for brief periods from December through April.

This unit is used mainly for irrigated crops, such as alfalfa hay and small grain. Other crops include corn for silage and tree fruit. Some areas are used for grass-legume hay, pasture, or homesite development.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding, the moderately slow permeability, and wetness in winter and spring. The risk of flooding can be reduced by levees, dikes, and diversions.

In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. The system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

A subsurface drainage system can lower the water table if a suitable outlet is available. Land smoothing and open ditches can reduce surface wetness.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet and by planting a cover crop. A permanent cover crop helps to control runoff and erosion.

Maintaining a protective plant cover in winter reduces the soil loss resulting from flooding. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the flooding, the moderately slow permeability, the wetness, the shrink-swell potential, and low strength.

The wetness, the moderately slow permeability, and the hazard of flooding increase the possibility that septic tank absorption fields will fail. The moderately slow permeability can be overcome by increasing the size of the absorption field. Interceptor ditches can divert subsurface water and thus improve the efficiency of the absorption fields. Dikes and channels that have outlets for floodwater can protect buildings and onsite sewage disposal systems from flooding. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

A drainage system is needed if roads or building foundations are constructed on this unit. The wetness can be reduced by installing drainage tile around footings. Properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

Roads and streets should be constructed above the expected level of flooding. The risk of flooding has been reduced in some areas by the construction of large dams and reservoirs upstream.

The vegetative site is Loamy Flood Plain, 18- to 30-inch precipitation zone.

3E—Acker-Dumont complex, 12 to 35 percent north slopes. This map unit is on hillslopes. Elevation is 2,400 to 4,000 feet. The mean annual precipitation is 45 to 60 inches, the mean annual temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 45 percent Acker soil and 30 percent Dumont soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Dubakella, Gravecreek, Norling, and Pearsoll soils; Abegg soils on alluvial fans and near drainageways; Atring and Kanid soils on the more sloping parts of the landscape and on convex slopes; and poorly drained soils near drainageways. Also included are small areas of Acker and Dumont soils that have slopes of less than 12 or more than 35 percent. Included areas make up about 25 percent of the total acreage.

The Acker soil is very deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about 4 inches thick. The surface layer is brown gravelly loam about 8 inches thick. The next layer is yellowish brown gravelly clay loam about 9 inches thick. The upper 11 inches of the subsoil is yellowish red gravelly clay loam. The lower 32 inches is strong brown gravelly clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony.

Permeability is moderately slow in the Acker soil. Available water capacity is about 7 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Dumont soil is very deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about 1 inch thick. The surface layer is dark reddish brown gravelly clay loam about 4 inches thick. The next layer is dark reddish brown clay loam about 11 inches thick. The upper 36 inches of the subsoil is yellowish red clay. The lower 9 inches is yellowish red clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony.

Permeability is moderately slow in the Dumont soil. Available water capacity is about 9 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir. Other species that grow on this unit include incense cedar, western hemlock, and Pacific madrone. The understory vegetation includes golden chinkapin, salal, and cascade Oregongrape.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 135 on both the Acker and Dumont soils. The yield at culmination of the mean annual increment is 8,280 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 63,910 board feet per acre (Scribner rule) at 110 years. On the basis of a 50-year curve, the mean site index is 100.

The main limitations affecting timber production are erosion, compaction, and plant competition on both soils and the hazard of slumping on the Dumont soil. Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer in the more sloping areas and results in less surface disturbance. Using standard wheeled and tracked equipment when the soils are moist causes rutting and compaction. Puddling can occur when the soils are wet. Using low-pressure ground equipment causes less damage to the soils and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Ripping skid trails and landings when the soils are dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both.

The Dumont soil is subject to slumping. Road failure and landslides are likely to occur after road construction and clearcutting. Slumping can be minimized by constructing logging roads in the less sloping areas, on better suited soils if practical, and by installing properly designed road drainage systems. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The vegetative site is Mixed Fir-Salal (rhododendron) Forest.

4E—Acker-Dumont complex, 12 to 35 percent south slopes. This map unit is on hillslopes. Elevation is 2,400 to 4,000 feet. The mean annual precipitation is 45 to 60 inches, the mean annual temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 40 percent Acker soil and 30 percent Dumont soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Dubakella, Gravecreek, Norling, and Pearsoll soils; Abegg soils on alluvial fans and near drainageways; Atring and Kanid soils on the more sloping parts of the landscape and or convex slopes; and poorly drained soils near drainageways. Also included are small areas of Acker and Dumont soils that have slopes of less than 12 or more than 35 percent. Included areas make up about 30 percent of the total acreage.

The Acker soil is very deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about 4 inches thick. The surface layer is brown gravelly loam about 8 inches thick. The next layer is yellowish brown gravelly clay loam about 9 inches thick. The upper 11 inches of the subsoil is yellowish red gravelly clay loam. The lower 32 inches is strong brown gravelly clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony.

Permeability is moderately slow in the Acker soil. Available water capacity is about 7 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Dumont soil is very deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about 1 inch thick. The surface layer is dark reddish brown gravelly clay loam about 4 inches thick. The next layer is dark reddish brown clay loam about 11 inches thick. The upper 36 inches of the subsoil is yellowish red clay. The lower 9 inches is yellowish red clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony.

Permeability is moderately slow in the Dumont soil. Available water capacity is about 9 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone. The understory vegetation includes golden chinkapin, Whipplevine, and cascade Oregongrape.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 130 on both the Acker and Dumont soils. The yield at culmination of the mean annual increment is 7,740 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 58,520 board feet per acre (Scribner rule) at 110 years. On the basis of a 50-year curve, the mean site index is 95.

The main limitations affecting timber production are erosion, compaction, seedling mortality, and plant competition on both soils and slumping on the Dumont soil. Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer in the more sloping areas and results in less surface disturbance. Using standard wheeled and tracked equipment when the soils are moist causes rutting and compaction. Puddling can occur when the soils are wet. Using low-pressure ground equipment causes less damage to the soils and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Ripping skid trails and landings when the soils are dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both.

Because the Dumont soil is subject to slumping, road failure and landslides are likely to occur after road construction and clearcutting. Slumping can be minimized by constructing logging roads in the less sloping areas, on better suited soils if practical, and by installing properly designed road drainage systems. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The vegetative site is Douglas Fir-Madrone-Chinkapin Forest.

5F—Acker-Norling complex, 35 to 55 percent north slopes. This map unit is on hillslopes. Elevation is 2,400 to 4,000 feet. The mean annual precipitation is 45 to 60 inches, the mean annual temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 50 percent Acker soil and 35 percent Norling soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Dubakella, Gravecreek, and Pearsoll soils; Dumont soils on the less sloping parts of the landscape and on concave slopes; and Atring and Kanid soils on the more sloping parts of the landscape and on convex slopes. Also included are small areas of Acker and Norling soils that have slopes of less than 35 or more than 55 percent. Included areas make up about 15 percent of the total acreage.

The Acker soil is very deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about 4 inches thick. The surface layer is brown gravelly loam about 8 inches thick. The next layer is yellowish brown gravelly clay loam about 9 inches thick. The upper 11 inches of the subsoil is yellowish red gravelly clay loam. The lower 32 inches is strong brown gravelly clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony.

Permeability is moderately slow in the Acker soil. Available water capacity is about 7 inches. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Norling soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about 2 inches thick. The surface layer is brown very gravelly loam about 5 inches thick. The next layer is brown gravelly clay loam about 5 inches thick. The upper 12 inches of the subsoil is yellowish brown gravelly clay loam. The lower 7 inches is yellowish brown very cobbly clay loam. Weathered bedrock is at a depth of about 29 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony.

Permeability is moderate in the Norling soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir. Other species that grow on this unit include incense cedar, golden chinkapin, and western hemlock. The understory vegetation includes salal, cascade Oregongrape, and deerfoot vanillaleaf.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 135 on the Acker soil. The yield at culmination of the mean annual increment is 8,280 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 63,910 board feet per acre (Scribner rule) at 110 years. On the basis of a 50-year curve, the mean site index is 100.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 130 on the Norling soil. The yield at culmination of the mean annual increment is 7,740 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 58,520 board feet per acre (Scribner rule) at 110 years. On the basis of a 50 year curve, the mean site index is 95.

The main limitations affecting timber production are the slope, erosion, compaction, and plant competition. Also, root growth is restricted by the bedrock underlyir the Norling soil. As a result, trees are subject to windthrow.

Wheeled and tracked logging equipment can be use in the less sloping areas, but cable yarding generally is safer and results in less surface disturbance. Using standard wheeled and tracked equipment when the soils are moist causes rutting and compaction. Puddlin can occur when the soils are wet. Using low-pressure ground equipment causes less damage to the soils an helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Ripping skid trails and landings when the soils are dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosio Seeding, mulching, and benching areas that have beer cut and filled also help to control erosion. Steep yardin paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Cutbanks occasionally slump when the soils are saturated.

Constructing logging roads on the steeper slopes ca result in a high risk of erosion. Material that is discarde when the roads are built can damage vegetation and is a potential source of sedimentation. If the material becomes saturated, avalanches of debris can occur. End hauling of the waste material minimizes damage to the vegetation downslope and reduces the risk of sedimentation. Skid trails and unsurfaced roads may b impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The vegetative site is Mixed Fir-Salal (rhododendror Forest.

Figure 7.—An area of Brader-Debenger loams, 15 to 40 percent slopes, on a knoll. Abin silty clay loam, 0 to 3 percent slopes, is on the flood plain in the foreground.

sandstone. Typically, the surface layer is dark brown loam about 5 inches thick. The next layer is reddish brown loam about 4 inches thick. The subsoil is reddish brown and yellowish red clay loam about 18 inches thick. Weathered bedrock is at a depth of about 27 inches. The depth to bedrock ranges from 20 to 40 inches.

Permeability is moderate in the Debenger soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate or high.

This unit is used mainly for livestock grazing or homesite development. Some of the less sloping areas are used for hay and pasture.

The main limitations affecting livestock grazing are compaction, erosion, droughtiness, the depth to bedrock in the Brader soil, and the slope. The vegetation suitable for grazing includes Idaho fescue, bluebunch wheatgrass, and pine bluegrass. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soils are firm enough to withstand trampling by livestock.

Range seeding is suitable if the site is in poor condition. The main limitations are droughtiness, the depth to bedrock in the Brader soil, and the slope. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment. The use of ground equipment and access by livestock are limited on some of the steeper parts of the landscape. Constructing trails or walkways allows livestock to graze in areas where access is limited.

This unit is limited as a site for livestock watering ponds and other water impoundments because of the slope and the depth to bedrock.

The main limitations affecting homesite development are the depth to bedrock and the slope.

This unit is poorly suited to septic tank absorption fields because of the depth to bedrock and the slope. The absorption fields can be installed in some areas of the unit where the soils are deeper over bedrock and are less sloping. Onsite investigation is needed to locate such areas.

The slope limits the use of the steeper parts of this unit for building site development. Cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site in areas of the Brader soil is Loamy Hills, 20- to 35-inch precipitation zone, and the one in areas of the Debenger soil is Loamy Slopes, 18- to 24-inch precipitation zone.

18C—Bybee loam, 1 to 12 percent slopes. This very deep, somewhat poorly drained soil is on plateaus. It formed in residuum and colluvium derived dominantly from andesite, tuff, and breccia. Elevation is 3,600 to 5,500 feet. The mean annual precipitation is 30 to 50 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs.

Typically, the surface is covered with a layer of needles and twigs about ½ inch thick. The surface layer is very dark grayish brown loam about 4 inches thick. The next layer is very dark grayish brown clay loam about 6 inches thick. The upper 4 inches of the subsoil is brown clay. The lower 24 inches is light yellowish brown clay. The substratum is light yellowish brown clay about 22 inches thick. The depth to bedrock is 60 inches or more.

Included in this unit are small areas of Pinehurst and Tatouche soils, Kanutchan and Sibannac soils on concave slopes, and Farva soils on convex slopes. Also included are small areas of Bybee soils that have slopes of more than 12 percent. Included areas make up about 20 percent of the total acreage.

Permeability is very slow in the Bybee soil. Available water capacity is about 9 inches. The effective rooting depth is limited by a dense layer of clay at a depth of 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The water table, which is perched above the layer of clay, is at a depth of 1 to 3 feet from December through May.

This unit is used for timber production, livestock grazing, and wildlife habitat.

This unit is suited to the production of Douglas fir and white fir. Other species that grow on this unit include incense cedar and ponderosa pine. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and common snowberry.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 100. The yield at culmination of the mean annual increment is 5,040 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 39,750 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 75.

The main limitations affecting timber production are compaction, erosion, slumping, seasonal wetness, seedling mortality, and plant competition. Also, the dense layer of clay restricts root growth. As a result, windthrow is a hazard.

Conventional methods of harvesting timber generally are suitable, but the seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or to midwinter, when the soil is frozen. The soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

This unit is subject to severe slumping, especially in areas of road cuts. Road failure and landslides are likely to occur after road construction and clearcutting. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

This unit is poorly suited to standard systems of waste disposal because of a poor filtering capacity in the extremely gravelly substratum and the hazard of flooding. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils. Dikes and channels that have outlets for floodwater can protect buildings and onsite sewage disposal systems from flooding.

In some areas excavation for houses and access roads exposes material that is highly susceptible to soil blowing. Revegetating as soon as possible in disturbed areas around construction sites helps to control soil blowing. Cutbanks are not stable and are subject to slumping. To keep cutbanks from caving in, excavations may require special retainer walls.

Establishing plants in areas where the surface layer has been removed is difficult. Mulching and applying fertilizer help to establish plants in cut areas. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of droughtiness and a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

Roads and streets should be constructed above the expected level of flooding. The risk of flooding has been reduced in some areas by the construction of large dams and reservoirs upstream.

The vegetative site is Loamy Flood Plain, 18- to 30-inch precipitation zone.

22A—Camas gravelly sandy loam, 0 to 3 percent slopes. This very deep, excessively drained soil is on flood plains. It formed in alluvium derived from mixed sources. Elevation is 1,000 to 3,000 feet. The mean annual precipitation is 18 to 40 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 180 days. The vegetation in areas that have not been cultivated is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown gravelly sandy loam about 10 inches thick. The upper 9 inches of the substratum is very dark grayish brown very gravelly loamy sand. The lower part to a depth of 60 inches is very dark grayish brown extremely gravelly coarse sand. In some areas the surface layer is very gravelly or cobbly.

Included in this unit are small areas of Riverwash; Cove soils on concave slopes; Central Point, Medford, and Takilma soils on terraces; Abin, Evans, and Newberg soils; and poorly drained soils. Also included are small areas of Camas soils that have slopes of more than 3 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately rapid in the upper part of the Camas soil and very rapid in the lower part. Available water capacity is about 3 inches. The effective rooting depth is 60 inches or more. The substratum can restrict the penetration of roots, however, because of droughtiness. Runoff is slow, and the hazard of water erosion is slight. This soil is occasionally flooded for brief periods from November through May.

This unit is used mainly for hay and pasture. It also is used for cultivated crops, such as small grain, and for homesite development.

This unit is suited to hay and pasture. The main limitations are the flooding, droughtiness, and gravel on the surface, which may limit the use of equipment. The risk of flooding can be reduced by levees, dikes, and diversions.

In summer, irrigation is needed for the maximum production of most forage crops. Because the rate of water intake is rapid, sprinkler irrigation is the best method of applying water. This method permits an even, controlled application of water, helps to prevent excessive runoff, and minimizes the risk of erosion. To prevent overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Because the soil is droughty, the applications should be light and frequent.

Maintaining a protective plant cover in winter reduces the soil loss resulting from flooding. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

This unit is poorly suited to homesite development. The main limitations are the flooding and the very rapid permeability in the substratum.

This unit is poorly suited to standard systems of waste disposal because of a poor filtering capacity in the extremely gravelly substratum and the hazard of flooding. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils. Dikes and channels that have outlets for floodwater can protect buildings and onsite sewage disposal systems from flooding.

In some areas excavation for houses and access roads exposes material that is highly susceptible to soil blowing. Revegetating as soon as possible in disturbed areas around construction sites helps to control soil blowing. Cutbanks are not stable and are subject to slumping. To keep cutbanks from caving in, excavations may require special retainer walls.

Establishing plants is difficult in areas where the surface layer has been removed and the extremely gravelly substratum exposed. Mulching and applying fertilizer help to establish plants in cut areas. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of droughtiness and a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

Roads and streets should be constructed above the expected level of flooding. The risk of flooding has been reduced in some areas by the construction of large dams and reservoirs upstream.

The vegetative site is Loamy Flood Plain, 18- to 30-inch precipitation zone.

23A—Camas-Newberg-Evans complex, 0 to 3 percent slopes. This map unit is on flood plains. Elevation is 1,000 to 3,000 feet. The mean annual precipitation is 18 to 40 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 180 days. The native vegetation is mainly hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 40 percent Camas soil, 30 percent Newberg soil, and 20 percent Evans soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Riverwash; Cove soils on concave slopes; Central Point, Medford, and Takilma soils on terraces; Abin soils; and poorly drained soils. Also included are small areas of Camas, Newberg, and Evans soils that have slopes of more than 3 percent. Included areas make up about 10 percent of the total acreage.

The Camas soil is very deep and excessively drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown gravelly sandy loam about 10 inches thick. The upper 9 inches of the substratum is very dark grayish brown very gravelly loamy sand. The lower part to a depth of 60 inches is very dark grayish brown extremely gravelly coarse sand. In some areas the surface layer is very gravelly or cobbly.

Permeability is moderately rapid in the upper part of the Camas soil and very rapid in the lower part. Available water capacity is about 3 inches. The effective rooting depth is 60 inches or more. The substratum can restrict the penetration of roots, however, because of droughtiness. Runoff is slow, and the hazard of water erosion is slight. This soil is occasionally flooded for brief periods from November through May. In some areas the water table is within a depth of 60 inches.

The Newberg soil is very deep and somewhat excessively drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is very dark grayish brown fine sandy loam about 17 inches thick. The upper 13 inches of the substratum is dark brown sandy loam. The next 12 inches is dark brown fine sand. The lower part to a depth of 60 inches is dark grayish brown loamy sand. In some areas the surface layer is gravelly or cobbly.

Permeability is moderately rapid in the upper part of the Newberg soil and rapid in the lower part. Available water capacity is about 8 inches. The effective rooting depth is 60 inches or more. The substratum can restrict the penetration of roots, however, because of droughtiness. Runoff is slow, and the hazard of water erosion is slight. This soil is occasionally flooded for brief periods from December through March. In some areas the water table is within a depth of 60 inches.

The Evans soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is very dark brown loam about 38 inches thick. The substratum to a depth of 60 inches is dark brown loam. In some areas the surface layer is gravelly or cobbly.

Permeability is moderate in the Evans soil. Available water capacity is about 11 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is occasionally flooded for brief periods from December through March. In some areas the water table is within a depth of 60 inches.

This unit is used mainly for wildlife habitat or for hay and pasture. It also is used for homesite development.

The main limitations in the areas used for hay and pasture are the flooding, droughtiness, and gravel on the surface, which may limit the use of equipment. The risk of flooding can be reduced by levees, dikes, and diversions.

In summer, irrigation is needed for the maximum production of most forage crops. Because of a moderately rapid rate of water intake in the Camas and

Newberg soils, sprinkler irrigation is the best method of applying water. This method permits an even, controlled application of water, helps to prevent excessive runoff, and minimizes the risk of erosion. To prevent overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Because the soils are droughty, the applications should be light and frequent.

Maintaining a protective plant cover in winter reduces the soil loss resulting from flooding. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soils from erosion. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Returning all crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

This unit is poorly suited to homesite development. The main limitations are the flooding and the rapid or very rapid permeability in the substratum of the Camas and Newberg soils.

This unit is poorly suited to standard systems of waste disposal because of a poor filtering capacity in the substratum of the Camas and Newberg soils and the hazard of flooding. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils. Dikes and channels that have outlets for floodwater can protect buildings and onsite sewage disposal systems from flooding.

In some areas excavation for houses and access roads exposes material that is highly susceptible to soil blowing. Revegetating as soon as possible in disturbed areas around construction sites helps to control soil blowing. Cutbanks are not stable and are subject to slumping. To keep cutbanks from caving in, excavations may require special retainer walls.

Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer help to establish plants in cut areas. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of droughtiness and a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

Roads and streets should be constructed above the expected level of flooding. The risk of flooding has been reduced in some areas by the construction of large dams and reservoirs upstream.

The vegetative site is Loamy Flood Plain, 18- to 30-inch precipitation zone.

24C—Campfour-Paragon complex, 1 to 12 percent slopes. This map unit is on plateaus. Elevation is 3,000 to 4,400 feet. The mean annual precipitation is 20 to 25 inches, the mean annual temperature is 45 to 51 degrees F, and the average frost-free period is 100 to 130 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 45 percent Campfour soil and 30 percent Paragon soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Rock outcrop; Carney, Randcore, Shoat, and Skookum soils; and soils that are similar to the Paragon soil but have more than 35 percent hard rock fragments or have bedrock at a depth of more than 40 inches. Also included are small areas of Campfour and Paragon soils that have slopes of more than 12 percent. Included areas make up about 25 percent of the total acreage.

The Campfour soil is very deep and well drained. It formed in residuum and colluvium derived dominantly from andesite. Typically, the surface is covered with a layer of needles and twigs about 1 inch thick. The surface layer is dark reddish brown loam about 5 inches thick. The next layer is dark reddish brown loam about 16 inches thick. The upper 29 inches of the subsoil is dark reddish brown clay loam. The lower 10 inches is dark reddish brown gravelly clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony.

Permeability is moderately slow in the Campfour soil. Available water capacity is about 8 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

The Paragon soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from andesite. Typically, the surface is covered with a layer of needles and twigs about 1 inch thick. The surface layer is dark reddish brown cobbly loam about 3 inches thick. The next 10 inches also is dark reddish brown cobbly loam. The subsoil is dark reddish brown gravelly clay loam about 12 inches thick. Weathered bedrock is at a depth of about 25 inches.

The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony or very cobbly.

Permeability is moderately slow in the Paragon soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for timber production, livestock grazing, and wildlife habitat.

This unit is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar and California black oak. The understory vegetation includes tall Oregon grape, common snowberry, and western fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 110 on the Campfour soil. The yield at culmination of the mean annual increment is 5,880 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 48,300 board feet per acre (Scribner rule) at 140 years. On the basis of a 50-year curve, the mean site index is 85.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 95 on the Campfour soil. The yield at culmination of the mean annual increment is 3,760 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 43,160 board feet per acre (Scribner rule) at 130 years.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 85 on the Paragon soil. The yield at culmination of the mean annual increment is 4,480 cubic feet per acre in a fully stocked, even-aged stand of trees at 70 years and 27,520 board feet per acre (Scribner rule) at 160 years. On the basis of a 50-year curve, the mean site index is 60.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 80 on the Paragon soil. The yield at culmination of the mean annual increment is 2,670 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 33,750 board feet per acre (Scribner rule) at 150 years.

The main limitations affecting timber production are compaction, erosion, and seedling mortality. Also, the bedrock underlying the Paragon soil restricts root growth. As a result, windthrow is a hazard.

Conventional methods of harvesting timber generally are suitable, but the soils may be compacted if they are moist when heavy equipment is used. Puddling can occur when the soils are wet. If the soils are excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Using low-pressure ground equipment causes less damage to the soils and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Ripping skid trails and landings when the soils are dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. The large number of rock fragments in the Paragon soil also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting ponderosa pine and Douglas fir seedlings.

Severe frost can damage or kill seedlings. Air drainage may be restricted on this unit. Proper timber harvesting methods can reduce the effect of frost on regeneration.

The main limitation affecting livestock grazing is compaction. The native vegetation suitable for grazing includes western fescue, tall trisetum, and mountain brome on the Campfour soil and Idaho fescue and bluegrass on the Paragon soil. If the understory is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

A planned grazing system that includes timely deferment of grazing, rotation grazing, and proper livestock distribution helps to prevent overgrazing of the understory and damage to the soils. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soils are firm enough to withstand trampling by livestock.

Thinning, logging, and fire reduce the density of the overstory canopy and increase the production of understory vegetation. Areas that support a large amount of competing vegetation can be improved by prescribed burning or by chemical or mechanical treatment. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The vegetative site in areas of the Campfour soil is Douglas Fir-Mixed Pine-Sedge Forest, and the one in areas of the Paragon soil is Loamy Slopes, 18- to 24-inch precipitation zone.

index for Douglas fir is 105 on the Caris soil. The yield at culmination of the mean annual increment is 5,460 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 45,600 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 70.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 110 on the Offenbacher soil. The yield at culmination of the mean annual increment is 5,880 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 48,300 board feet per acre (Scribner rule) at 140 years. On the basis of a 50-year curve, the mean site index is 75.

The main limitations affecting timber production are the slope, erosion, plant competition, and seedling mortality. Also, the bedrock restricts root growth. As a result, windthrow is a hazard.

The slope restricts the use of wheeled and tracked logging equipment. High-lead or other cable systems are the best methods of logging. If the soils are excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Ripping landings when the soils are dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Road cuts can expose a large amount of fractured bedrock, which limits the response to seeding and mulching. Cut slopes are subject to slumping where the bedrock is highly fractured or where rock layers are parallel to the slopes. Steep yarding paths and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both.

Building logging roads at midslope requires extensive cutting and filling and removes land from production. Material that is discarded when the roads are built can damage vegetation and is a potential source of sedimentation. If the material becomes saturated, avalanches of debris can occur. End hauling of the waste material minimizes damage to the vegetation downslope and reduces the risk of sedimentation. Unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

A high temperature in the surface layer during summer and the low available water capacity increase the seedling mortality rate. The large number of rock fragments in the soils also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings.

Increased erosion, loss of plant nutrients, and water repellency are likely to result from fires of moderate intensity.

The vegetative site is Douglas Fir Forest.

26G—Caris-Offenbacher gravelly loams, 50 to 75 percent south slopes. This map unit is on hillslopes. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 25 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 60 percent Caris soil and 20 percent Offenbacher soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Tallowbox, Vannoy, and Voorhies soils; McMullin soils and Rock outcrop on ridges and convex slopes; and, on concave slopes, soils that are similar to the Caris and Offenbacher soils but have bedrock at a depth of more than 40 inches. Also included are small areas of Caris and Offenbacher soils that have slopes of less than 50 percent and more than 75 percent. Included areas make up about 20 percent of the total acreage.

The Caris soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles and twigs about 1 inch thick. The surface layer is very dark grayish brown gravelly loam about 7 inches thick. The upper 13 inches of the subsoil is dark yellowish brown very gravelly clay loam. The lower 11 inches is dark yellowish brown extremely gravelly loam. Bedrock is at a depth of about 31 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is very gravelly loam or is stony.

Permeability is moderate in the Caris soil. Available water capacity is about 2 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Offenbacher soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about 1 inch thick. The surface layer is dark grayish brown and dark brown gravelly loam about 9 inches thick. The subsoil is reddish brown and yellowish red loam about 25 inches thick. Bedrock is at a depth of about 34 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is very gravelly loam or is stony.

Permeability is moderate in the Offenbacher soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, California black oak, and Pacific madrone. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and California fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 100 on the Caris soil. The yield at culmination of the mean annual increment is 5,040 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 39,750 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 65.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 105 on the Offenbacher soil. The yield at culmination of the mean annual increment is 5,460 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 45,600 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 70.

The main limitations affecting timber production are the slope, erosion, seedling mortality, and plant competition. Also, the bedrock restricts root growth. As a result, windthrow is a hazard.

The slope restricts the use of wheeled and tracked logging equipment. High-lead or other cable systems are the best methods of logging. If the soils are excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Ripping landings when the soils are dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Road cuts can expose a large amount of fractured bedrock, which limits the response to seeding and mulching. Cut slopes are subject to slumping where the bedrock is highly fractured or where rock layers are parallel to the slopes. Steep yarding paths and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both.

Building logging roads at midslope requires extensive cutting and filling and removes land from production. Material that is discarded when the roads are built can damage vegetation and is a potential source of sedimentation. If the material becomes saturated, avalanches of debris can occur. End hauling of the waste material minimizes damage to the vegetation downslope and reduces the risk of sedimentation. Unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer during summer and the low available water capacity increase the seedling mortality rate. The large number of rock fragments in the soils also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. The seedling mortality rate also can be reduced by providing artificial shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

Increased erosion, loss of plant nutrients, and water repellency are likely to result from fires of moderate intensity.

The vegetative site is Pine-Douglas Fir-Fescue.

27B—Carney clay, 1 to 5 percent slopes. This moderately deep, moderately well drained soil is on alluvial fans. It formed in alluvium derived dominantly from tuff and breccia. Elevation is 1,200 to 4,000 feet. The mean annual precipitation is 18 to 30 inches, the mean annual temperature is 48 to 54 degrees F, and the average frost-free period is 150 to 180 days. The native vegetation is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown clay about 6 inches thick. The next layer also is dark brown clay about 6 inches thick. The subsoil is dark brown clay about 23 inches thick. Weathered bedrock is at a depth of about 35 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is cobbly or stony.

Included in this unit are small areas of Coker and Phoenix soils on concave slopes, Cove and Padigan soils on concave slopes near drainageways, Brader anc Debenger soils on ridges and convex slopes, and Darow and Manita soils. Also included are small areas of soils that are similar to the Carney soil but have bedrock at a depth of more than 40 inches and Carney soils that have slopes of more than 5 percent. Included areas make up about 20 percent of the total acreage.

Permeability is very slow in the Carney soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The water table fluctuates between depths of 3.0 and 3.5 feet from December through April.

This unit is used mainly for hay and pasture or for tree fruit. It also is used for homesite development and livestock grazing.

This unit is suited to irrigated crops. It is limited mainly by the high content of clay, a slow rate of water intake, and droughtiness. In summer, irrigation is needed for the maximum production of most crops. Sprinkler and trickle irrigation systems are the best methods of applying water. These systems permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Border and contour flood irrigation systems also are suitable. For the efficient application and removal of surface irrigation water, land leveling is needed. Because of the very slow permeability, water applications should be regulated so that the water does not stand on the surface and damage the crop. Land smoothing and open ditches can reduce surface wetness. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

This unit is well suited to permanent pasture. The high content of clay severely limits tillage and root growth. Deep cracks form as the soil dries in summer. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the very slow permeability, a high shrink-swell potential, the depth to bedrock, and low strength.

This unit is poorly suited to standard systems of waste disposal because of the very slow permeability and the depth to bedrock. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

If buildings are constructed on this unit, properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The main limitations affecting livestock grazing are compaction, the clayey surface layer, and droughtiness. The vegetation suitable for grazing includes Idaho fescue, bluebunch wheatgrass, and prairie junegrass. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment.

Range seeding is suitable if the site is in poor condition. The main limitations are the clayey surface layer and droughtiness. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

This unit is limited as a site for livestock watering ponds and other water impoundments because of the depth to bedrock.

The vegetative site is Droughty Fan, 18- to 26-inch precipitation zone.

27D—Carney clay, 5 to 20 percent slopes. This moderately deep, moderately well drained soil is on alluvial fans and hillslopes. It formed in alluvium and colluvium derived dominantly from tuff and breccia. Elevation is 1,200 to 4,000 feet. The mean annual precipitation is 18 to 30 inches, the mean annual temperature is 48 to 54 degrees F, and the average frost-free period is 150 to 180 days. The native vegetation is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown clay about 6 inches thick. The next layer also is dark brown clay about 6 inches thick. The subsoil is dark brown clay about 23 inches thick. Weathered bedrock is at a depth of about 35 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is cobbly or stony.

Included in this unit are small areas of Coker and Phoenix soils on concave slopes; Cove and Padigan soils on concave slopes near drainageways; and Rock outcrop and Brader, Debenger, Darow, and Manita soils. Also included are small areas of soils that are similar to the Carney soil but have bedrock at a depth of less than 20 or more than 40 inches and Carney soils that have slopes of less than 5 or more than 20 percent. Included areas make up about 20 percent of the total acreage.

Permeability is very slow in the Carney soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The water table fluctuates between depths of 3.0 and 3.5 feet from December through April.

This unit is used mainly for hay and pasture or for tree fruit. It also is used for homesite development and livestock grazing.

This unit is suited to irrigated crops. It is limited mainly by the high content of clay, a slow rate of water intake, the slope, and droughtiness. In summer, irrigation is needed for the maximum production of most crops. Because of the slope, sprinkler and trickle irrigation systems are suitable methods of applying water. These systems permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

This unit is well suited to permanent pasture. The high content of clay severely limits tillage and root growth. Deep cracks form as the soil dries in summer. Seedbeds should be prepared on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the very slow permeability, a high shrink-swell potential, the depth to bedrock, the slope, and low strength.

This unit is poorly suited to standard systems of waste disposal because of the very slow permeability and the depth to bedrock. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

If buildings are constructed on this unit, properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The main limitations affecting livestock grazing are compaction, erosion, the clayey surface layer, and droughtiness. The vegetation suitable for grazing includes Idaho fescue, bluebunch wheatgrass, and prairie junegrass. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock.

Range seeding is suitable if the site is in poor condition. The main limitations are the clayey surface layer and droughtiness. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment.

Reforestation can be accomplished by planting ponderosa pine seedlings.

Undesirable plants, especially grasses, limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The main limitations affecting livestock grazing are compaction and erosion. The native vegetation suitable for grazing includes California oatgrass, Idaho fescue, and bluegrass. If the understory is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

A planned grazing system that includes timely deferment of grazing, rotation grazing, and proper livestock distribution helps to prevent overgrazing of the understory and damage to the soil. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock.

Thinning, logging, and fire reduce the density of the overstory canopy and increase the production of understory vegetation. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The vegetative site is Clayey Hills, 20- to 35-inch precipitation zone.

30E—Carney-Tablerock complex, 20 to 35 percent slopes. This map unit is on alluvial fans and hillslopes. Elevation is 1,250 to 3,600 feet. The mean annual precipitation is 18 to 30 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 120 to 180 days. The native vegetation is mainly grasses, shrubs, and forbs.

This unit is about 45 percent Carney soil and 35 percent Tablerock soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Coker and Phoenix soils on concave slopes; Cove and Padigan soils on concave slopes near drainageways; Rock outcrop; and Brader, Debenger, and Darow soils. Also included are small areas of soils that are similar to the Carney soil but have bedrock at a depth of less than 20 or more than 40 inches, soils that are similar to the Tablerock soil but have bedrock within a depth of 60 inches, and Carney and Tablerock soils that have slopes of less than 20 or more than 35 percent. Included areas make up about 20 percent of the total acreage.

The Carney soil is moderately deep and moderately well drained. It formed in alluvium and colluvium derived dominantly from tuff and breccia. Typically, the surface layer is dark brown cobbly clay about 6 inches thick. The next layer is dark brown clay about 6 inches thick. The subsoil also is dark brown clay. It is about 23 inches thick. Weathered bedrock is at a depth of about 35 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony.

Permeability is very slow in the Carney soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The water table fluctuates between depths of 3.0 and 3.5 feet from December through April.

The Tablerock soil is very deep and moderately well drained. It formed in colluvium derived dominantly from tuff, breccia, andesite, and sandstone. Typically, the surface is covered with a layer of leaves and twigs about 1½ inches thick. The surface layer is very dark brown gravelly loam about 3 inches thick. The next layer is very dark grayish brown very cobbly clay loam about 7 inches thick. The upper 10 inches of the subsoil is dark brown very cobbly clay loam. The next 18 inches is brown very cobbly clay. The lower 27 inches is dark yellowish brown gravelly clay loam and gravelly loam. Weathered bedrock is at a depth of about 65 inches. The depth to bedrock is 60 inches or more. In some areas the surface layer is cobbly or stony.

Permeability is very slow in the Tablerock soil. Available water capacity is about 7 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The water table fluctuates between depths of 4 and 6 feet from December through April.

This unit is used for livestock grazing and recreational development.

The main limitations affecting livestock grazing are the cobbly surface layer of the Carney soil, compaction, erosion, the slope, droughtiness, and the included areas of Rock outcrop. The vegetation suitable for grazing includes Idaho fescue, bluebunch wheatgrass, and Lemmon needlegrass. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soils are firm enough to withstand trampling by livestock.

Range seeding is suitable if the site is in poor condition. The main limitations are the surface layer of cobbly clay in the Carney soil, the slope, droughtiness, and the included areas of Rock outcrop. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment. In places the use of ground equipment and access by livestock are limited by the slope, the cobbles on the surface, and the included areas of Rock outcrop.

This unit is limited as a site for livestock watering ponds and other water impoundments because of the slope of both soils and the depth to bedrock in the Carney soil.

If this unit is used for recreational development, the main limitations are the high content of clay, the surface layer of cobbly clay in the Carney soil, the slope, and the included areas of Rock outcrop. The Rock outcrop should be avoided unless it is to be highlighted in the development. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. A plant cover can be established and maintained through applications of fertilizer and through seeding, mulching, and shaping of the slopes. Gravel and cobbles should be removed, particularly in picnic areas and on playgrounds. The soils are sticky and plastic when wet. As a result, trafficability is restricted.

The vegetative site in areas of the Carney soil is Droughty Foothill Slopes, 18- to 22-inch precipitation zone, and the one in areas of the Tablerock soil is Droughty Fan, 18- to 26-inch precipitation zone.

31A—Central Point sandy loam, 0 to 3 percent slopes. This very deep, well drained soil is on stream terraces. It formed in alluvium derived dominantly from granitic and metamorphic rock. Elevation is 1,000 to 2,000 feet. The mean annual precipitation is 18 to 40 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The vegetation in areas that have not been cultivated is mainly grasses and forbs.

Typically, the surface layer is black and very dark brown sandy loam about 30 inches thick. The upper 12 inches of the subsoil is very dark grayish brown sandy loam. The lower 7 inches is dark brown sandy loam. The upper 10 inches of the substratum is dark brown gravelly sandy loam. The lower part to a depth of 67 inches is dark brown gravelly loamy sand.

Included in this unit are small areas of Evans, Newberg, and Camas soils on flood plains; Barron soils on the higher parts of the landscape; Gregory and Clawson soils on concave slopes; Kubli and Medford soils; and soils that are similar to the Central Point soil but have very gravelly layers below a depth of 30 inches. Also included are small areas of Central Point soils that have slopes of more than 3 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately rapid in the Central Point soil. Available water capacity is about 6 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table fluctuates between depths of 4 and 6 feet from December through March.

This unit is used mainly for irrigated crops, such as grass seed, onions, alfalfa, and tree fruit. Other crops include strawberries, small grain, and sugar beet seed. Some areas are used for homesite development or pasture.

This unit is well suited to irrigated crops. It has few limitations. In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. The system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Because the soil is droughty, the applications should be light and frequent. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if this unit is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

This unit is well suited to homesite development. It has few limitations. Cutbanks are not stable and are subject to slumping. To keep cutbanks from caving in, excavations may require special retainer walls. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall and droughtiness in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Deep Loamy Terrace, 18- to 28-inch precipitation zone.

32B—Clawson sandy loam, 2 to 5 percent slopes. This very deep, poorly drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rock. Elevation is 1,000 to 1,300 feet. The mean annual precipitation is 30 to 35 inches, the mean annual temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days. The vegetation in areas that have not been cultivated is mainly grasses, sedges, and forbs.

Typically, the surface layer is very dark grayish brown sandy loam about 10 inches thick. The subsoil is dark grayish brown sandy loam about 35 inches thick. The substratum to a depth of 60 inches is dark grayish brown and grayish brown sandy loam. In some areas the surface layer is gravelly.

Included in this unit are small areas of Barron and Shefflein soils on convex slopes and on the higher parts of the landscape; Central Point, Kubli, and Medford soils; and soils that are similar to the Clawson soil but have gravelly layers within a depth of 40 inches. Also included are small areas of Clawson soils that have slopes of more than 5 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately rapid in the Clawson soil. Available water capacity is about 7 inches. The effective rooting depth is limited by the water table, which is at a depth of 1 to 3 feet from November through June. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for hay and pasture or for homesite development.

This unit is suited to hay and pasture. The main limitations are wetness in winter and spring and droughtiness in summer and fall. Tile drainage can lower the water table if a suitable outlet is available. Land smoothing and open ditches can reduce surface wetness.

In summer, irrigation is needed for the maximum production of most forage crops. Sprinkler irrigation is the best method of applying water. This method permits an even, controlled application of water, helps to prevent excessive runoff, and minimizes the risk of erosion. Border and contour flood irrigation systems also are suitable. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Wetness limits the choice of suitable forage plants and the period of cutting or grazing and increases the risk of winterkill. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

This unit is limited as a site for livestock watering ponds and other water impoundments because of seepage.

The main limitations affecting homesite development are wetness in winter and spring and the moderately rapid permeability.

This unit is poorly suited to standard systems of waste disposal because of the wetness. Interceptor ditches can divert subsurface water and thus improve the efficiency of the absorption fields. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

Because of the seasonal high water table, a drainage system is needed on sites for buildings with basements and crawl spaces. The wetness can be reduced by installing drainage tile around footings. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of droughtiness and a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

Cutbanks are not stable and are subject to slumping. To keep cutbanks from caving in, excavations may require special retainer walls.

The vegetative site is Semi-Wet Meadow.

33A—Coker clay, 0 to 3 percent slopes. This very deep, somewhat poorly drained soil is on alluvial fans. It formed in alluvium derived dominantly from tuff and breccia. Elevation is 1,200 to 4,000 feet. The mean annual precipitation is 18 to 30 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 120 to 180 days. The native vegetation is mainly grasses, sedges, and forbs.

Typically, the surface layer is very dark gray clay about 20 inches thick. The next layer is very dark gray and dark grayish brown, calcareous clay about 26 inches thick. The subsoil to a depth of 70 inches is dark grayish brown, calcareous clay. The depth to bedrock is 60 inches or more.

Included in this unit are small areas of Brader, Carney, Darow, and Debenger soils on convex slopes; Cove, Gregory, and Padigan soils on concave slopes near drainageways; Medford and Phoenix soils; and soils that are similar to the Coker soil but have bedrock at a depth of 40 to 60 inches. Also included are small areas of Coker soils that have slopes of more than 3 percent. Included areas make up about 20 percent of the total acreage.

Permeability is very slow in the Coker soil. Available water capacity is about 9 inches. The effective rooting depth is limited by the water table, which is at a depth of 0.5 foot to 1.5 feet from December through April. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for hay and pasture or for tree fruit. It also is used for livestock grazing, small grain, and homesite development.

This unit is suited to irrigated crops. It is limited mainly by the high content of clay, a slow rate of water intake, wetness in winter and spring, and droughtiness in summer and fall. Crops that require good drainage can be grown if a properly designed drainage system is installed. The ability of tile drains to remove subsurface water from the soil is limited because of the very slow permeability.

In summer, irrigation is needed for the maximum production of most crops. Sprinkler and trickle irrigation systems are suitable. Border and contour flood systems also are suitable. For the efficient application and removal of surface irrigation water, land leveling is needed. Because of the very slow permeability and the water table, water applications should be regulated so that the water does not stand on the surface and damage the crop. Land smoothing and open ditches can reduce surface wetness. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

This unit is well suited to permanent pasture. Wetness limits the choice of suitable forage plants and the period of cutting or grazing and increases the risk of winterkill. The high content of clay severely limits tillage and root growth. Deep cracks form as the soil dries in summer. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting livestock grazing are compaction, the clayey surface layer, wetness in winter and spring, and droughtiness in summer and fall. The vegetation suitable for grazing includes California oatgrass, bluegrass, and sedge. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

Because this soil remains wet for long periods in spring, grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock. Compaction can be minimized by grazing first in the areas that dry out earliest.

Range seeding is suitable if the site is in poor condition. The main limitations are the clayey surface layer, wetness in winter and spring, and droughtiness in summer and fall. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment.

This unit is suited to livestock watering ponds and other water impoundments.

The main limitations affecting homesite development are the wetness, a high shrink-swell potential, the very slow permeability, and low strength.

This unit is poorly suited to standard systems of waste disposal because of the wetness and the very slow permeability. Alternative waste disposal systems may function properly on this unit. Suitable included soils are in some areas of the unit. Onsite investigation is needed to locate such soils.

A drainage system is needed if roads or building foundations are constructed on this unit. The wetness can be reduced by installing drainage tile around footings. Properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Semi-Wet Meadow.

33C—Coker clay, 3 to 12 percent slopes. This very deep, somewhat poorly drained soil is on alluvial fans. It formed in alluvium derived dominantly from tuff and breccia. Elevation is 1,200 to 4,000 feet. The mean annual precipitation is 18 to 30 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 120 to 180 days. The native vegetation is mainly grasses, sedges, and forbs.

Typically, the surface layer is very dark gray clay about 20 inches thick. The next layer is very dark gray and dark grayish brown, calcareous clay about 26 inches thick. The subsoil to a depth of 70 inches is dark grayish brown, calcareous clay. The depth to bedrock is 60 inches or more.

Included in this unit are small areas of Brader, Carney, Darow, and Debenger soils on convex slopes; Cove, Gregory, and Padigan soils on concave slopes near drainageways; Medford and Phoenix soils; and soils that are similar to the Coker soil but have bedrock at a depth of 40 to 60 inches. Also included are small areas of Coker soils that have slopes of less than 3 or more than 12 percent. Included areas make up about 20 percent of the total acreage.

Permeability is very slow in the Coker soil. Available water capacity is about 9 inches. The effective rooting depth is limited by the water table, which is at a depth of 0.5 foot to 1.5 feet from December through April. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for hay and pasture or for tree fruit. It also is used for livestock grazing, small grain, and homesite development.

This unit is suited to irrigated crops. It is limited mainly by the high content of clay, a slow rate of water intake, wetness in winter and spring, droughtiness in summer and fall, and the slope. Crops that require good drainage can be grown if a properly designed tile drainage system is installed. The ability of tile drains to remove subsurface water from the soil is limited because of the very slow permeability.

In summer, irrigation is needed for the maximum production of most crops. Because of the slope, sprinkler and trickle irrigation systems are the best methods of applying water. These systems permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Border and contour flood irrigation systems also are suitable in the less sloping areas. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. Growing a permanent cover crop helps to control runoff and reduces the hazard of erosion.

This unit is well suited to permanent pasture. Wetness limits the choice of suitable forage plants and the period of cutting or grazing and increases the risk of winterkill. The high content of clay severely limits tillage and root growth. Deep cracks form as the soil dries in summer. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting livestock grazing are compaction, erosion, the clayey surface layer, wetness in winter and spring, and droughtiness in summer and fall. The vegetation suitable for grazing includes California oatgrass, bluegrass, and sedge. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

Because this soil remains wet for long periods in spring, grazing should be delayed until the soil is firm and the more desirable forage plants have achieved enough growth to withstand grazing pressure. Compaction can be minimized by grazing first in the areas that dry out earliest.

Range seeding is suitable if the site is in poor condition. The main limitations are the clayey surface layer, wetness in winter and spring, and droughtiness in summer and fall. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment.

This unit is limited as a site for livestock watering ponds and other water impoundments because of the slope.

The main limitations affecting homesite development are the wetness, a high shrink-swell potential, the very slow permeability, and low strength.

This unit is poorly suited to standard systems of waste disposal because of the wetness and the very slow permeability. Alternative waste disposal systems may function properly on this unit. Suitable included soils are in some areas of the unit. Onsite investigation is needed to locate such soils.

A drainage system is needed if roads or building foundations are constructed on this unit. The wetness can be reduced by installing drainage tile around footings. Properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Semi-Wet Meadow.

34B—Coleman loam, 0 to 7 percent slopes. This very deep, moderately well drained soil is on stream terraces. It formed in alluvium derived dominantly from sedimentary and volcanic rock. Elevation is 1,200 to 1,700 feet. The mean annual precipitation is 18 to 25 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 160 to 180 days. The vegetation in areas that have not been cultivated is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown loam about 8 inches thick. The next layer is dark brown clay loam about 12 inches thick. The subsoil is dark brown clay about 20 inches thick. The upper 18 inches of the substratum is dark brown clay loam. The lower part to a depth of 65 inches is yellowish red clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is gravelly.

Included in this unit are small areas of Gregory and Medford soils on the lower terraces and Ruch soils on alluvial fans. Also included are small areas of Coleman soils that have slopes of more than 7 percent. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Coleman soil. Available water capacity is about 10 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table fluctuates between depths of 1.5 and 2.0 feet from December through April.

This unit is used mainly for irrigated crops, such as alfalfa hay, tree fruit, and small grain. Other crops include corn for silage and sugar beet seed. Some areas are used for homesite development, grass hay, or pasture.

This unit is suited to irrigated crops. It is limited mainly by wetness in winter and spring and by the slow permeability. Crops that require good drainage can be grown if a properly designed tile drainage system is installed. Tile drainage can lower the water table if collection laterals are closely spaced and a suitable outlet is available. In the less sloping areas, land smoothing and open ditches can reduce surface wetness.

In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. The system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation, development of a perched water table, and an increase in the risk of erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet.

Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet and by planting a cover crop. Growing a permanent cover crop helps to control runoff and reduces the hazard of erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the wetness, the slow permeability, a high shrink-swell potential, and low strength.

The slow permeability and the water table increase the possibility that septic tank absorption fields will fail. Interceptor ditches can divert subsurface water and thus improve the efficiency of the absorption fields. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

A seasonal high water table is perched above the layer of clay; therefore, a drainage system is needed on sites for buildings with basements and crawl spaces. The wetness can be reduced by installing drainage tile around footings. Properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the subsoil to support a load.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Loamy Hills, 20- to 35-inch precipitation zone.

35A—Cove clay, 0 to 3 percent slopes. This very deep, poorly drained soil is on flood plains. It formed in alluvium derived dominantly from tuff and breccia. Elevation is 1,200 to 2,500 feet. The mean annual precipitation is 18 to 30 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The native vegetation is mainly grasses, sedges, and forbs.

Typically, the surface layer is black clay about 16 inches thick. The subsoil is very dark grayish brown silty clay about 34 inches thick. The substratum to a depth of 60 inches is dark grayish brown silty clay. The depth to bedrock is 60 inches or more. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Carney soils on convex slopes; Coker, Gregory, and Padigan soils; and soils that are similar to the Cove soil but are very gravelly within a depth of 30 inches. Also included are small areas of Cove soils that have slopes of more than 3 percent. Included areas make up about 10 percent of the total acreage.

Permeability is very slow in the Cove soil. Available water capacity is about 9 inches. The effective rooting depth is limited by the water table, which is within a depth of 1 foot from December through June. Runoff is slow, and the hazard of water erosion is slight. This soil is frequently flooded for brief periods from December through April.

This unit is used mainly for pasture. It also is used for tree fruit, grass-legume hay, and homesite development.

This unit is suited to permanent pasture. It is limited mainly by the hazard of flooding, the wetness, the high content of clay, and a slow rate of water intake. The risk of flooding can be reduced by levees, dikes, and diversions. The ability of tile drains to remove subsurface water from the soil is limited because of the very slow permeability.

In summer, irrigation is needed for the maximum production of most forage crops. Sprinkler irrigation is the best method of applying water. Border and contour flood irrigation systems also are suitable. For the efficient application and removal of surface irrigation water, land leveling is needed. Because of the very slow permeability and the seasonal high water table, water applications should be regulated so that the water does not stand on the surface and damage the crop. Land smoothing and open ditches can reduce surface wetness. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Wetness limits the choice of suitable forage plants and the period of cutting or grazing and increases the risk of winterkill. Maintaining a protective plant cover in winter reduces the soil loss resulting from flooding. The high content of clay severely limits tillage and root growth. Deep cracks form as the soil dries in summer. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet and by planting a cover crop. A permanent sod crop helps to control runoff.

This unit is poorly suited to homesite development. The main limitations are the flooding, the wetness, a high shrink-swell potential, and the very slow permeability.

This unit is poorly suited to standard systems of waste disposal because of the hazard of flooding, the wetness, and the very slow permeability. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

A drainage system is needed if roads or building foundations are constructed on this unit. The wetness can be reduced by installing drainage tile around footings. Properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load. Roads and streets should be constructed above the expected level of flooding.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Poorly Drained Bottom.

36G—Coyata-Rock outcrop complex, 35 to 80 percent north slopes. This map unit is on hillslopes. Elevation is 2,000 to 4,000 feet. The mean annual precipitation is 40 to 50 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 50 percent Coyata soil and 30 percent Rock outcrop. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Crater Lake, Dumont, and Reinecke soils on the less sloping parts of the landscape; soils that are similar to the Coyata soil but have bedrock at a depth of more than 40 inches; and Coyata soils that have slopes of less than 35 or more than 80 percent. Included areas make up about 20 percent of the total acreage.

The Coyata soil is moderately deep and well drained. It formed in colluvium derived dominantly from andesite. Typically, the surface is covered with a layer of needles, leaves, and twigs about 1½ inches thick. The surface layer is dark reddish brown very stony loam about 11 inches thick. The next layer is dark brown very cobbly clay loam about 10 inches thick. The subsoil is dark brown extremely cobbly clay loam about 10 inches thick. Bedrock is at a depth of about 31 inches. The depth to bedrock ranges from 20 to 40 inches.

Permeability is moderate in the Coyata soil. Available water capacity is about 2 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed bedrock. Runoff is very rapid in these areas.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir. Other species that grow on this unit include white fir, western hemlock, and golden chinkapin. The understory vegetation includes vine maple, California hazel, and cascade Oregongrape.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 130 on the Coyata soil. The yield at culmination of the mean annual increment is 7,740 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 58,520 board feet per acre (Scribner rule) at 110 years. On the basis of a 50-year curve, the mean site index is 100.

The main limitations affecting timber production are the slope, the Rock outcrop, erosion, plant competition, and seedling mortality. Also, the bedrock restricts root slopes of more than 5 percent. Included areas make up about 20 percent of the total acreage.

Permeability is slow in the Darow soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The water table fluctuates between depths of 3.0 and [illegible].5 feet from December through April.

This unit is used mainly for hay and pasture or for tree fruit. It also is used for homesite development and livestock grazing.

This unit is suited to irrigated crops. It is limited mainly by the high content of clay, a slow rate of water intake, and droughtiness. In summer, irrigation is needed for the maximum production of most crops. Sprinkler and trickle irrigation systems are suitable. These systems permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Border and contour flood irrigation systems also are suitable. For the efficient application and removal of surface irrigation water, land leveling is needed. Because of the slow permeability, water applications should be regulated so that the water does not stand on the surface and damage the crop. Land smoothing and open ditches can reduce surface wetness. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

This unit is well suited to permanent pasture. The high content of clay limits tillage and root growth. Deep cracks form as the soil dries in summer. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the slow permeability, a high shrink-swell potential, the depth to bedrock, and low strength.

This unit is poorly suited to standard systems of waste disposal because of the slow permeability and the depth to bedrock. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

If buildings are constructed on this unit, properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The main limitations affecting livestock grazing are compaction, the clayey surface layer, and droughtiness. The vegetation suitable for grazing includes Idaho fescue, California brome, and prairie junegrass. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment.

Range seeding is suitable if the site is in poor condition. The main limitations are the clayey surface layer and droughtiness. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

This unit is limited as a site for livestock watering ponds and other water impoundments because of the depth to bedrock.

The vegetative site is Droughty North, 18- to 35-inch precipitation zone.

43D—Darow silty clay loam, 5 to 20 percent slopes. This moderately deep, moderately well drained soil is on hillslopes. It formed in colluvium and residuum derived dominantly from siltstone. Elevation is 1,200 to 3,000 feet. The mean annual precipitation is 18 to 30 inches, the mean annual temperature is 52 to 54 degrees F, and the average frost-free period is 120 to 180 days. The native vegetation is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown silty clay loam about 12 inches thick. The subsoil is dark brown and dark yellowish brown silty clay about 20 inches thick. Weathered bedrock is at a depth of about 32 inches. The depth to bedrock ranges from 20 to 40 inches.

Included in this unit are small areas of Brader and Debenger soils on ridges and convex slopes; Carney, Coker, and Selmac soils on concave slopes; Cove, Gregory, and Padigan soils near drainageways; Manita soils; and soils that are similar to the Darow soil but have bedrock at a depth of more than 40 inches. Also included are small areas of Darow soils that have slopes of less than 5 or more than 20 percent. Included areas make up about 20 percent of the total acreage.

Permeability is slow in the Darow soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The water table fluctuates between depths of 3.0 and 3.5 feet from December through April.

This unit is used mainly for hay and pasture or for tree fruit. It also is used for homesite development and livestock grazing.

This unit is suited to irrigated crops. It is limited mainly by the high content of clay, a slow rate of water intake, and droughtiness. In summer, irrigation is needed for the maximum production of most crops. Because of the slope, sprinkler and trickle irrigation systems are the best methods of applying water. These systems permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

This unit is well suited to permanent pasture. The high content of clay limits tillage and root growth. Deep cracks form as the soil dries in summer. Seedbeds should be prepared on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the slow permeability, a high shrink-swell potential, the slope, the depth to bedrock, and low strength.

This unit is poorly suited to standard systems of waste disposal because the slow permeability and the depth to bedrock. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

If buildings are constructed on this unit, properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The main limitations affecting livestock grazing are compaction, erosion, the clayey surface layer, and droughtiness. The vegetation suitable for grazing includes Idaho fescue, California brome, and prairie junegrass. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment.

Range seeding is suitable if the site is in poor condition. The main limitations are the clayey surface layer and droughtiness. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

This unit is limited as a site for livestock watering ponds and other water impoundments because of the slope and the depth to bedrock.

The vegetative site is Droughty North, 18- to 35-inch precipitation zone.

thick. Bedrock is at a depth of about 31 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is cobbly or stony.

Permeability is moderate in the Coyata soil. Available water capacity is about 2 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, livestock grazing, and wildlife habitat.

This unit is suited to the production of Douglas fir. Other species that grow on this unit include white fir, ponderosa pine, sugar pine, and Pacific madrone. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and western fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 135 on the Dumont soil. The yield at culmination of the mean annual increment is 8,280 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 63,910 board feet per acre (Scribner rule) at 110 years. On the basis of a 50-year curve, the mean site index is 105.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 120 on the Coyata soil. The yield at culmination of the mean annual increment is 6,900 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 52,440 board feet per acre (Scribner rule) at 120 years. On the basis of a 50-year curve, the mean site index is 90.

The main limitations affecting timber production are the slope, erosion, compaction, seedling mortality, and plant competition. Also, the bedrock underlying the Coyata soil restricts root growth. As a result, windthrow is a hazard.

Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer and results in less surface disturbance. If the soils are excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Using standard wheeled and tracked equipment when the soils are moist causes rutting and compaction. Puddling can occur when the soils are wet. Using low-pressure ground equipment causes less damage to the soils and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Ripping skid trails and landings when the soils are dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Cutbanks occasionally slump when the soils are saturated.

Constructing logging roads on the steeper slopes can result in a high risk of erosion. Building the roads at midslope requires extensive cutting and filling and removes land from production. Material that is discarded when the roads are built can damage vegetation and is a potential source of sedimentation. If the material becomes saturated, avalanches of debris can occur. End hauling of the waste material minimizes damage to the vegetation downslope and reduces the risk of sedimentation. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. The large number of rock fragments in the Coyata soil also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. The seedling mortality rate also can be reduced by providing artificial shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The main limitations affecting livestock grazing are erosion, compaction, and the slope. The native vegetation suitable for grazing includes western fescue, tall trisetum, and Alaska oniongrass. If the understory is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

A planned grazing system that includes timely deferment of grazing, rotation grazing, and proper livestock distribution helps to prevent overgrazing of the understory and damage to the soils. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soils are firm enough to withstand trampling by livestock.

Thinning, logging, and fire reduce the density of the overstory canopy and increase the production of understory vegetation. Areas that support a large amount of competing vegetation can be improved by prescribed burning or by chemical or mechanical treatment. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The vegetative site is Mixed Fir-Mixed Pine Forest.

55A—Evans loam, 0 to 3 percent slopes. This very deep, well drained soil is on flood plains. It formed in alluvium derived from mixed sources. Elevation is 1,000 to 3,000 feet. The mean annual precipitation is 18 to 40 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 180 days. The vegetation in areas that have not been cultivated is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is very dark brown loam about 38 inches thick. The substratum to a depth of 60 inches is dark brown loam. In some areas the surface layer is gravelly or cobbly.

Included in this unit are small areas of Abin, Camas, and Newberg soils and Riverwash; Cove soils on concave slopes; Central Point, Medford, and Takilma soils on terraces; and soils that are similar to the Evans soil but have a gravelly or very gravelly substratum. Also included are small areas of Evans soils that have slopes of more than 3 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderate in the Evans soil. Available water capacity is about 11 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is occasionally flooded for brief periods from December through March.

This unit is used mainly for irrigated crops, such as alfalfa hay and small grain. Other crops include corn for silage and tree fruit. Some areas are used for grass-legume hay, pasture, or homesite development.

This unit is well suited to irrigated crops. It is limited mainly by the hazard of flooding. This hazard can be reduced by levees, dikes, and diversions.

In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. The system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Because the soil is droughty, the applications should be light and frequent. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet and by planting a cover crop. A permanent sod crop helps to control runoff.

Maintaining a protective plant cover in winter reduces the soil loss resulting from flooding. Proper stocking rates, pasture rotation, and restricted grazing during we periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main hazard affecting homesite development is the flooding, which limits the suitability for septic tank absorption fields. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils. Dikes and channels that have outlets for floodwater can protect buildings and onsite sewage disposal systems from flooding.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

Roads and streets should be constructed above the expected level of flooding. The risk of flooding has been reduced in some areas by the construction of large dams and reservoirs upstream.

The vegetative site is Loamy Flood Plain, 18- to 30-inch precipitation zone.

56C—Farva very cobbly loam, 3 to 12 percent slopes. This moderately deep, well drained soil is on plateaus. It formed in colluvium derived from andesite, basalt, and volcanic ash. Elevation is 3,600 to 6,100 feet. The mean annual precipitation is 30 to 55 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days susceptible to compaction. Ripping skid trails and landings when the soils are dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. The large number of rock fragments in the Geppert soil also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings.

The main limitations affecting livestock grazing are compaction and erosion. The native vegetation suitable for grazing includes western fescue, mountain brome, tall trisetum, and Alaska oniongrass. If the understory is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

A planned grazing system that includes timely deferment of grazing, rotation grazing, and proper livestock distribution helps to prevent overgrazing of the understory and damage to the soils. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soils are firm enough to withstand trampling by livestock.

Thinning, logging, and fire reduce the density of the overstory canopy and increase the production of understory vegetation. Areas that support a large amount of competing vegetation can be improved by prescribed burning or by chemical or mechanical treatment. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The vegetative site is Mixed Fir-Dogwood Forest.

66G—Freezener-Geppert complex, 35 to 60 percent north slopes. This map unit is on hillslopes. Elevation is 1,500 to 4,000 feet. The mean annual precipitation is 30 to 50 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 65 percent Freezener soil and 30 percent Geppert soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of McMullin soils and Rock outcrop on ridges and convex slopes and soils that are similar to the Freezener soil but have more than 35 percent rock fragments or have bedrock within a depth of 60 inches. Also included are small areas of Freezener and Geppert soils that have slopes of less than 35 or more than 60 percent. Included areas make up about 5 percent of the total acreage.

The Freezener soil is very deep and well drained. It formed in colluvium derived dominantly from andesite. Typically, the surface is covered with a layer of needles, leaves, and twigs about 1½ inches thick. The surface layer is dark reddish brown gravelly loam about 9 inches thick. The upper 9 inches of the subsoil is dark reddish brown clay loam. The lower 42 inches is dark reddish brown and dark brown clay and clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is cobbly or stony.

Permeability is moderately slow in the Freezener soil. Available water capacity is about 9 inches. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Geppert soil is moderately deep and well drained. It formed in colluvium derived dominantly from andesite. Typically, the surface is covered with a layer of needles, leaves, and twigs about ½ inch thick. The surface layer is dark reddish brown very cobbly loam about 13 inches thick. The subsoil is dark reddish brown extremely cobbly clay loam about 17 inches thick. Weathered bedrock is at a depth of about 30 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony.

Permeability is moderate in the Geppert soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, livestock grazing, and wildlife habitat.

This unit is suited to the production of Douglas fir. Other species that grow on this unit include white fir, incense cedar, and Pacific dogwood. The understory vegetation includes Pacific serviceberry, cascade

Oregongrape, and deerfoot vanillaleaf.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 140 on the Freezener soil. The yield at culmination of the mean annual increment is 8,700 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 69,410 board feet per acre (Scribner rule) at 110 years. On the basis of a 50-year curve, the mean site index is 105.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 120 on the Geppert soil. The yield at culmination of the mean annual increment is 6,900 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 52,440 board feet per acre (Scribner rule) at 120 years. On the basis of a 50-year curve, the mean site index is 80.

The main limitations affecting timber production are the slope, erosion, compaction, plant competition, and seedling mortality. Also, the bedrock underlying the Geppert soil restricts root growth. As a result, windthrow is a hazard.

Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer and results in less surface disturbance. If the soils are excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Using standard wheeled and tracked equipment when the soils are moist causes rutting and compaction. Puddling can occur when the soils are wet. Using low-pressure ground equipment causes less damage to the soils and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Ripping skid trails and landings when the soils are dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Cutbanks occasionally slump when the soils are saturated.

Constructing logging roads on the steeper slopes can result in a high risk of erosion. Building the roads at midslope requires extensive cutting and filling and removes land from production. Material that is discarded when the roads are built can damage vegetation and is a potential source of sedimentation. If the material becomes saturated, avalanches of debris can occur. End hauling of the waste material minimizes damage to the vegetation downslope and reduces the risk of sedimentation. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging road require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir and ponderos pine seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimize competition from undesirable understory plants.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. The large number of rock fragments in the Geppert soil also increases the seedling mortality rate. To compensate for the expecte high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings.

The main limitations affecting livestock grazing are erosion, compaction, and the slope. The native vegetation suitable for grazing includes western fescue mountain brome, tall trisetum, and Alaska oniongrass. the understory is overgrazed, the proportion of preferre forage plants decreases and the proportion of less preferred forage plants increases.

A planned grazing system that includes timely deferment of grazing, rotation grazing, and proper livestock distribution helps to prevent overgrazing of th understory and damage to the soils. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soils are firm enough to withstand trampling b livestock.

Thinning, logging, and fire reduce the density of the overstory canopy and increase the production of understory vegetation. Areas that support a large amount of competing vegetation can be improved by prescribed burning or by chemical or mechanical treatment. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The vegetative site is Mixed Fir-Dogwood Forest.

67E—Freezener-Geppert complex, 12 to 35 perce south slopes. This map unit is on hillslopes. Elevation is 1,500 to 4,000 feet. The mean annual precipitation i 30 to 50 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 65 percent Freezener soil and 30 percent Geppert soil. The components of this unit occ as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Terrabella soils near drainageways and on concave slopes and soils that are similar to the Freezener soil but have more than 35 percent rock fragments or have bedrock within a depth of 60 inches. Also included are small areas of Freezener and Geppert soils that have slopes of less than 12 or more than 35 percent. Included areas make up about 5 percent of the total acreage.

The Freezener soil is very deep and well drained. It formed in colluvium derived dominantly from andesite. Typically, the surface is covered with a layer of needles, leaves, and twigs about 1½ inches thick. The surface layer is dark reddish brown gravelly loam about 9 inches thick. The upper 9 inches of the subsoil is dark reddish brown clay loam. The lower 42 inches is dark reddish brown and dark brown clay and clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is cobbly or stony.

Permeability is moderately slow in the Freezener soil. Available water capacity is about 9 inches. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Geppert soil is moderately deep and well drained. It formed in colluvium derived dominantly from andesite. Typically, the surface is covered with a layer of needles, leaves, and twigs about ½ inch thick. The surface layer is dark reddish brown very cobbly loam about 13 inches thick. The subsoil is dark reddish brown extremely cobbly clay loam about 17 inches thick. Weathered bedrock is at a depth of about 30 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony.

Permeability is moderate in the Geppert soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production, livestock grazing, and wildlife habitat.

This unit is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include sugar pine, white fir, and California black oak. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and western fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 125 on the Freezener soil. The yield at culmination of the mean annual increment is 7,320 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 58,200 board feet per acre (Scribner rule) at 120 years. On the basis of a 50-year curve, the mean site index is 90.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 95 on the Geppert soil. The yield at culmination of the mean annual increment is 4,620 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 37,120 board feet per acre (Scribner rule) at 160 years. On the basis of a 50-year curve, the mean site index is 70.

The main limitations affecting timber production are erosion, compaction, seedling mortality, and plant competition. Also, the bedrock underlying the Geppert soil restricts root growth. As a result, windthrow is a hazard.

Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer in the more sloping areas and results in less surface disturbance. If the soils are excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Using standard wheeled and tracked equipment when the soils are moist causes rutting and compaction. Puddling can occur when the soils are wet. Using low-pressure ground equipment causes less damage to the soils and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Ripping skid trails and landings when the soils are dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. The large number of rock fragments in the Geppert soil also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The main limitations affecting livestock grazing are compaction and erosion. The native vegetation suitable for grazing includes western fescue, mountain brome, tall trisetum, and Alaska oniongrass. If the understory is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

A planned grazing system that includes timely deferment of grazing, rotation grazing, and proper livestock distribution helps to prevent overgrazing of the understory and damage to the soils. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soils are firm enough to withstand trampling by livestock.

Thinning, logging, and fire reduce the density of the overstory canopy and increase the production of understory vegetation. Areas that support a large amount of competing vegetation can be improved by prescribed burning or by chemical or mechanical treatment. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The vegetative site is Mixed Fir-Mixed Pine Forest.

67G—Freezener-Geppert complex, 35 to 60 percent south slopes. This map unit is on hillslopes. Elevation is 1,500 to 4,000 feet. The mean annual precipitation is 30 to 50 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 65 percent Freezener soil and 30 percent Geppert soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of McMullin soils and Rock outcrop on ridges and convex slopes and soils that are similar to the Freezener soil but have more than 35 percent rock fragments or have bedrock within a depth of 60 inches. Also included are small areas of Freezener and Geppert soils that have slopes of less than 35 or more than 60 percent. Included areas make up about 5 percent of the total acreage.

The Freezener soil is very deep and well drained. It formed in colluvium derived dominantly from andesite. Typically, the surface is covered with a layer of needles, leaves, and twigs about 1½ inches thick. The surface layer is dark reddish brown gravelly loam about 9 inches thick. The upper 9 inches of the subsoil is dark reddish brown clay loam. The lower 42 inches is dark reddish brown and dark brown clay and clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is cobbly or stony.

Permeability is moderately slow in the Freezener sc Available water capacity is about 9 inches. The effecti rooting depth is 60 inches or more. Runoff is rapid, ar the hazard of water erosion is high.

The Geppert soil is moderately deep and well drained. It formed in colluvium derived dominantly fror andesite. Typically, the surface is covered with a layeı of needles, leaves, and twigs about ½ inch thick. The surface layer is dark reddish brown very cobbly loam about 13 inches thick. The subsoil is dark reddish brown extremely cobbly clay loam about 17 inches thick. Weathered bedrock is at a depth of about 30 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony.

Permeability is moderate in the Geppert soil. Available water capacity is about 3 inches. The effecti rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, livestock grazing, and wildlife habitat.

This unit is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include sugar pine, white fir, and California black oak. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and western fescue.

On the basis of a 100-year site curve, the mean sit index for Douglas fir is 125 on the Freezener soil. The yield at culmination of the mean annual increment is 7,320 cubic feet per acre in a fully stocked, even-agec stand of trees at 60 years and 58,200 board feet per acre (Scribner rule) at 120 years. On the basis of a 5(year curve, the mean site index is 90.

On the basis of a 100-year site curve, the mean sit index for Douglas fir is 95 on the Geppert soil. The yi at culmination of the mean annual increment is 4,620 cubic feet per acre in a fully stocked, even-aged stanc of trees at 60 years and 37,120 board feet per acre (Scribner rule) at 160 years. On the basis of a 50-yea curve, the mean site index is 70.

The main limitations affecting timber production are the slope, erosion, compaction, seedling mortality, an plant competition. Also, the bedrock underlying the Geppert soil restricts root growth. As a result, windthr is a hazard.

Wheeled and tracked logging equipment can be us in the less sloping areas, but cable yarding generally safer and results in less surface disturbance. If the so are excessively disturbed when timber is harvested oı logging roads are built, a larger number of rock fragments is left on the surface. Using standard wheeled and tracked equipment when the soils are moist causes rutting and compaction. Puddling can occur when the soils are wet. Using low-pressure ground equipment causes less damage to the soils ar seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

Increased erosion, loss of plant nutrients, and water repellency are likely to result from fires of moderate intensity.

The vegetative site is Douglas Fir-Madrone-Chinkapin Forest.

96B—Kanutchan clay, 1 to 8 percent slopes. This deep, somewhat poorly drained soil is in basins. It formed in alluvium and colluvium derived dominantly from andesite, tuff, and breccia. Elevation is 3,600 to 5,500 feet. The mean annual precipitation is 25 to 50 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days. The native vegetation is mainly grasses, sedges, and forbs.

Typically, the surface layer is black clay about 20 inches thick. The subsoil is black and very dark gray clay about 26 inches thick. Bedrock is at a depth of about 46 inches. The depth to bedrock ranges from 40 to 60 inches. In some areas the surface layer is cobbly or stony.

Included in this unit are small areas of Bybee, Farva, Pinehurst, Sibannac, and Tatouche soils. Also included are small areas of soils that are similar to the Kanutchan soil but have bedrock at a depth of less than 40 or more than 60 inches and small areas of Kanutchan soils that have slopes of more than 8 percent. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Kanutchan soil. Available water capacity is about 7 inches. The effective rooting depth is limited by the water table, which is within a depth of 1.5 feet from December through May. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for livestock grazing and wildlife habitat. It is well suited to permanent pasture. The main limitations affecting livestock grazing are the seasonal wetness, compaction, the high content of clay, and a slow rate of water intake. The wetness limits the choice of suitable forage plants and the period of cutting or grazing and increases the risk of winterkill. The high content of clay severely limits tillage and root growth. Deep cracks form as the soil dries in summer.

If the pasture is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. The grazing system should maintain the desired balance of species in the plant community. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth.

Tufted hairgrass is the native plant preferred for livestock grazing; however, this unit can be renovated and forage production increased by seeding other suitable grasses. The plants selected for seeding should be those that are tolerant of wetness. Border and contour flood irrigation systems are suitable. Because of the very slow permeability, water applications should be regulated so that the water does not stand on the surface and damage the crop. Land leveling helps to ensure a uniform application of water. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The vegetative site is Wet Meadow.

97A—Kerby loam, 0 to 3 percent slopes. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. Elevation is 1,000 to 2,000 feet. The mean annual precipitation is 18 to 35 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The vegetation in areas that have not been cultivated is mainly grasses and forbs.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. The subsoil is dark brown loam about 47 inches thick. The substratum to a depth of 60 inches is dark brown very gravelly sandy loam.

Included in this unit are small areas of Gregory and Kubli soils on concave slopes, Central Point and Medford soils, and soils that are similar to the Kerby soil but have very gravelly layers within a depth of 40 inches. Also included are small areas of Kerby soils that have slopes of more than 3 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Kerby soil. Available water capacity is about 10 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated crops, such as grass seed, onions, alfalfa, and tree fruit. Other crops include strawberries, small grain, and sugar beet seed. Some areas are used for homesite development or pasture.

This unit is well suited to irrigated crops. It has few limitations. In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. The system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

This unit is well suited to homesite development. It has few limitations. Cutbanks are not stable and are subject to slumping. To keep cutbanks from caving in, excavations may require special retainer walls. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Deep Loamy Terrace, 18- to 28-inch precipitation zone.

98A—Kerby loam, wet, 0 to 3 percent slopes. This very deep, moderately well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. Elevation is 1,000 to 1,500 feet. The mean annual precipitation is 18 to 35 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The vegetation in areas that have not been cultivated is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown and dark yellowish brown loam about 15 inches thick. The subs is brown and dark yellowish brown clay loam about 40 inches thick. The substratum to a depth of 60 inches i dark yellowish brown loam. The depth to bedrock is 6(inches or more.

Included in this unit are small areas of Central Poin Kerby, and Medford soils; Gregory soils on concave slopes; and Brader, Debenger, and Langellain soils or convex slopes. Also included are small areas of Kerby soils that have slopes of more than 3 percent. Include areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Kerby soil. Available water capacity is about 10 inches. The effective rooting depth is limited by the water table, which is at a depth of 1.5 to 2.5 feet from December through May. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for irrigated small grain and hay ar pasture.

This unit is suited to irrigated crops. It is limited mainly by wetness in winter and spring. Crops that require good drainage can be grown if a properly designed tile drainage system is installed. Tile drainag can lower the water table if a suitable outlet is availab Land smoothing and open ditches can reduce surface wetness.

In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. Tl system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to tl available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and til Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when w Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returnir crop residue to the soil.

The main limitations in the areas used for hay and pasture are wetness in winter and spring and compaction. The wetness limits the choice of suitable

Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

This unit is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, California black oak, and Pacific madrone. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and California fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 105. The yield at culmination of the mean annual increment is 5,460 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 45,600 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 75.

The main limitations affecting timber production are compaction, seedling mortality, and plant competition. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The vegetative site is Pine-Douglas Fir-Fescue.

108D—Manita loam, 7 to 20 percent slopes. This deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 20 to 40 inches, the mean annual temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown loam about 8 inches thick. The upper 5 inches of the subsoil is dark reddish brown clay loam. The lower 45 inches is yellowish red clay loam. Weathered bedrock is at a depth of about 58 inches. The depth to bedrock ranges from 40 to 60 inches. In some areas the surface layer is gravelly.

Included in this unit are small areas of Ruch soils, Darow and Vannoy soils on ridges and convex slopes, Selmac soils on concave slopes, Gregory and Medford soils near drainageways on terraces, and soils that are similar to the Manita soil but have bedrock at a depth of more than 60 inches. Also included are small areas of Manita soils that have slopes of less than 7 or more than 20 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Manita soil. Available water capacity is about 8 inches. The effective rooting depth is 40 to 60 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This unit is used for irrigated crops, such as alfalfa hay, small grain, tree fruit, and grass-legume hay. It also is used for timber production, pasture, and homesite development.

This unit is suited to irrigated crops. It is limited mainly by the slope and the moderately slow permeability. In summer, irrigation is needed for the maximum production of most crops. Because of the slope, sprinkler irrigation is the best method of applying water. This method permits an even, controlled application of water, helps to prevent excessive runoff, and minimizes the risk of erosion. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

The hazard of erosion can be reduced if fall grain is seeded early, tillage is minimized, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grasses.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

The main limitations affecting homesite development are the moderately slow permeability, the shrink-swell potential, and the slope. The moderately slow permeability can be overcome by increasing the size of the absorption field.

If buildings are constructed on this unit, properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

This unit is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, California black oak, and Pacific madrone. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and California fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 105. The yield at culmination of the mean annual increment is 5,460 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 45,600 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 75.

The main limitations affecting timber production are erosion, compaction, seedling mortality, and plant competition. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The vegetative site is Pine-Douglas Fir-Fescue.

108E—Manita loam, 20 to 35 percent slopes. This deep, well drained soil is on alluvial fans and hillslopes. It formed in alluvium and colluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 4,000 feet The mean annual precipitation is 20 to 40 inches, the mean annual temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown loam about 8 inches thick. The upper 5 inches of the subsoil is dark reddish brown clay loam. The lower 45 inches is yellowish red clay loam. Weathered bedrock is at a depth of about 58 inches. The depth to bedrock ranges yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

The Medco soil, which occurs throughout the unit, is subject to severe slumping. Road failure and landslides are likely to occur after road construction and clearcutting. Slumping can be minimized by constructing logging roads in the less sloping areas, on better suited soils if practical, and by installing properly designed road drainage systems.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate, especially on south- and southwest-facing slopes. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable understory plants.

The vegetative site in areas of the Medco soil is Loamy Hills, 20- to 35-inch precipitation zone, and the one in areas of the McNull soil is Pine-Douglas Fir-Fescue.

127A—Medford silty clay loam, 0 to 3 percent slopes. This very deep, moderately well drained soil is on stream terraces. It formed in alluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 18 to 35 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 125 to 180 days. The vegetation in areas that have not been cultivated is mainly grasses and forbs.

Typically, the surface layer is very dark brown silty clay loam about 12 inches thick. The upper 10 inches of the subsoil is very dark brown silty clay. The next 31 inches is dark brown and dark yellowish brown silty clay loam and clay loam. The lower part to a depth of 71 inches is dark yellowish brown sandy clay loam. In some areas the surface layer is gravelly or cobbly.

Included in this unit are small areas of Abin, Evans, Newberg, and Camas soils on flood plains; Gregory soils on the lower terraces and on concave slopes; Coleman soils on the higher terraces; and Central Point soils. Also included are small areas of Medford soils that have slopes of more than 3 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Medford soil. Available water capacity is about 10 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table fluctuates between depths of 4 and 6 feet from December through April.

This unit is used mainly for irrigated crops, such as alfalfa hay, tree fruit, and small grain. Other crops include corn for silage and sugar beet seed. Some areas are used for homesite development, grass-legume hay, or pasture.

This unit is well suited to irrigated crops. It is limited mainly by the moderately slow permeability and wetness in winter and spring. In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. The system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

A subsurface drainage system can lower the water table if a suitable outlet is available. Land smoothing and open ditches can reduce surface wetness.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

percent. Included areas make up about 15 percent of the total acreage.

The Medco soil is moderately deep and moderately well drained. It formed in colluvium derived dominantly from andesite, tuff, and breccia. Typically, the surface layer is very dark brown and very dark grayish brown cobbly clay loam about 7 inches thick. The next layer is very dark grayish brown cobbly clay loam about 5 inches thick. The subsoil is brown clay about 18 inches thick. Weathered bedrock is at a depth of about 30 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony.

Permeability is very slow in the Medco soil. Available water capacity is about 4 inches. The effective rooting depth is limited by a dense layer of clay at a depth of 6 to 18 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate or high. The water table, which is perched above the layer of clay, is at a depth of 0.5 foot to 1.5 feet from December through March.

The McNull soil is moderately deep and well drained. It formed in colluvium derived dominantly from andesite, tuff, and breccia. Typically, the surface is covered with a layer of needles, leaves, and twigs about 1 inch thick. The surface layer is dark reddish brown loam about 6 inches thick. The upper 6 inches of the subsoil is dark reddish brown clay loam. The lower 20 inches is dark reddish brown cobbly clay. Weathered bedrock is at a depth of about 32 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony or cobbly.

Permeability is slow in the McNull soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for livestock grazing or wildlife habitat. The McNull soil also is used for timber production.

The main limitations affecting livestock grazing are compaction, erosion, and the slope. The Medco soil also is limited by wetness in winter and spring. The vegetation suitable for grazing includes Idaho fescue, bluebunch wheatgrass, and pine bluegrass on the Medco soil and Idaho fescue, tall trisetum, and western fescue on the McNull soil. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

A planned grazing system that includes timely deferment of grazing, rotation grazing, and proper livestock distribution helps to prevent overgrazing of the understory and damage to the soils. Because the Medco soil remains wet for long periods in spring, grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock. Compaction can be minimized by grazing first in the areas that dry out earliest.

Thinning, logging, and fire reduce the density of the overstory canopy and increase the production of understory vegetation. Areas that support a large amount of competing vegetation can be improved by prescribed burning or by chemical or mechanical treatment. In places the use of ground equipment is limited by the seasonal wetness, the slope, and the included areas of stony soils and Rock outcrop.

Range seeding is suitable on the Medco soil if the site is in poor condition. The main limitations are wetness in winter and spring and droughtiness in summer and fall. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The McNull soil is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, California black oak, and Pacific madrone. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and California fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 95 on the McNull soil. The yield at culmination of the mean annual increment is 4,620 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 37,120 board feet per acre (Scribner rule) at 160 years. On the basis of a 50-year curve, the mean site index is 70.

The main limitations affecting timber production on the McNull soil are erosion, compaction, seedling mortality, and plant competition. Also, the bedrock restricts root growth. As a result, windthrow is a hazard.

Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer in the more sloping areas and results in less surface disturbance. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Areas that have been cut and filled are easily eroded unless they are treated. Seeding, mulching, and benching these areas help to control erosion. Steep

Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the moderately slow permeability, the wetness, the shrink-swell potential, and low strength.

The moderately slow permeability and depth to the water table increase the possibility that septic tank absorption fields will fail. The moderately slow permeability can be overcome by increasing the size of the absorption field. Interceptor ditches can divert subsurface water and thus improve the efficiency of the absorption fields.

A drainage system may be needed if roads and building foundations are constructed on this unit. The wetness can be reduced by installing drainage tile around footings. Properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Deep Loamy Terrace, 18- to 28-inch precipitation zone.

128B—Medford clay loam, gravelly substratum, 0 to 7 percent slopes. This very deep, moderately well drained soil is on stream terraces. It formed in alluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 18 to 35 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 125 to 180 days. The vegetation in areas that have not been cultivated is mainly grasses and forbs.

Typically, the surface layer is very dark gray clay loam about 9 inches thick. The subsoil is very dark grayish brown clay about 31 inches thick. The substratum to a depth of 62 inches is light olive brown very gravelly clay loam. In some areas the surface layer is gravelly or cobbly.

Included in this unit are small areas of Abin, Evans, Newberg, and Camas soils on flood plains; Gregory soils on the lower terraces and on concave slopes; Coleman soils on the higher terraces; and Central Point soils. Also included are small areas of Medford soils that have slopes of more than 7 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Medford soil. Available water capacity is about 8 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table fluctuates between depths of 3 and 5 feet from December through April.

This unit is used mainly for irrigated crops, such as alfalfa hay, tree fruit, and small grain. Other crops include corn for silage and sugar beet seed. Some areas are used for homesite development, grass-legume hay, or pasture.

This unit is well suited to irrigated crops. It is limited mainly by the moderately slow permeability and wetness in winter and spring. In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. The system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

A subsurface drainage system can lower the water table if a suitable outlet is available. Land smoothing and open ditches can reduce surface wetness.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the moderately slow permeability, the wetness, the shrink-swell potential, and low strength.

The moderately slow permeability and depth to the water table increase the possibility that septic tank absorption fields will fail. The moderately slow permeability can be overcome by increasing the size of the absorption field. Interceptor ditches can divert subsurface water and thus improve the efficiency of the absorption fields.

A drainage system may be needed if roads and building foundations are constructed on this unit. The wetness can be reduced by installing drainage tile around footings. Properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Deep Loamy Terrace, 18- to 28-inch precipitation zone.

129B—Merlin extremely stony loam, 1 to 8 percent slopes. This shallow, well drained soil is on plateaus. It formed in residuum derived dominantly from andesite and tuff. Elevation is 4,000 to 4,800 feet. The mean annual precipitation is 17 to 18 inches, the mean annual temperature is 43 to 45 degrees F, and the average frost-free period is less than 100 days. The native vegetation is mainly grasses, shrubs, and forbs.

Typically, the surface layer is dark brown extremely stony loam about 11 inches thick. The subsoil is dark brown clay about 2 inches thick. Bedrock is at a depth of about 13 inches. The depth to bedrock ranges from 10 to 20 inches. In some areas the surface layer is very gravelly or very cobbly.

Included in this unit are small areas of Bly and Royst soils and soils that are similar to the Merlin soil but have bedrock within a depth of 10 inches or have a subsoil of loam. Also included are small areas of Merlin soils that have slopes of more than 8 percent. Included areas make up about 20 percent of the total acreage.

Permeability is very slow in the Merlin soil. Available water capacity is about 2 inches. The effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used for livestock grazing and wildlife habitat. The main limitations affecting livestock grazing are compaction, stones on the surface, droughtiness, and the depth to bedrock. The vegetation suitable for grazing includes Idaho fescue, pine bluegrass, and bluebunch wheatgrass. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment. The use of ground equipment is not practical because of the stones on the surface.

This unit is poorly suited to range seeding. The main limitations are droughtiness, the stones on the surface, and the depth to bedrock. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

This unit is limited as a site for livestock watering ponds and other water impoundments because of the depth to bedrock.

The vegetative site is Loamy Juniper Scabland, 20- to 30-inch precipitation zone.

130E—Musty-Goolaway complex, 12 to 35 percent slopes. This map unit is on ridges. Elevation is 2,500 to 4,000 feet. The mean annual precipitation is 40 to 50 inches, the mean annual temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 60 percent Musty soil and 20 percent Goolaway soil. The Goolaway soil commonly has slopes of more than 20 percent. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Josephine, Siskiyou, and Speaker soils; Pollard soils on concave slopes; Rock outcrop; soils that are similar to the Musty soil but have bedrock within a depth of 20 inches; and soils that are similar to the Goolaway soil but have bedrock at a depth of more than 40 inches. Also included are small areas of Musty and Goolaway soils that have slopes of less than 12 or more than 35 percent. Included areas make up about 20 percent of the total acreage.

The Musty soil is moderately deep and well drained. It formed in colluvium derived dominantly from schist.

shrink-swell potential help to prevent the structural damage caused by shrinking and swelling.

Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer help to establish plants in cut areas. Gravel and cobbles should be removed from disturbed areas, particularly areas used for lawns. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Loamy Hills, 20- to 35-inch precipitation zone.

151C—Provig-Agate complex, 5 to 15 percent slopes. This map unit is on fan terraces. Elevation is 1,100 to 1,850 feet. The mean annual precipitation is 18 to 30 inches, the mean annual temperature is 52 to 54 degrees F, and the average frost-free period is 150 to 180 days. The native vegetation on the Provig soil is mainly hardwoods and an understory of grasses, shrubs, and forbs. That on the Agate soil is mainly grasses, shrubs, and forbs.

This unit is about 60 percent Provig soil and 30 percent Agate soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Carney and Winlo soils, Cove and Padigan soils near drainageways and on concave slopes, and soils that are similar to the Provig soil but have sandstone bedrock at a depth of 40 to 60 inches. Also included are small areas of Provig and Agate soils that have slopes of less than 5 or more than 15 percent. Included areas make up about 10 percent of the total acreage.

The Provig soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is very dark brown and very dark grayish brown very gravelly loam about 9 inches thick. The subsoil is dark brown very gravelly clay loam about 6 inches thick. The substratum to a depth of 60 inches is dark reddish brown and reddish brown, stratified extremely gravelly clay. In some areas the surface layer is very cobbly.

Permeability is slow in the Provig soil. Available water capacity is about 4 inches. The effective rooting depth is 14 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Agate soil is moderately deep to a hardpan and is well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown loam about 6 inches thick. The next layer is dark yellowish brown clay loam about 6 inches thick. The upper 13 inches of the subsoil is dark brown clay loam. The lower 5 inches is a hardpan. The substratum to a depth of 62 inches is light olive brown extremely gravelly coarse sandy loam. Depth to the hardpan is 20 to 30 inches. The depth to bedrock is 60 inches or more. In some areas the surface layer is gravelly or cobbly.

Permeability is moderately slow in the Agate soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 30 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for hay and pasture, homesite development, and livestock grazing.

The main limitations affecting the use of this unit for hay and pasture are compaction, droughtiness, the limited rooting depth, and the very gravelly surface layer of the Provig soil. In some areas ripping and shattering the hardpan in the Agate soil can increase the effective rooting depth.

If the pasture or range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. The grazing system should maintain the desired balance of species in the plant community. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soils from erosion. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth.

The native vegetation suitable for grazing includes Idaho fescue, bluebunch wheatgrass, pine bluegrass, and Lemmon needlegrass. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment.

Range seeding is suitable if the site is in poor condition. The main limitation is droughtiness. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. In places the use of ground equipment is limited by the gravel on the surface of the Provig soil and the included Winlo soils.

In summer, irrigation is needed for the maximum production of hay and pasture. Because of the slope, sprinkler irrigation is the best method of applying water. This method permits an even, controlled application of water, helps to prevent excessive runoff, and minimizes the risk of erosion. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the slow permeability, a high shrink-swell potential, the very gravelly surface layer in the Provig soil, and depth to the hardpan in the Agate soil.

This unit is poorly suited to standard systems of waste disposal because of depth to the hardpan in the Agate soil and the slow permeability in the Provig soil. The suitability of the Agate soil for septic tank absorption fields can be improved by ripping the hardpan. Alternative waste disposal systems may function properly on this unit. Suitable included soils are in some areas of the unit. Onsite investigation is needed to locate such soils.

If buildings are constructed on the Provig soil, properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling.

Cuts needed to provide essentially level building sites can expose bedrock. Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer help to establish plants in cut areas. Gravel and cobbles should be removed from disturbed areas, particularly areas used for lawns. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site in areas of the Provig soil is Loamy Hills, 20- to 35-inch precipitation zone, and the one in areas of the Agate soil is Biscuit-Scabland (mound), 18- to 26-inch precipitation zone.

152B—Randcore-Shoat complex, 0 to 5 percent slopes. This map unit is on plateaus. Elevation is 2,000 to 3,800 feet. The mean annual precipitation is 18 to 25 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 150 days. The native vegetation is mainly grasses, shrubs, and forbs.

This unit is about 60 percent Randcore soil and 30 percent Shoat soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used. The soils occur as patterned land. Areas of the Randcore soil are between and around areas of the Shoat soil, which is on circular mounds (fig. 10).

Included in this unit are small areas of Lorella, Paragon, and Skookum soils; Rock outcrop; and soils that are similar to the Shoat soil but have bedrock at a depth of 10 to 20 inches or more than 40 inches. Also included are small areas of Randcore and Shoat soils that have slopes of more than 5 percent. Included areas make up about 10 percent of the total acreage.

The Randcore soil is very shallow and moderately well drained. It formed in loess over andesite. Typically, the surface layer is dark brown extremely stony loam about 1 inch thick. The next layer is dark brown loam about 5 inches thick. Bedrock is at a depth of about 6 inches. The depth to bedrock ranges from 4 to 10 inches.

Permeability is moderate in the Randcore soil. Available water capacity is about 1 inch. The effective rooting depth is 4 to 10 inches. This soil is ponded in January and February. Runoff is ponded, and the hazard of water erosion is slight.

The Shoat soil is moderately deep and well drained. It formed in loess over andesite. Typically, the surface layer is dark brown loam about 4 inches thick. The subsoil also is dark brown loam. It is about 20 inches thick. Bedrock is at a depth of about 24 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony.

Permeability is moderate in the Shoat soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for livestock grazing and wildlife habitat. The main limitations affecting livestock grazing are compaction and droughtiness in summer and fall. The Randcore soil also is limited by stones on the surface, wetness in winter and spring, and the depth to bedrock. The vegetation suitable for grazing includes bluebunch wheatgrass, Idaho fescue, and pine bluegrass. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soils are firm enough to withstand trampling by livestock.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment. The use of ground equipment generally is not practical because of the stones on the surface of the Randcore soil.

This unit is poorly suited to range seeding. The main prescribed burning or by chemical or mechanical treatment. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The vegetative site is Mixed Fir-Serviceberry Forest.

156G—Rogue cobbly coarse sandy loam, 35 to 75 percent south slopes. This deep, somewhat excessively drained soil is on hillslopes. It formed in colluvium derived dominantly from granitic rock. Elevation is 3,600 to 6,000 feet. The mean annual precipitation is 35 to 55 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is very dark grayish brown cobbly coarse sandy loam about 6 inches thick. The subsoil is brown and yellowish brown cobbly coarse sandy loam about 28 inches thick. The substratum is light olive brown and light yellowish brown coarse sandy loam about 20 inches thick. Weathered bedrock is at a depth of about 54 inches. The depth to bedrock ranges from 40 to 60 inches. In some areas the surface layer is stony or very cobbly.

Included in this unit are small areas of poorly drained soils near drainageways and soils that are similar to the Rogue soil but have more than 35 percent rock fragments or have bedrock at a depth of less than 40 or more than 60 inches. Also included are small areas of Rogue soils that have slopes of less than 35 or more than 75 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately rapid in the Rogue soil. Available water capacity is about 4 inches. The effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, livestock grazing, and wildlife habitat.

This unit is suited to the production of white fir and Douglas fir. Other species that grow on this unit include incense cedar and ponderosa pine. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and common snowberry.

On the basis of a 50-year site curve, the mean site index for white fir is 70. The yield at culmination of the mean annual increment is 11,410 cubic feet per acre in a fully stocked, even-aged stand of trees at 70 years.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 100. The yield at culmination of the mean annual increment is 5,040 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 39,750 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 70.

The main limitations affecting timber production are the slope, erosion, compaction, seedling mortality, and plant competition. When timber is harvested, management that minimizes the risk of erosion is essential. Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer and results in less surface disturbance. If the soil is excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface.

Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Areas that have been cut and filled are easily eroded unless they are treated. Seeding, mulching, and benching these areas help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Cutbanks occasionally slump when the soil is saturated.

This unit is subject to slumping, especially in areas adjacent to drainageways. Road failure and landslides are likely to occur after road construction and clearcutting. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Constructing logging roads on the steeper slopes can result in a high risk of erosion. Building logging roads at midslope requires extensive cutting and filling and removes land from production. Material that is discarded when the roads are built can damage vegetation and is a potential source of sedimentation. If the material becomes saturated, avalanches of debris can occur. End hauling of the waste material minimizes damage to the vegetation downslope and reduces the risk of sedimentation.

A high temperature in the surface layer during summer and the low available water capacity increase the seedling mortality rate. The large number of rock fragments in the soil also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. The seedling mortality rate also can be reduced by providing artificial shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Severe frost can damage or kill seedlings. Proper timber harvesting methods can reduce the effect of frost on regeneration.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

Increased erosion, loss of plant nutrients, and water repellency are likely to result from fires of moderate intensity.

The main limitations affecting livestock grazing are erosion, compaction, and the slope. The native vegetation suitable for grazing includes western fescue, mountain brome, tall trisetum, and Alaska oniongrass. If the understory is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

A planned grazing system that includes timely deferment of grazing, rotation grazing, and proper livestock distribution helps to prevent overgrazing of the understory and damage to the soil. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock.

Thinning, logging, and fire reduce the density of the overstory canopy and increase the production of understory vegetation. Areas that support a large amount of competing vegetation can be improved by prescribed burning or by chemical or mechanical treatment. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The vegetative site is Mixed Fir-Serviceberry Forest.

157B—Ruch silt loam, 2 to 7 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 3,000 feet. The mean annual precipitation is 20 to 35 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper 10 inches of the subsoil is reddish brown loam. The lower 53 inches is yellowish red loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is gravelly, cobbly, or stony.

Included in this unit are small areas of Camas, Evans, and Newberg soils on flood plains; Gregory soils near drainageways; Selmac soils on concave slopes; Coleman, Foehlin, and Medford soils on terraces; and Abegg, Manita, Shefflein, and Vannoy soils. Also included are small areas of Xerorthents, small areas of Dumps, and small areas of Ruch soils that have slopes of more than 7 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Ruch soil. Available water capacity is about 8 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for irrigated crops, such as alfalfa hay, small grain, and tree fruit. Other crops include corn for silage and grass-legume hay. Some areas are used for timber production, pasture, or homesite development.

This unit is well suited to irrigated crops. It is limited mainly by the moderately slow permeability. In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. The system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

This unit is well suited to homesite development. It has few limitations. Revegetating as soon as possible in disturbed areas around construction sites helps to control erosion. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

This unit is suited to the production of ponderosa pine and Douglas fir. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone. The understory vegetation includes deerbrush, tall Oregon grape, and western fescue.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 115. The yield at culmination of the mean annual increment is 5,280 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 56,780 board feet per acre (Scribner rule) at 110 years.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 90. The yield at culmination of the mean annual increment is 4,200 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 31,840 board feet per acre (Scribner rule) at 160 years. On the basis of a 50-year curve, the mean site index is 70.

The main limitations affecting timber production are compaction, seedling mortality, and plant competition. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

The vegetative site is Douglas Fir-Mixed Pine-Fescue Forest.

158B—Ruch gravelly silt loam, 2 to 7 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 3,000 feet. The mean annual precipitation is 20 to 35 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown gravelly silt loam about 7 inches thick. The upper 10 inches of the subsoil is reddish brown loam. The lower 53 inches is yellowish red loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is cobbly or stony.

Included in this unit are small areas of Camas, Evans, and Newberg soils on flood plains; Gregory soils near drainageways; Selmac soils on concave slopes; Coleman, Foehlin, and Medford soils on terraces; and Abegg, Manita, Shefflein, and Vannoy soils. Also included are small areas of Xerorthents, small areas of Dumps, and small areas of Ruch soils that have slopes of more than 7 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Ruch soil. Available water capacity is about 8 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for irrigated crops, such as alfalfa hay, small grain, and tree fruit. Other crops include corn for silage and grass-legume hay. Some areas are used for timber production, pasture, or homesite development.

This unit is well suited to irrigated crops. It is limited mainly by the moderately slow permeability and the gravelly surface layer, which may limit the use of some equipment and increase maintenance costs. In summer, irrigation is needed for the maximum production of most crops. Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suitable. The system used generally is governed by the crop that is grown. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

This unit is well suited to homesite development. It has few limitations. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Gravel and cobbles should be removed from disturbed areas, particularly areas used for lawns. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

This unit is suited to the production of ponderosa pine and Douglas fir. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone. The understory vegetation includes deerbrush, tall Oregon grape, and western fescue.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 115. The yield at culmination of the mean annual increment is 5,280 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 56,780 board feet per acre (Scribner rule) at 110 years.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 90. The yield at culmination of the mean annual increment is 4,200 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 31,840 board feet per acre (Scribner rule) at 160 years. On the basis of a 50-year curve, the mean site index is 70.

The main limitations affecting timber production are compaction, seedling mortality, and plant competition. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. If the soil is excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface.

Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. The large number of rock fragments in some areas also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

The vegetative site is Douglas Fir-Mixed Pine-Fescue Forest.

158D—Ruch gravelly silt loam, 7 to 20 percent slopes. This very deep, well drained soil is on alluvial fans and foot slopes. It formed in alluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 3,000 feet. The mean annual precipitation is 20 to 35 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown gravelly silt loam about 7 inches thick. The upper 10 inches of the subsoil is reddish brown loam. The lower 53 inches is yellowish red loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is cobbly or stony.

Included in this unit are small areas of Gregory soils near drainageways; Selmac soils on concave slopes; Vannoy and Voorhies soils on ridges and convex slopes; Coleman, Foehlin, and Medford soils on terraces; and Abegg, Manita, and Shefflein soils. Also included are small areas of Xerorthents, small areas of Dumps, and small areas of Ruch soils that have slopes of more than 7 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Ruch soil. Available water capacity is about 8 inches. The effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This unit is used mainly for irrigated crops, such as alfalfa hay, small grain, tree fruit, and grass-legume hay. It also is used for timber production, pasture, and homesite development.

This unit is suited to irrigated crops. It is limited mainly by the slope, the moderately slow permeability, and the gravelly surface layer, which may limit the use of some equipment and increase maintenance costs. In summer, irrigation is needed for the maximum production of most crops. Because of the slope, sprinkler and trickle irrigation systems are the best methods of applying water. These systems permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

The hazard of erosion can be reduced if fall grain is seeded early, stubble-mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grasses.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

The main limitation affecting homesite development is the slope. Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Gravel and cobbles should be removed from disturbed areas, particularly areas used for lawns. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

This unit is suited to the production of ponderosa pine and Douglas fir. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone. The understory vegetation includes deerbrush, tall Oregon grape, and western fescue.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 115. The yield at culmination of the mean annual increment is 5,280 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 56,780 board feet per acre (Scribner rule) at 110 years.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 90. The yield at culmination of the mean annual increment is 4,200 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 31,840 board feet per acre (Scribner rule) at 160 years. On the basis of a 50-year curve, the mean site index is 70.

The main limitations affecting timber production are erosion, compaction, seedling mortality, and plant competition. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. If the soil is excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. The large number of rock fragments in some areas also increases the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

The vegetative site is Douglas Fir-Mixed Pine-Fescue Forest.

159C—Rustlerpeak gravelly loam, 3 to 12 percent slopes. This moderately deep, well drained soil is on plateaus. It formed in colluvium derived from andesite and volcanic ash. Elevation is 4,000 to 6,100 feet. The mean annual precipitation is 40 to 50 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs.

Typically, the surface is covered with a layer of needles, leaves, and twigs about 1 inch thick. The surface layer is dark reddish brown gravelly loam about 12 inches thick. The subsoil is dark reddish brown very cobbly clay loam about 11 inches thick. Weathered bedrock is at a depth of about 23 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony.

Included in this unit are small areas of Snowlin soils on concave slopes, poorly drained soils near drainageways and on concave slopes, Woodseye soils and Rock outcrop on convex slopes, and soils that are similar to the Rustlerpeak soil but have bedrock at a depth of more than 40 inches. Also included are small areas of Rustlerpeak soils that have slopes of less than 3 or more than 12 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Rustlerpeak soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for timber production, livestock grazing, and wildlife habitat.

This unit is suited to the production of white fir. Other species that grow on this unit include Douglas fir, incense cedar and Rocky Mountain maple. The understory vegetation includes cascade Oregongrape, western white anemone, and gooseberry.

On the basis of a 50-year site curve, the mean site index for white fir is 75. The yield at culmination of the mean annual increment is 12,530 cubic feet per acre in a fully stocked, even-aged stand of trees at 70 years.

The main limitations affecting timber production are compaction, erosion, seedling mortality, and plant competition. Also, the bedrock restricts root growth. As a result, windthrow is a hazard.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. If the soil is excessively disturbed when timber is harvested or logging roads are built, a larger number of rock fragments is left on the surface. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Severe frost can damage or kill seedlings. Air drainage is restricted on this unit. Proper timber harvesting methods can reduce the effect of frost on regeneration. Reforestation can be accomplished by planting seedlings of frost-tolerant species, such as ponderosa pine and lodgepole pine.

prevent overirrigation and the development of a perched water table, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the wetness, the very slow permeability, a high shrink-swell potential, and low strength.

The very slow permeability and the seasonal high water table increase the possibility that septic tank absorption fields will fail. Interceptor ditches can divert subsurface water and thus improve the efficiency of the absorption fields. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

Because the seasonal high water table is perched above the layer of clay, a drainage system is needed on sites for buildings with basements and crawl spaces. The wetness can be reduced by installing drainage tile around footings. Properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Loamy Hills, 20- to 35-inch precipitation zone.

162D—Selmac loam, 7 to 20 percent slopes. This very deep, moderately well drained soil is in basins. It formed in alluvium derived dominantly from sedimentary and volcanic rock and underlain by clayey sediment. Elevation is 1,000 to 3,000 feet. The mean annual precipitation is 25 to 40 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The native vegetation is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown loam about 17 inches thick. The subsoil is reddish brown clay loam about 12 inches thick. The substratum to a depth of 60 inches is olive brown clay. The depth to bedrock is 60 inches or more.

Included in this unit are small areas of Darow, Manita, and Vannoy soils on hillslopes; Debenger and Ruch soils on convex slopes; Langellain soils; and Gregory soils and poorly drained or very poorly drained, loamy soils near drainageways and on concave slopes. Also included are small areas of Selmac soils that have slopes of less than 7 or more than 20 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow to a depth of 29 inches in the Selmac soil and very slow below that depth. Available water capacity is about 8 inches. The effective rooting depth is limited by the dense, clayey substratum, which is at a depth of 12 to 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The water table, which is perched above the layer of clay, is at a depth of 1.5 to 3.0 feet from December through May.

This unit is used mainly for hay and pasture. It also is used for tree fruit, small grain, and homesite development.

This unit is suited to irrigated crops. It is limited mainly by wetness in winter and spring, the very slow permeability, and the slope. Crops that require good drainage can be grown if a properly designed drainage system is installed. The ability of tile drains to remove subsurface water from the soil is limited because of the slope and the very slow permeability in the substratum. Wetness can be reduced by interceptor drains. Open ditches can reduce surface wetness.

In summer, irrigation is needed for the maximum production of most crops. Because of the slope, sprinkler irrigation is the best method of applying water. This method permits an even, controlled application of water, helps to prevent excessive runoff, and minimizes the risk of erosion. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

The hazard of erosion can be reduced if fall grain is seeded early, stubble-mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grasses.

Seedbeds should be prepared on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet. A permanent cover crop helps to control runoff and erosion.

The main limitations affecting homesite development are the wetness, the very slow permeability, a high shrink-swell potential, and the slope.

The very slow permeability and the seasonal high water table increase the possibility that septic tank absorption fields will fail. Interceptor ditches can divert subsurface water and thus improve the efficiency of the absorption fields. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

Because the seasonal high water table is perched above the layer of clay, a drainage system is needed on sites for buildings with basements and crawl spaces. The wetness can be reduced by installing drainage tile around footings. Properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Loamy Hills, 20- to 35-inch precipitation zone.

163A—Sevenoaks loamy sand, 0 to 3 percent slopes. This very deep, somewhat excessively drained soil is on stream terraces. It formed in alluvium derived from mixed sources and containing various amounts of pumice and volcanic ash. Elevation is 1,000 to 1,500 feet. The mean annual precipitation is 18 to 25 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 180 days. The vegetation in areas that have not been cultivated is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is very dark brown loamy sand about 14 inches thick. The next layer is dark brown gravelly sand about 8 inches thick. The substratum to a depth of 60 inches is dark grayish brown and olive brown gravelly coarse sand and gravelly sand. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Central Point, Medford, and Takilma soils; Gregory soils on concave slopes; and Sevenoaks soils that have slopes of more than 3 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Sevenoaks soil. Available water capacity is about 6 inches. The effective rooting depth is 60 inches or more. The substratum can restrict the penetration of roots, however, because of droughtiness. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated crops, such as alfalfa hay, tree fruit, and small grain. Other crops include corn for silage. Some areas are used for grass hay, pasture, or homesite development.

This unit is suited to irrigated crops. It is limited mainly by a rapid rate of water intake and droughtiness. In summer, irrigation is needed for the maximum production of most crops. Because the rate of water intake is rapid, sprinkler and trickle irrigation systems are the best methods of applying water. These systems permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. To prevent overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Because the soil is droughty, the applications should be light and frequent.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control soil blowing.

Solid-set sprinkler irrigation is the best method of controlling frost and providing adequate moisture for tree fruit. Compaction can be minimized by limiting the use of equipment when the soil is wet and by planting a cover crop. A permanent cover crop helps to control runoff and erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

This unit is suited to homesite development. The main limitations are the moderately rapid permeability and droughtiness.

This unit is poorly suited to standard systems of waste disposal because of the moderately rapid permeability. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

In some areas excavation for houses and access roads exposes material that is highly susceptible to soil blowing. Revegetating as soon as possible in disturbed areas around construction sites helps to control soil blowing. Cutbanks are not stable and are subject to slumping. To keep cutbanks from caving in, excavations may require special retainer walls.

Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer help to establish plants in cut areas. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Deep Loamy Terrace, 18- to 28-inch precipitation zone.

164B—Shefflein loam, 2 to 7 percent slopes. This deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 25 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown loam about 4 inches thick. The next layer is reddish brown loam about 6 inches thick. The upper 30 inches of the subsoil is reddish brown clay loam. The lower 16 inches is reddish brown sandy clay loam. Weathered bedrock is at a depth of about 56 inches. The depth to bedrock ranges from 40 to 60 inches. In some areas the surface layer is sandy loam or clay loam.

Included in this unit are small areas of Clawson and Kubli soils near drainageways and on concave slopes; Barron, Manita, and Ruch soils; and soils that are similar to the Shefflein soil but have bedrock at a depth of more than 60 inches. Also included are small areas of Shefflein soils that have slopes of more than 7 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Shefflein soil. Available water capacity is about 8 inches. The effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used mainly for hay and pasture, timber production, or wildlife habitat. It also is used for homesite development.

This unit is well suited to irrigated crops. It is limited mainly by the moderately slow permeability and the hazard of erosion. In summer, irrigation is needed for the maximum production of most crops. Sprinkler irrigation is the best method of applying water. This method permits an even, controlled application of water, helps to prevent excessive runoff, and minimizes the risk of erosion. Border and contour flood irrigation systems also are suitable. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

This unit is well suited to homesite development. The main limitations are the moderately slow permeability and the shrink-swell potential. The moderately slow permeability can be overcome by increasing the size of the absorption field.

If buildings are constructed on this unit, properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

This unit is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone. The understory vegetation includes deerbrush, tall Oregon grape, and western fescue.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 115. The yield at culmination of the mean annual increment is 5,280 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 56,780 board feet per acre (Scribner rule) at 110 years.

On the basis of a 100-year site curve, the mean sit index for Douglas fir is 105. The yield at culmination c the mean annual increment is 5,460 cubic feet per ac in a fully stocked, even-aged stand of trees at 60 yeai and 45,600 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 75.

The main limitations affecting timber production are compaction, seedling mortality, and plant competition. When timber is harvested, management that minimize the risk of erosion is essential. Conventional methods harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipmen is used. Puddling can occur when the soil is wet. Usin low-pressure ground equipment causes less damage t the soil and helps to maintain productivity. Compactior can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. To compensate for the expecte high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

Increased erosion, loss of plant nutrients, and water repellency are likely to result from fires of moderate intensity.

The vegetative site is Douglas Fir-Mixed Pine-Fescue Forest.

164D—Shefflein loam, 7 to 20 percent slopes. This deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rock.

Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 25 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown loam about 4 inches thick. The next layer is reddish brown loam about 6 inches thick. The upper 30 inches of the subsoil is reddish brown clay loam. The lower 16 inches is reddish brown sandy clay loam. Weathered bedrock is at a depth of about 56 inches. The depth to bedrock ranges from 40 to 60 inches. In some areas the surface layer is sandy loam or clay loam or is stony.

Included in this unit are small areas of Clawson and Kubli soils near drainageways and on concave slopes; Tallowbox soils on the more sloping parts of the landscape; Barron, Manita, and Ruch soils; and soils that are similar to the Shefflein soil but have bedrock at a depth of less than 40 or more than 60 inches. Also included are small areas of Shefflein soils that have slopes of less than 7 or more than 20 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Shefflein soil. Available water capacity is about 8 inches. The effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate or high.

This unit is used mainly for timber production or wildlife habitat. It also is used for hay and pasture and for homesite development.

This unit is suited to irrigated crops. It is limited mainly by the slope, the hazard of erosion, and the moderately slow permeability. In summer, irrigation is needed for the maximum production of most crops. Because of the slope, sprinkler irrigation is the best method of applying water. This method permits an even, controlled application of water, helps to prevent excessive runoff, and minimizes the risk of erosion. To prevent overirrigation and excessive erosion, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Leaving crop residue on or near the surface helps to conserve moisture and control erosion.

A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Surface crusting and compaction can be minimized by returning crop residue to the soil.

Seedbeds should be prepared on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the moderately slow permeability, the shrink-swell potential, and the slope. The moderately slow permeability can be overcome by increasing the size of the absorption field.

If buildings are constructed on this unit, properly designing foundations and footings, diverting runoff away from the buildings, and backfilling with material that has a low shrink-swell potential help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

This unit is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone. The understory vegetation includes deerbrush, tall Oregon grape, and western fescue.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 115. The yield at culmination of the mean annual increment is 5,280 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 56,780 board feet per acre (Scribner rule) at 110 years.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 105. The yield at culmination of the mean annual increment is 5,460 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 45,600 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 75.

The main limitations affecting timber production are erosion, compaction, seedling mortality, and plant competition. When timber is harvested, management that minimizes the risk of erosion is essential. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is moist when heavy equipment is used. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

Increased erosion, loss of plant nutrients, and water repellency are likely to result from fires of moderate intensity.

The vegetative site is Douglas Fir-Mixed Pine-Fescue Forest.

165E—Shefflein loam, 20 to 35 percent north slopes. This deep, well drained soil is on hillslopes. It formed in colluvium and residuum derived from granitic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 25 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown loam about 4 inches thick. The next layer is reddish brown loam about 6 inches thick. The upper 30 inches of the subsoil is reddish brown clay loam. The lower 16 inches is reddish brown sandy clay loam. Weathered bedrock is at a depth of about 56 inches. The depth to bedrock ranges from 40 to 60 inches. In some areas the surface layer is sandy loam or clay loam.

Included in this unit are small areas of Ruch, Vannoy, and Voorhies soils; Tallowbox soils on the more sloping parts of the landscape and on convex slopes; poorly drained soils near drainageways and on concave slopes; and soils that are similar to the Shefflein soil but have bedrock at a depth of more than 60 inches. Also included are small areas of Shefflein soils that have slopes of less than 20 or more than 35 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Shefflein soil. Available water capacity is about 8 inches. The effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone The understory vegetation includes deerbrush, tall Oregon grape, and western fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 110. The yield at culmination of the mean annual increment is 5,880 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 48,300 board feet per acre (Scribner rule) at 140 years. On the basis of a 50-year curve, the mean site index is 80.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 115. The yield at culmination of the mean annual increment is 5,280 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 56,780 board feet per acre (Scribner rule) at 110 years.

The main limitations affecting timber production are erosion, compaction, plant competition, and seedling mortality. When timber is harvested, management that minimizes the risk of erosion is essential. Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer in the more sloping areas and results in less surface disturbance. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Areas that have been cut and filled are easily eroded

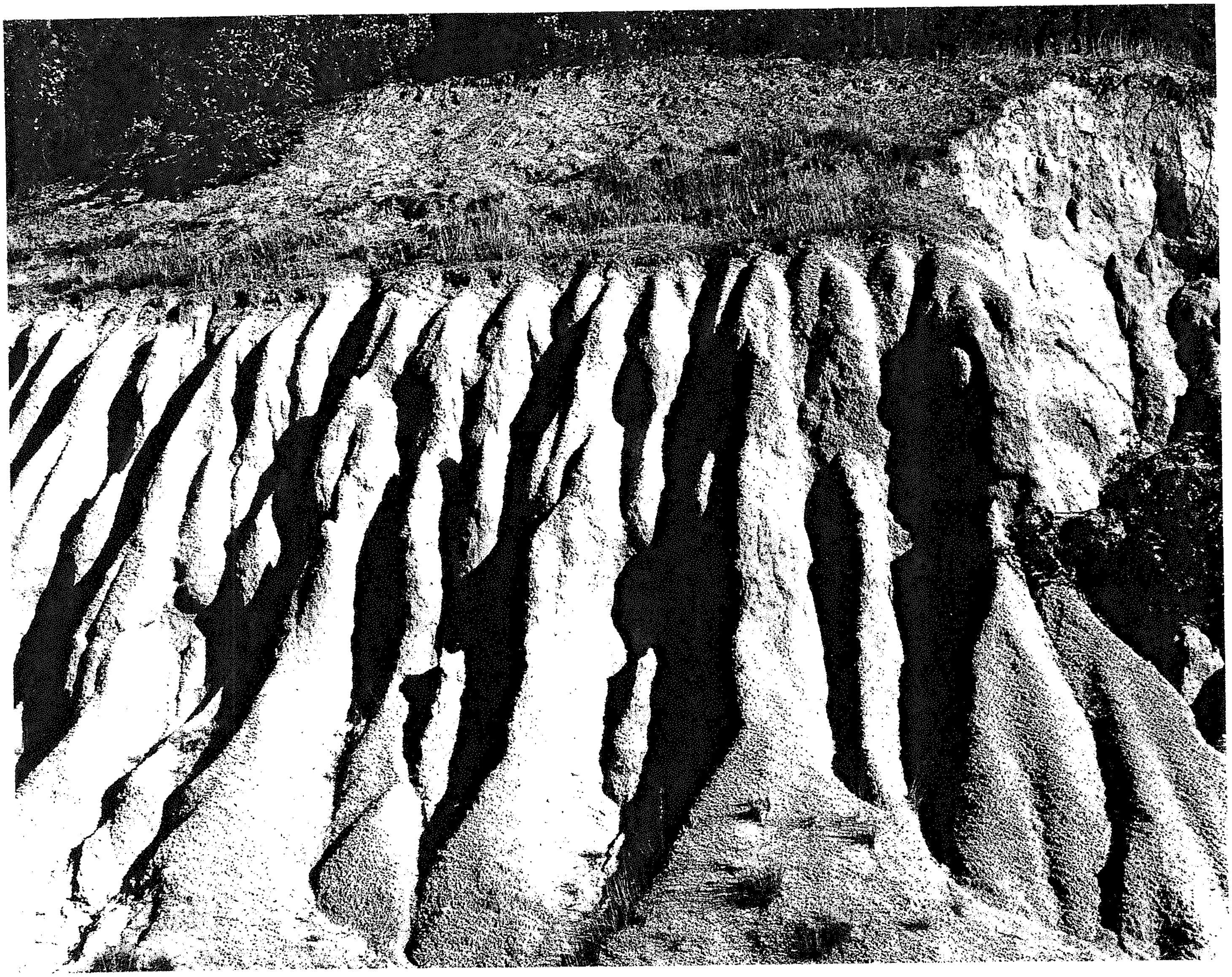


Figure 11.—Severely eroded roadcut in an area of Shefflein loam, 20 to 35 percent north slopes.

unless they are treated (fig. 11). Seeding, mulching, and benching these areas help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Cutbanks occasionally slump when the soil is saturated.

This unit is subject to slumping, especially in areas adjacent to drainageways. Road failure and landslides are likely to occur after road construction and clearcutting. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings.

Increased erosion, loss of plant nutrients, and water repellency are likely to result from fires of moderate intensity.

The vegetative site is Douglas Fir-Mixed Pine-Fescue Forest.

166E—Shefflein loam, 20 to 35 percent south slopes. This deep, well drained soil is on hillslopes. It formed in colluvium and residuum derived from granitic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 25 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is dark brown loam about 4 inches thick. The next layer is reddish brown loam about 6 inches thick. The upper 30 inches of the subsoil is reddish brown clay loam. The lower 16 inches is reddish brown sandy clay loam. Weathered bedrock is at a depth of about 56 inches. The depth to bedrock ranges from 40 to 60 inches. In some areas the surface layer is sandy loam or clay loam or is stony.

Included in this unit are small areas of Ruch, Vannoy, and Voorhies soils; Tallowbox soils on the more sloping parts of the landscape and on convex slopes; and soils that are similar to the Shefflein soil but have bedrock at a depth of less than 40 or more than 60 inches. Also included are small areas of poorly drained soils near drainageways and on concave slopes and Shefflein soils that have slopes of less than 20 or more than 35 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Shefflein soil. Available water capacity is about 8 inches. The effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat. It is suited to the production of ponderosa pine and Douglas fir. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone. The understory vegetation includes deerbrush, tall Oregon grape, and Idaho fescue.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 100. The yield at culmination of the mean annual increment is 4,080 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 44,640 board feet per acre (Scribner rule) at 120 years.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 100. The yield at culmination of the mean annual increment is 5,040 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 39,750 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 70.

The main limitations affecting timber production are erosion, compaction, seedling mortality, and plant competition. When timber is harvested, management that minimizes the risk of erosion is essential. Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer in the more sloping areas and results in less surface disturbance. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Areas that have been cut and filled are easily eroded unless they are treated. Seeding, mulching, and benching these areas help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Cutbanks occasionally slump when the soil is saturated.

This unit is subject to slumping, especially in areas adjacent to drainageways. Road failure and landslides are likely to occur after road construction and clearcutting. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. The seedling mortality rate also can be reduced by providing artificial shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied (fig. 12). Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

Increased erosion, loss of plant nutrients, and water repellency are likely to result from fires of moderate intensity.

leaving some of the larger trees unharvested provides shade for seedlings. The seedling mortality rate also can be reduced by providing artificial shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

The main limitations affecting livestock grazing are erosion, compaction, and the slope. The native vegetation suitable for grazing includes western fescue, mountain brome, tall trisetum, and Alaska oniongrass. If the understory is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases.

A planned grazing system that includes timely deferment of grazing, rotation grazing, and proper livestock distribution helps to prevent overgrazing of the understory and damage to the soils. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soils are firm enough to withstand trampling by livestock.

Thinning, logging, and fire reduce the density of the overstory canopy and increase the production of understory vegetation. Areas that support a large amount of competing vegetation can be improved by prescribed burning or by chemical or mechanical treatment. Seeding disturbed areas to suitable plants increases forage production and reduces the risk of erosion.

The vegetative site is Mixed Fir-Mixed Pine Forest.

186H—Tablerock-Rock outcrop complex, 35 to 110 percent slopes. This map unit is on hillslopes. Elevation is 1,250 to 3,600 feet. The mean annual precipitation is 18 to 30 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 120 to 180 days. The native vegetation is mainly hardwoods and conifers and an understory of grasses, shrubs, and forbs.

This unit is about 45 percent Tablerock soil and 35 percent Rock outcrop. The Tablerock soil has slopes of 35 to 50 percent, and Rock outcrop has slopes of more than 50 percent. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of Carney, Darow, and Heppsie soils; soils that are similar to Carney soils but have bedrock at a depth of less than 20 or more than 40 inches; and Brader and Debenger soils and on ridges and convex slopes. Also included are small areas of soils that are similar to the Tablerock soil but have bedrock within a depth of 60 inches. Included areas make up about 20 percent of the total acreage.

The Tablerock soil is very deep and moderately well drained. It formed in colluvium derived dominantly from andesite and sandstone. Typically, the surface is covered with a layer of leaves and twigs about 1½ inches thick. The surface layer is very dark brown gravelly loam about 3 inches thick. The next layer is very dark grayish brown very cobbly clay loam about 7 inches thick. The upper 10 inches of the subsoil is dark brown very cobbly clay loam. The next 18 inches is brown very cobbly clay. The lower 27 inches is dark yellowish brown gravelly clay loam and gravelly loam. Weathered bedrock is at a depth of about 65 inches. The depth to bedrock is 60 inches or more. In some areas the surface layer is cobbly or stony.

Permeability is very slow in the Tablerock soil. Available water capacity is about 7 inches. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The water table fluctuates between depths of 4 and 6 feet from December through April.

Rock outcrop consists of areas of exposed bedrock. Runoff is very rapid in these areas.

This unit is used for recreational development and livestock grazing.

The main limitations affecting recreational development are the slope, the Rock outcrop, and the high content of clay, which makes the soil sticky and plastic when wet and thus restricts trafficability. These limitations restrict the use of this unit mainly to paths and trails, which should extend across the slope. The steep slopes and the Rock outcrop should be avoided unless they are to be highlighted in the development.

The main limitations affecting livestock grazing are erosion, compaction, the slope, droughtiness, and the Rock outcrop. The vegetation suitable for grazing includes Idaho fescue, prairie junegrass, and western fescue. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the more desirable forage plants have achieved enough growth to withstand grazing pressure and the soil is firm enough to withstand trampling by livestock.

This unit is poorly suited to range seeding. The main limitations are the slope, droughtiness, and the Rock outcrop. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

The steeper slopes and the Rock outcrop limit access by livestock. As a result, the less sloping areas tend to be overgrazed. Constructing trails or walkways allows livestock to graze in areas where access is limited.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment. The use of ground equipment is not practical because of the Rock outcrop and the slope.

This unit is limited as a site for livestock watering ponds and other water impoundments because of the slope and the Rock outcrop.

The vegetative site is Pine-Douglas Fir-Fescue.

187A—Takilma cobbly loam, 0 to 3 percent slopes. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. Elevation is 1,000 to 2,500 feet. The mean annual precipitation is 20 to 35 inches, the mean annual temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 180 days. The native vegetation is mainly hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface layer is very dark grayish brown cobbly loam about 6 inches thick. The upper 9 inches of the subsoil is very dark grayish brown very cobbly loam. The lower 9 inches is brown extremely cobbly sandy loam. The substratum to a depth of 60 inches is dark yellowish brown and brown extremely gravelly and very gravelly sandy loam.

Included in this unit are small areas of Evans, Newberg, and Camas soils on flood plains; Medford soils on the lower terraces; poorly drained soils near drainageways; Central Point and Foehlin soils; and soils that are similar to the Takilma soil but have a substratum of very gravelly sand. Also included are small areas of Takilma soils that have slopes of more than 3 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Takilma soil. Available water capacity is about 4 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for hay and pasture. It also is used for homesite development and livestock grazing.

This unit is suited to hay and pasture. The main limitations are droughtiness and cobbles on the surface. The cobbles limit the use of equipment in some areas. In summer, irrigation is needed for the maximum production of most forage crops. Sprinkler irrigation is the best method of applying water. Border and contour flood irrigation systems also are suitable. For the efficient application and removal of surface irrigation water, land leveling is needed. To prevent overirrigation and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Because the soil is droughty, the applications should be light and frequent. The use of pipe, ditch lining, or drop structures in irrigation ditches reduces water loss and the hazard of erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The main limitations affecting homesite development are the moderately rapid permeability and the large number of rock fragments on and below the surface.

The suitability of this unit for septic tank absorption fields is limited because the extremely gravelly substratum has a poor filtering capacity. Alternative waste disposal systems may function properly on this unit. Suitable included soils are throughout the unit. Onsite investigation is needed to locate such soils.

Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer help to establish plants in cut areas. Gravel and cobbles should be removed from disturbed areas, particularly areas used for lawns. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In many areas it may be necessary to haul in topsoil for lawns and gardens. Because of droughtiness and a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The main limitations affecting livestock grazing are compaction, the cobbly surface layer, and droughtiness. The vegetation suitable for grazing includes Idaho fescue, tall trisetum, and western fescue. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved enough growth to withstand grazing pressure.

Range seeding is suitable if the site is in poor condition. The main limitations are the cobbly surface layer and droughtiness. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both.

Suitable management practices on this unit include proper grazing use, deferred grazing, rotation grazing, and brush control. Areas that support a large amount of competing vegetation can be improved by chemical or mechanical treatment. In places the use of ground equipment is limited by the cobbles on the surface.

This unit is limited as a site for livestock watering ponds and other water impoundments because of seepage.

The vegetative site is Pine-Douglas Fir-Fescue.

188E—Tallowbox gravelly sandy loam, 20 to 35 percent north slopes. This moderately deep, somewhat excessively drained soil is on hillslopes and ridges. It formed in colluvium derived from granitic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 25 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface is covered with a layer of needles, leaves, and twigs about 1 inch thick. The surface layer is dark brown gravelly sandy loam about 6 inches thick. The upper 6 inches of the subsoil is dark brown sandy loam. The lower 11 inches is brown gravelly sandy loam. Weathered bedrock is at a depth of about 23 inches. The depth to bedrock ranges from 20 to 40 inches.

Included in the unit are small areas of Offenbacher, Shefflein, and Vannoy soils; Caris and Voorhies soils on the more sloping parts of the landscape; Ruch soils on toe slopes; poorly drained soils near drainageways and on concave slopes; and soils that are similar to the Tallowbox soil but have bedrock at a depth of less than 20 or more than 40 inches. Also included are small areas of Tallowbox soils that have slopes of less than 20 or more than 35 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Tallowbox soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone. The understory vegetation includes creambush oceanspray, common snowberry, and tall Oregon grape.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 100. The yield at culmination of the mean annual increment is 5,040 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 39,750 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 70.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 100. The yield at culmination of the mean annual increment is 4,080 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 44,640 board feet per acre (Scribner rule) at 120 years.

The main limitations affecting timber production are erosion, compaction, plant competition, and seedling mortality. Also, the bedrock restricts root growth. As a result, windthrow is a hazard.

When timber is harvested, management that minimizes the risk of erosion is essential. Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer in the more sloping areas and results in less surface disturbance. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Areas that have been cut and filled are easily eroded unless they are treated. Seeding, mulching, and benching these areas help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Cutbanks occasionally slump when the soil is saturated.

This unit is subject to slumping, especially in areas adjacent to drainageways. Road failure and landslides are likely to occur after road construction and clearcutting. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

A high temperature in the surface layer during summer and the low available water capacity increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings.

Increased erosion, loss of plant nutrients, and water repellency are likely to result from fires of moderate intensity.

The vegetative site is Douglas Fir Forest.

188G—Tallowbox gravelly sandy loam, 35 to 70 percent north slopes. This moderately deep, somewhat excessively drained soil is on hillslopes. It formed in colluvium derived from granitic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 25 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface is covered with a layer of needles, leaves, and twigs about 1 inch thick. The surface layer is dark brown gravelly sandy loam about 6 inches thick. The upper 6 inches of the subsoil is dark brown sandy loam. The lower 11 inches is brown gravelly sandy loam. Weathered bedrock is at a depth of about 23 inches. The depth to bedrock ranges from 20 to 40 inches.

Included in this unit are small areas of Caris, Offenbacher, Vannoy, and Voorhies soils; soils that are similar to the Tallowbox soil but have bedrock at a depth of less than 20 or more than 40 inches; and Tallowbox soils that have slopes of less than 35 or more than 70 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Tallowbox soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, sugar pine, and Pacific madrone. The understory vegetation includes creambush oceanspray, common snowberry, and tall Oregon grape.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 100. The yield at culmination of the mean annual increment is 5,040 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 39,750 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 70.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 100. The yield at culmination of the mean annual increment is 4,080 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 44,640 board feet per acre (Scribner rule) at 120 years.

The main limitations affecting timber production are the slope, erosion, compaction, plant competition, and seedling mortality. Also, the bedrock restricts root growth. As a result, windthrow is a hazard.

When timber is harvested, management that minimizes the risk of erosion is essential. Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer and results in less surface disturbance. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Areas that have been cut and filled are easily eroded unless they are treated. Seeding, mulching, and benching these areas help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Cutbanks occasionally slump when the soil is saturated.

This unit is subject to slumping, especially in areas adjacent to drainageways. Road failure and landslides are likely to occur after road construction and clearcutting.

Constructing logging roads on the steeper slopes can result in a high risk of erosion. Building the roads at midslope requires extensive cutting and filling and removes land from production. Material that is discarded when the roads are built can damage vegetation and is a potential source of sedimentation. If the material becomes saturated, avalanches of debris can occur. End hauling of the waste material minimizes damage to the vegetation downslope and reduces the risk of sedimentation. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

A high temperature in the surface layer during

Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is used for pasture and homesite development.

This unit is suited to the production of Douglas fir. Other species that grow on this unit include incense cedar, ponderosa pine, and Pacific madrone. The understory vegetation includes creambush oceanspray, common snowberry, and tall Oregon grape.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 110. The yield at culmination of the mean annual increment is 5,880 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 48,300 board feet per acre (Scribner rule) at 140 years. On the basis of a 50-year curve, the mean site index is 80.

The main limitations affecting timber production are erosion, compaction, plant competition, and seedling mortality. Also, the bedrock restricts root growth. As a result, windthrow is a hazard.

Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer in the more sloping areas and results in less surface disturbance. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

A high temperature in the surface layer during summer and the low available water capacity increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings.

The main limitations in the areas used as pasture are the slope, erosion, and droughtiness. Seedbeds should be prepared on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Because of low rainfall in summer, forage production would be increased if this unit were irrigated. Irrigation is difficult, however, because of a limited water supply and the slope.

The main limitations affecting homesite development are the depth to bedrock, the slope, the moderately slow permeability, and low strength. The moderately slow permeability is a limitation on sites for septic tank absorption fields. It can be overcome by increasing the size of the absorption field. Because of the slope, the absorption lines should be installed on the contour. Areas where the soil is deeper and less sloping may be suited to septic tank absorption fields. Onsite investigation is needed to locate such areas.

The slope limits the use of some areas for building site development. Cuts needed to provide essentially level building sites can expose bedrock. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Douglas Fir Forest.

195F—Vannoy silt loam, 35 to 55 percent north slopes. This moderately deep, well drained soil is on hillslopes. It formed in colluvium derived from metamorphic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 20 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface is covered with a layer of needles, leaves, and twigs about ¾ inch thick. The surface layer is dark brown silt loam about 4 inches thick. The next layer is reddish brown silt loam about 7 inches thick. The subsoil is yellowish red clay loam about 27 inches thick. Weathered bedrock is at a depth of about 38 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is gravelly or very gravelly loam.

Included in this unit are small areas of Voorhies soils, Caris and Offenbacher soils on the more sloping parts of the landscape, McMullin soils and Rock outcrop on ridges and convex slopes, Manita soils on the less sloping parts of the landscape and on concave slopes, and soils that are similar to the Vannoy soil but have bedrock at a depth of more than 40 inches. Also included are small areas of Vannoy soils that have slopes of less than 35 or more than 55 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Vannoy soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir. Other species that grow on this unit include incense cedar, ponderosa pine, and Pacific madrone. The understory vegetation includes creambush oceanspray, common snowberry, and tall Oregon grape.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 110. The yield at culmination of the mean annual increment is 5,880 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 48,300 board feet per acre (Scribner rule) at 140 years. On the basis of a 50-year curve, the mean site index is 80.

The main limitations affecting timber production are the slope, erosion, compaction, plant competition, and seedling mortality. Also, the bedrock restricts root growth. As a result, windthrow is a hazard.

Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer and results in less surface disturbance. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. When the soil is dry, ripping skid trails and landings improves the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Cutbanks occasionally slump when the soil is saturated.

Constructing logging roads on the steeper slopes can result in a high risk of erosion. Material that is discarded when the roads are built can damage vegetation and is a potential source of sedimentation. If the material becomes saturated, avalanches of debris can occur. End hauling of the waste material minimizes damage to the vegetation downslope and reduces the risk of sedimentation. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

A high temperature in the surface layer and an insufficient moisture supply in summer increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings.

The vegetative site is Douglas Fir Forest.

196E—Vannoy silt loam, 12 to 35 percent south slopes. This moderately deep, well drained soil is on hillslopes. It formed in colluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 20 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface is covered with a layer of needles, leaves, and twigs about ¾ inch thick. The surface layer is dark brown silt loam about 4 inches thick. The next layer is reddish brown silt loam about 7 inches thick. The subsoil is yellowish red clay loam about 27 inches thick. Weathered bedrock is at a depth of about 38 inches. The depth to bedrock ranges from

20 to 40 inches. In some areas the surface layer is gravelly or very gravelly.

Included in this unit are small areas of Rock outcrop and McMullin soils on ridges and convex slopes; Selmac soils on concave slopes; Caris and Offenbacher soils on the more sloping parts of the landscape; and Manita, Ruch, and Voorhies soils. Also included are small areas of soils that are similar to the Vannoy soil but have bedrock at a depth of more than 40 inches, poorly drained soils near drainageways, and Vannoy soils that have slopes of less than 12 or more than 35 percent. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Vannoy soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is used for pasture and homesite development.

This unit is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, California black oak, and Pacific madrone. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and California fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 105. The yield at culmination of the mean annual increment is 5,460 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 45,600 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 75.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 90. The yield at culmination of the mean annual increment is 3,400 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 37,960 board feet per acre (Scribner rule) at 130 years.

The main limitations affecting timber production are erosion, compaction, seedling mortality, and plant competition. Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer in the more sloping areas and results in less surface disturbance. Using standard wheeled and tracked equipment when the soil is moist causes rutting and compaction. Puddling can occur when the soil is wet. Using low-pressure ground equipment causes less damage to the soil and helps to maintain productivity. Compaction can be minimized by using suitable methods of harvesting, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Ripping skid trails and landings when the soil is dry can improve the growth of plants.

Properly designed road drainage systems that include carefully located culverts help to control erosion. Seeding, mulching, and benching areas that have been cut and filled also help to control erosion. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by a plant cover or adequate water bars, or both. Skid trails and unsurfaced roads may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use.

A high temperature in the surface layer during summer and the low available water capacity increase the seedling mortality rate. To compensate for the expected high mortality rate, the larger seedlings or a greater number of seedlings should be planted. When the timber is harvested, leaving some of the larger trees unharvested provides shade for seedlings. Reforestation can be accomplished by planting Douglas fir and ponderosa pine seedlings.

Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance measures are applied. Mulching around seedlings helps to maintain the moisture supply in summer and minimizes competition from undesirable plants.

The main limitations in the areas used as pasture are the slope, erosion, and droughtiness. Seedbeds should be prepared on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep pastures in good condition and protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping help to maintain uniform plant growth, discourage selective grazing, and reduce the extent of clumpy growth. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Because of low rainfall in summer, forage production would be increased if this unit were irrigated. Irrigation is difficult, however, because of a limited water supply and the slope.

The main limitations affecting homesite development are the depth to bedrock, the slope, the moderately slow permeability, and low strength. The moderately slow permeability is a limitation on sites for septic tank absorption fields. It can be overcome by increasing the size of the absorption field. Because of the slope, the absorption lines should be installed on the contour. Areas where the soil is deeper and less sloping may be suited to septic tank absorption fields. Onsite investigation is needed to locate such areas.

The slope limits the use of some areas for building site development. Cuts needed to provide essentially level building sites can expose bedrock. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

Erosion is a hazard on the steeper slopes. Only the part of the site that is used for construction should be disturbed. Revegetating as soon as possible helps to control erosion in disturbed areas around construction sites. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Because of a low amount of rainfall in summer, irrigation is needed in areas that support lawn grasses, shrubs, vines, shade trees, or ornamental trees.

The vegetative site is Pine-Douglas Fir-Fescue.

197F—Vannoy-Voorhies complex, 35 to 55 percent south slopes. This map unit is on hillslopes. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 20 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

This unit is about 60 percent Vannoy soil and 30 percent Voorhies soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

Included in this unit are small areas of McMullin soils and Rock outcrop on ridges and convex slopes, Caris and Offenbacher soils on the more sloping parts of the landscape, Manita soils on the less sloping parts of the landscape and on concave slopes, and soils that are similar to the Vannoy soil but have bedrock at a depth more than 40 inches. Also included are small areas of Vannoy and Voorhies soils that have slopes of less than 35 or more than 55 percent. Included areas make up about 10 percent of the total acreage.

The Vannoy soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about ¾ inch thick. The surface layer is dark brown silt loam about 4 inches thick. The next layer is reddish brown silt loam about 7 inches thick. The subsoil is yellowish red clay loam about 27 inches thick. Weathered bedrock is at a depth of about 38 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is gravelly or very gravelly loam.

Permeability is moderately slow in the Vannoy soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Voorhies soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles and twigs about 1 inch thick. The surface layer is very dark grayish brown and dark brown very gravelly loam about 8 inches thick. The upper 10 inches of the subsoil is brown very gravelly clay loam. The lower 18 inches is brown very cobbly clay loam. Weathered bedrock is at a depth of about 36 inches. The depth to bedrock ranges from 20 to 40 inches.

Permeability is moderate in the Voorhies soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production and wildlife habitat. It is suited to the production of Douglas fir and ponderosa pine. Other species that grow on this unit include incense cedar, California black oak, and Pacific madrone. The understory vegetation includes Pacific serviceberry, tall Oregon grape, and California fescue.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 100 on the Vannoy soil. The yield at culmination of the mean annual increment is 5,040 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 39,750 board feet per acre (Scribner rule) at 150 years. On the basis of a 50-year curve, the mean site index is 75.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 90 on the Vannoy soil. The yield at culmination of the mean annual increment is 3,400 cubic feet per acre in a fully stocked, even-aged stand of trees at 40 years and 37,960 board feet per acre (Scribner rule) at 130 years.

On the basis of a 100-year site curve, the mean site index for Douglas fir is 95 on the Voorhies soil. The yield at culmination of the mean annual increment is 4,620 cubic feet per acre in a fully stocked, even-aged stand of trees at 60 years and 37,120 board feet per acre (Scribner rule) at 160 years. On the basis of a 50-year curve, the mean site index is 65.

On the basis of a 100-year site curve, the mean site index for ponderosa pine is 75 on the Voorhies soil. The yield at culmination of the mean annual increment is 3,100 cubic feet per acre in a fully stocked, even-aged stand of trees at 50 years and 31,680 board feet per acre (Scribner rule) at 160 years.

The main limitations affecting timber production are the slope, erosion, compaction, seedling mortality, and plant competition. Also, the bedrock restricts root growth. As a result, windthrow is a hazard.

Wheeled and tracked logging equipment can be used in the less sloping areas, but cable yarding generally is safer and results in less surface disturbance. If the soils are excessively disturbed when timber is harvested or logging roads are built, a large number of rock fragments is left on the surface. Using standard

Josephine County

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Pollard loam, 2 to 7 percent slopes, is one of several phases in the Pollard series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Camas-Newberg complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

This survey was mapped at two levels of intensity, or detail. The more detailed part is identified by narrowly defined units, and the less detailed part is identified by broadly defined units. In the narrowly defined units the soil delineation boundaries were plotted and verified at closely spaced intervals. In the broadly defined units the soil delineation boundaries were plotted and verified by some observations. The intensity of mapping was based on the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use. On the soil map legend at the back of this survey, the broadly defined units are identified by an asterisk following the map unit name.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

map unit descriptions

1B—Abegg gravelly loam, 2 to 7 percent slopes. This deep, well drained soil is on high stream terraces. It formed in alluvium and colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, shrubs, forbs, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs about 1 1/2 inches thick. The surface layer is very dark grayish brown gravelly loam about 4 inches thick. The next layer is dark brown gravelly loam about 5 inches thick. The upper 7 inches of the subsoil is dark brown gravelly loam. The lower 40 inches is dark brown and dark reddish brown very gravelly and extremely gravelly clay loam and extremely gravelly loam. The substratum to a depth of 60 inches or more is variegated brown and reddish brown extremely gravelly loamy sand.

Included in this unit are about 10 percent Pollard soils and 5 percent Kerby soils on low stream terraces. Also included are small areas of Takilma soils on low stream terraces and Manita soils on high stream terraces. The percentage of included soils varies from one area to another.

Permeability of this Abegg soil is moderate to a depth of 56 inches and moderately rapid below this depth. Available water capacity is about 4 to 6 inches. Water supplying capacity is 15 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. It is also used for dryland hay and pasture and for wildlife habitat.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitations are droughtiness and seepage. Crops that are tolerant of drought are best suited because the available moisture is not adequate for good growth of most other crops.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Because the soil is droughty, light and frequent applications of irrigation water are needed. These applications should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure good growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—If this unit is used for homesite development, the main limitations are moderate permeability and unstable cutbanks that are subject to raveling. Septic tank absorption fields may not function properly during rainy periods because of moderate permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this limitation.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants. Removal of pebbles and cobbles in these areas is needed for best results when landscaping, particularly in areas used for lawns.

Recreation.—Coarse fragments in the surface layer limit this unit for some recreational uses.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 114 for Douglas-fir, the potential production per acre is 6,300 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 63,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concern in producing and harvesting timber is the difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Minimizing the risk of erosion is essential in forest management.

Tree seedlings have only a moderate rate of survival because of droughtiness. Reforestation must be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

This map unit is in capability subclasses IIIs, irrigated, and IVs, nonirrigated.

1C—Abegg gravelly loam, 7 to 12 percent slopes. This deep, well drained soil is on high stream terraces. It formed in alluvium and colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, shrubs, forbs, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs about 1 1/2 inches thick. The surface layer is very dark grayish brown gravelly loam about 4 inches thick. The next layer is dark brown gravelly loam about 5 inches thick. The upper 7 inches of the subsoil is dark brown gravelly loam. The lower 40 inches is dark brown and dark reddish brown very gravelly and extremely gravelly clay loam and extremely gravelly loam. The substratum to a depth of 60 inches or more is variegated brown and reddish brown extremely gravelly loamy sand.

Included in this unit are about 10 percent Pollard soils and 5 percent Manita soils on high stream terraces. Also included are small areas of Takilma soils on low stream

Douglas-fir, Shasta red fir, shrubs, forbs, and grasses. Elevation is 3,600 to 5,500 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs about 1 inch thick. The surface layer is very dark brown very gravelly silt loam about 3 inches thick. The subsoil is brown and dark yellowish brown very gravelly silt loam about 23 inches thick. The substratum is light yellowish brown extremely gravelly silt loam about 20 inches thick over weathered metavolcanic bedrock. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 20 percent Jayar soils on mountainsides and 10 percent Woodseye soils on ridges. Also included are small areas of Rock outcrop. The percentage of inclusions varies from one area to another.

Permeability of this Althouse soil is moderate. Available water capacity is about 6 to 12 inches. Water supplying capacity is 8 to 14 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, recreation, and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir, Shasta red fir, and white fir. Based on a site index of 95 for Douglas-fir, the potential production per acre is 4,600 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 46,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soil is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants on the soil.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Small stones in the soil make planting difficult, and tree seedlings have only a moderate rate of survival because of droughtiness and frost heaving. Seedling survival can be improved by providing shade.

Among the trees that are suitable for planting are Douglas-fir and Shasta red fir. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can kill or damage seedlings.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

4—Banning loam. This deep, somewhat poorly drained soil is on alluvial fans and in drainageways. It formed in alluvium derived from metamorphic, granitic, and ultramafic rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly Oregon white oak, ponderosa pine, Oregon ash, shrubs, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is black loam about 6 inches thick. The next layer is black clay loam about 8 inches thick. The subsoil is very dark grayish brown clay loam about 36 inches thick. The substratum to a depth of 60 inches or more is dark grayish brown clay loam. It is underlain by bedrock.

Included in this unit are about 10 percent Wapato soils and 5 percent Selmac soils. Also included are small areas of Cove soils and other soils that are similar to this Banning soil but are redder. The percentages of included soils vary from one area to another.

Permeability of this Banning soil is moderately slow. Available water capacity is about 9 to 12 inches. Water supplying capacity is 18 to 22 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 12 to 36 inches in winter and spring. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for irrigated hay and pasture and as homesites. A few areas are used for recreation and dryland pasture.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by wetness. Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is also needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Leveling helps to insure the uniform application of water.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit has few limitations for pond reservoir development (fig. 3).

Homesites.—If this unit is used for homesite development, the main limitations are wetness and moderately slow permeability. Because of these limitations, septic tank absorption fields can be expected to function poorly.

Drainage is needed if roads and building foundations are constructed. Wetness can be reduced by installing drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Recreation.—If this unit is used for recreational development, the main limitation is wetness. Providing drainage helps to overcome this limitation.

This map unit is in capability subclass IIw, irrigated and nonirrigated.

5B—Barron coarse sandy loam, 2 to 7 percent slopes. This deep, somewhat excessively drained soil is on toe slopes and alluvial fans. It formed in colluvium and alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, California black oak, whiteleaf manzanita, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 9 inches thick. The subsoil is light olive brown coarse sandy loam about 26 inches thick. The substratum to a depth of 60 inches or more is light olive brown coarse sandy loam. It is underlain by bedrock.

Included in this unit are about 10 percent Clawson soils in depressional areas, 5 percent Jerome soils in drainageways, and 5 percent Holland soils. Also included are small areas of Siskiyou soils. The percentage of included soils varies from one area to another.

Permeability of this Barron soil is moderately rapid. Available water capacity is about 4 to 7 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for recreation, dryland pasture, other adapted cultivated crops, and timber production (fig. 4).

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitations are droughtiness and the hazard of erosion. Crops that are tolerant of drought are best suited because the available moisture is not adequate for good growth of other crops.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion. Piping is a concern, however, if the unit is used for the construction of terraces, diversions, embankments, dikes, and levees.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility. Crop residue left on or near the surface

This unit is used for timber production, wildlife habitat, watershed, and recreation.

Woodland.—This unit is suited to the production of white fir, Shasta red fir, and mountain hemlock. Based on a site index of 40 for Shasta red fir, the potential production per acre is 18,950 cubic feet from an even-aged, fully stocked stand of trees 140 years old or 136,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 140 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable systems that partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. The soil is subject to compaction if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness caused by coarse fragments in the soil and frost heaving. Mulching around seedlings helps to retain moisture in summer. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Shasta red fir and white fir.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and small stones. Slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

11B—Brockman clay loam, 2 to 7 percent slopes. This deep, moderately well drained soil is on alluvial fans. It formed in alluvium derived dominantly from serpentinite and peridotite. The vegetation in areas not cultivated is mainly Jeffrey pine, Douglas-fir, California black oak, whiteleaf manzanita, wedgeleaf ceanothus, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 120 to 170 days.

Typically, the surface layer is dark reddish brown clay loam about 15 inches thick. The subsoil is reddish brown cobbly clay loam about 10 inches thick. The substratum to a depth of 60 inches or more is reddish brown cobbly clay.

Included in this unit are about 10 percent Cornutt soils, 5 percent Copsey soils, and 10 percent soils that are similar to this Brockman soil but are 40 to 60 inches deep to bedrock. Also included are small areas of Dubakella soils and soils in the east-central part of the county that are similar to the Brockman soil but contain ultramafic minerals that affect plant growth. The percentage of included soils varies from one area to another.

Permeability of this Brockman soil is very slow. Available water capacity is about 4 to 8 inches. Water supplying capacity is 11 to 16 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 24 to 36 inches in winter and spring. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for wildlife habitat and dryland pasture.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by the low fertility of the soil, steepness of slope, and very slow permeability of the substratum.

The ultramafic rock from which the soil in this unit developed is very high in content of magnesium and very low in calcium, which limits plant growth. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

The water table that develops during the rainy period in winter and spring generally limits this soil for deep-rooted crops. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table. Drainage may also be needed.

Homesites.—If this unit is used for homesite development, the main limitations are wetness, low soil strength, the potential for shrinking and swelling, and very slow permeability in the substratum. Septic tank absorption fields can be expected to function poorly on this unit because of the very slow permeability and wetness.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Because a seasonal high water table is perched above the claypan, drainage should be provided for buildings with basements and crawl spaces. Wetness can be reduced by installing drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclasses IIIe, irrigated, and VIe, nonirrigated.

11C—Brockman clay loam, 7 to 12 percent slopes. This deep, moderately well drained soil is on alluvial fans. It formed in alluvium derived dominantly from serpentinite. The vegetation in areas not cultivated is mainly Jeffrey pine, Douglas-fir, California black oak, whiteleaf manzanita, wedgeleaf ceanothus, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 120 to 170 days.

Typically, the surface layer is dark reddish brown clay loam about 15 inches thick. The subsoil is reddish brown cobbly clay loam about 10 inches thick. The substratum to a depth of 60 inches or more is reddish brown cobbly clay.

Included in mapping are about 10 percent Cornutt soils, 5 percent Dubakella soils, and 10 percent soils that are similar to this Brockman soil but are 40 to 60 inches deep to bedrock. Also included are small areas of Copsey soils and soils in the east-central part of the county that are similar to this Brockman soil but contain ultramafic minerals that affect plant growth. The percentage of included soils varies from one area to another.

Permeability of this Brockman soil is very slow. Available water capacity is about 4 to 8 inches. Water supplying capacity is 11 to 16 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 24 to 30 inches in winter and spring. Runoff is medium, and the hazard of water erosion is moderate.

This soil is used mainly for irrigated hay and pasture and as homesites. It is also used for wildlife habitat and dryland pasture.

Hay and pasture.—This soil is suited to hay and pasture. It is limited mainly by low fertility, steepness of slope, and the very slow permeability of the substratum.

The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes.

The water table that develops during the rainy period in winter and spring generally limits the soil for deep-rooted crops. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table. Drainage may also be needed.

Seedbeds should be prepared on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion.

Homesites.—If this soil is used for homesite development, the main limitations are steepness of slope, the very slow permeability of the substratum, wetness, and the shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly because of wetness and very slow permeability.

If buildings are constructed on this soil, properly designed foundations and footings and diverting runoff away from buildings help to prevent structural damage by the shrinking and swelling of the soil. Because a seasonal high water table is perched above the claypan, drainage should be provided for buildings with a basement or crawl space. Wetness can be reduced by installing drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil to support a load. Excavation for roads and buildings increases the hazard of erosion.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

12B—Brockman cobbly clay loam, 2 to 7 percent slopes. This deep, moderately well drained soil is on variegated, mostly brown, dark brown, and dark grayish brown very gravelly sand.

Included in this unit are about 10 percent Newberg soils, 5 percent Evans soils, and 10 percent Riverwash. Also included are small areas of Takilma soils on low stream terraces that are not subject to flooding. The percentage of included components varies from one area to another.

Permeability of this Camas soil is very rapid. Available water capacity is about 1.5 to 3.5 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 12 to 24 inches. Roots are restricted by the very gravelly sand below this depth. Runoff is slow, and the hazard of water erosion is moderate. This soil is subject to occasional, brief periods of flooding in winter and spring. Channeling and deposition are common along streambanks.

This unit is used mainly for irrigated hay and pasture and for wildlife habitat. It is also used for recreation and homesite development.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by droughtiness and the hazard of flooding. The risk of flooding can be reduced by the use of embankments, dikes, and levees. Seeding early in fall and construction of diversions and grassed waterways help to control erosion.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Flooding can be controlled only by use of major flood control structures, which should be located above the expected flood level.

Recreation.—This unit is suited to recreational development. It is limited mainly by the hazard of flooding and small stones. The risk of flooding limits the use of this unit mainly to picnic areas, playgrounds, paths, and trails.

This map unit is in capability subclass IVw, irrigated and nonirrigated.

15—Camas-Newberg complex. This map unit is on flood plains. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly Oregon ash, cottonwood, ponderosa pine, shrubs, and grasses. Elevation is 750 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 170 days.

This unit is 45 percent Camas gravelly sandy loam and 35 percent Newberg fine sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Evans soils and 10 percent Riverwash. Also included are small areas of soils, in depressional areas, that are similar to the Newberg soil but are somewhat poorly drained. The percentage of included components varies from one area to another.

The Camas soil is deep and excessively drained. It formed in alluvium derived dominantly from granitic rock and altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown gravelly sandy loam about 10 inches thick. The underlying material to a depth of 60 inches or more is variegated, mostly brown, dark brown, and dark grayish brown very gravelly sand.

Permeability of this Camas soil is very rapid. Available water capacity is about 1.5 to 3.5 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 12 to 24 inches. Roots are restricted by the very gravelly sand below this depth. Runoff is slow, and the hazard of water erosion is moderate. This soil is subject to occasional, brief periods of flooding in winter and spring. Channeling and deposition are common along streambanks.

The Newberg soil is deep and somewhat excessively drained. It formed in alluvium derived dominantly from granitic rock and altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark brown fine sandy loam about 15 inches thick. The underlying material to a depth of 61 inches is dark yellowish brown sandy loam stratified with loamy sand and loamy fine sand stratified with fine sandy loam.

Permeability of the Newberg soil is moderately rapid to a depth of 24 inches and rapid below this depth. Available water capacity is about 5 to 8 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. This soil is subject to occasional, brief periods of flooding in winter and spring. Channeling and deposition are common along streambanks.

This unit is used mainly for irrigated hay and pasture and for wildlife habitat. It is also used for recreation and homesite development.

Hay and pasture.—This unit is suited to irrigated pasture and hay crops. It is limited mainly by the hazard of flooding and droughtiness. The risk of flooding can be reduced by the use of embankments, dikes, and levees. Seeding early in fall and construction of diversions and grassed waterways help to control erosion.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soils from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Flooding can be controlled only by use of major flood control structures, which should be located above the expected flood level.

Recreation.—This unit is suited to recreational development. It is limited mainly by the hazard of flooding and small stones. The risk of flooding limits the use of this unit mainly to picnic areas, playgrounds, paths, and trails.

This map unit is in capability subclass IVw, irrigated and nonirrigated.

16—Central Point sandy loam. This deep, well drained soil is on low stream terraces and alluvial fans. It formed in alluvium derived dominantly from granitic and metamorphic rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly native grasses, Oregon white oak, Douglas-fir, and ponderosa pine. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown and dark brown sandy loam about 15 inches thick. The subsoil is dark brown sandy loam about 21 inches thick. The substratum to a depth of 60 inches or more is dark brown gravelly sandy loam.

Included in this unit is about 10 percent Kerby and Foehlin soils on low stream terraces. Also included are small areas of Takilma soils and soils on or near flood plains. The percentage of included soils varies from one area to another.

Permeability of this Central Point soil is moderately rapid. Available water capacity is about 4.5 to 7.5 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 48 to 72 inches in winter.

Most areas of this unit are used for irrigated hay and pasture and as homesites. A few areas are used for recreation, wildlife habitat, and dryland pasture.

Hay and pasture.—This unit has few limitations for irrigated hay and pasture and for other cultivated crops. Piping is a concern if the soil in this unit is used for embankments, dikes, and levees.

In summer, irrigation is needed for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Leveling helps to insure the uniform application of water.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—This unit is suited to homesite development. The main limitations are wetness and the hazard of cutbanks caving in. Septic tank absorption fields may not function properly during rainy periods because of wetness.

Drainage may be needed if roads and building foundations are constructed. Wetness can be reduced by installing drain tile around footings.

This unit is a good source of roadfill.

Recreation.—This unit is well suited to recreational development. It has few limitations.

This map unit is in capability subclasses IIs, irrigated, and IVc, nonirrigated.

17B—Clawson sandy loam, 2 to 7 percent slopes. This deep, somewhat poorly drained soil is on alluvial fans and in drainageways. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly sedges, grasses, and willows. Elevation is 800 to 2,000 feet. The average annual

This map unit is in capability subclasses IIIw, irrigated, and IVw, nonirrigated.

19D—Cornutt-Dubakella complex, 7 to 20 percent slopes. This map unit is on mountains, ridgetops, and alluvial fans. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 65 percent Cornutt cobbly clay loam and 25 percent Dubakella very cobbly clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Pollard soils and 5 percent Brockman soils. The percentage of included soils varies from one area to another.

The Cornutt soil is deep and well drained. It formed in colluvium and alluvium derived dominantly from mixed ultramafic rock and altered sedimentary and extrusive igneous rock. Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark reddish brown cobbly clay loam about 11 inches thick. The subsoil is dark red clay about 30 inches thick. Metavolcanic bedrock is at a depth of 41 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Cornutt soil is slow. Available water capacity is about 4 to 8.5 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Dubakella soil is moderately deep and well drained. It formed in colluvium derived dominantly from ultramafic rock. Typically, the surface layer is dark brown very cobbly clay loam about 2 inches thick. The upper 5 inches of the subsoil is dark brown extremely cobbly clay loam. The lower 11 inches is dark brown and strong brown very cobbly clay. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and dryland hay and pasture. It is also used for homesite development, recreation, and wildlife habitat.

The present vegetation in most areas is mainly Douglas-fir, ponderosa pine, Jeffrey pine, Pacific madrone, shrubs, and grasses. The ultramafic rock from which the soils in this unit developed is very high in content of magnesium and very low in calcium, which limits plant growth. Plants generally are more productive and abundant on the Cornutt soil, because it is influenced less by the ultramafic rock.

Woodland.—The Cornutt soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 97 for Douglas-fir, the potential production per acre is 4,740 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 48,180 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

Most woodland areas of the Dubakella soil are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soils may be compacted if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants. Soil compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction.

The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are very plastic. Roads for year-round use need heavy base rock. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival on the Cornutt soil and a low rate of survival on the Dubakella soil because of low fertility and a lack of adequate moisture during the growing season. Mulching around seedlings helps to retain moisture in summer. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, Jeffrey pine, and incense-cedar.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Hay and pasture.—If this unit is used for dryland hay and pasture, the main limitations are the low fertility of the soils, lack of adequate moisture during the growing season, and the hazard of erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soils from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilizer is needed to insure optimum growth of grasses and legumes.

Homesites.—If this unit is used for homesite development, the main limitations are the potential for shrinking and swelling of the soils and depth to bedrock. Septic tank absorption fields can be expected to function poorly on this unit because of slow permeability.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soils to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Excavation for roads and buildings increases the hazard of erosion. Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens.

Recreation.—If this unit is used for recreational development, the main limitations are stones and steepness of slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIe, nonirrigated.

19E—Cornutt-Dubakella complex, 20 to 35 percent slopes. This map unit is on mountains. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 50 percent Cornutt cobbly clay loam and 30 percent Dubakella very cobbly clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Josephine and Pollard soils on mountainsides and 10 percent Brockman soils on alluvial fans. The percentage of included soils varies from one area to another.

The Cornutt soil is deep and well drained. It formed in colluvium derived dominantly from mixed ultramafic rock and altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark reddish brown cobbly clay loam about 6 inches thick. The next layer is reddish brown cobbly clay loam about 5 inches thick. The subsoil is dark red cobbly clay about 30 inches thick. Metavolcanic bedrock is at a depth of 41 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Cornutt soil is slow. Available water capacity is about 4 to 8.5 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Dubakella soil is moderately deep and well drained. It formed in colluvium derived from serpentinite and peridotite. Typically, the surface layer is dark brown very cobbly clay loam about 7 inches thick. The upper 5 inches of the subsoil is dark brown very cobbly clay loam. The lower 16 inches is dark brown and strong brown extremely cobbly clay. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of this Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and for dryland hay and pasture. It is also used for watershed, wildlife habitat, homesite development, and recreation.

The present vegetation in most areas is mainly Douglas-fir, ponderosa pine, Jeffrey pine, Pacific madrone, shrubs, and grasses. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth. Plants generally are more productive and abundant on the Cornutt soil, because it is influenced less by the ultramafic rock.

Woodland.—The Cornutt soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 97 for Douglas-fir, the potential production per acre is 4,740 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 48,180 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

Most woodland areas of the Dubakella soil are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soils may be compacted if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots. Soil compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants.

The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are very plastic. Roads for year-round use need heavy base rock. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival on the Cornutt soil and a low rate of survival on the Dubakella soil because of the low fertility of the soils and lack of adequate moisture during the growing season. Mulching around seedlings helps to retain moisture in summer. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, Jeffrey pine, and incense-cedar.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of the shallow depth to bedrock and steepness of slope.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and large stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

30—Dumps. Dumps consists of mine tailings that are mainly on flood plains. The dumps were formed when excavated material was deposited after the valuable minerals had been removed. The vegetation, where present, consists of trees and shrubs. Elevation is 600 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the frost-free season is 140 to 170 days.

Dumps consists mostly of cobbles and pebbles. The finer material has been removed during mining operations. The surface ranges from nearly level to hummocky.

Included in this unit are small areas of sandy loam.

Permeability of Dumps is very rapid. A seasonal high water table occurs in winter and spring.

This unit is a potential source of gravel. Most areas are limited for other uses.

This map unit is in capability subclass VIIIs.

31D—Eightlar extremely stony clay, 5 to 20 percent slopes. This deep, moderately well drained soil is on mountains and alluvial fans. It formed in colluvium and alluvium derived dominantly from serpentinite and peridotite. Elevation is 1,350 to 4,000 feet. The average annual precipitation is about 50 to 70 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically the surface layer is dark reddish brown extremely stony clay about 10 inches thick. The subsoil is dark reddish brown and dark brown extremely stony clay about 34 inches thick. The substratum to a depth of 61 inches or more is dark brown extremely stony clay.

Included in this unit are about 10 percent Dubakella soils, 5 percent Pearsoll soils, and 10 percent soils that are less than 35 percent rock fragments. The percentage of included components varies from one area to another.

Permeability of this Eightlar soil is very slow. Available water capacity is about 3.5 to 7.5 inches. Water supplying capacity is 14 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for livestock grazing, watershed, wildlife habitat, recreation, and homesite development.

Livestock grazing.—The present vegetation in most areas is mainly Jeffrey pine, whiteleaf manzanita and other shrubs, and grasses. The production of vegetation is limited by the low fertility of the soil and droughtiness. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical, because the surface is stony.

Livestock grazing should be managed to protect the soil from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of steepness of slope.

Homesites.—If this unit is used for homesite development, the main limitations are very slow permeability, large stones, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the very slow permeability.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

The soil in this unit is subject to landsliding and slumping because it is underlain by highly fractured bedrock and is very plastic. Roads for year-round use need heavy base rock. Excavation for roads and buildings increases the hazard of erosion.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens.

Recreation.—If this unit is used for recreational development, the main limitations are large stones, steepness of slope, and very slow permeability. These limitations restrict the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and

Permeability of the Pantz soil is moderate. Available water capacity is about 1.5 to 4.5 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed gabbro bedrock. Runoff from these areas is very rapid.

This unit is used as watershed and for wildlife habitat and recreation.

The present vegetation in most areas is mainly canyon live oak, Douglas-fir, shrubs, and grasses. The production of vegetation is limited by droughtiness.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, small stones, and areas of Rock outcrop. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIIs, nonirrigated.

38A—Foehlin gravelly loam, 0 to 3 percent slopes. This deep, well drained soil is on alluvial fans and low stream terraces. It formed in alluvium derived dominantly from metamorphic, granitic, and ultramafic rock. The vegetation in areas not cultivated is mainly California black oak, Oregon white oak, Douglas-fir, shrubs, and grasses. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown gravelly loam about 13 inches thick. The upper 35 inches of the subsoil is dark brown gravelly clay loam. The lower 12 inches is brown clay loam. The substratum to a depth of 66 inches or more is brown gravelly clay loam.

Included in this unit are about 10 percent Takilma soils on low stream terraces, 10 percent Banning soils on alluvial fans and in drainageways, and 5 percent Kerby soils on low stream terraces. The percentage of included soils varies from one area to another.

Permeability of this Foehlin soil is moderately slow. Available water capacity is about 7.5 to 11 inches. Water supplying capacity is 17 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for irrigated hay and pasture and as homesites. A few areas are used for other cultivated crops, dryland hay and pasture, and recreation.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitation is small stones on the surface.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Leveling also helps to insure the uniform application of water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Forage crops may require supplemental irrigation during the growing season for maximum crop production.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed for optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content of this soil can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are moderately slow permeability, low soil strength, and the potential for shrinking and swelling of the soil. Septic tank absorption fields do not function properly during rainy periods because of moderately slow permeability. This limitation can be overcome by increasing the size of the absorption field.

Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling.

In summer, irrigation is required for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

Recreation.—If this unit is used for recreational development, the main limitation is small stones on the surface.

This map unit is in capability subclasses IIs, irrigated, and IVc, nonirrigated.

38C—Foehlin gravelly loam, 3 to 12 percent slopes. This deep, well drained soil is on alluvial fans and low stream terraces. It formed in alluvium derived dominantly from metamorphic, granitic, and ultramafic rock. The vegetation in areas not cultivated is mainly California black oak, Oregon white oak, Douglas-fir, Permeability of this Jumpoff soil is slow. Available water capacity is about 5 to 10.5 inches. Water supplying capacity is 16 to 21 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. A water table is at a depth of 30 to 42 inches in winter and spring.

This unit is used mainly for timber production. It is also used as watershed and for recreation and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 90 for Douglas-fir, the potential production per acre is 4,200 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 41,030 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, susceptibility to landslides and slumping, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management.

This unit is subject to slumping, especially where road cuts are made in the steeper areas. Slumping can be minimized by locating roads in the more gently sloping areas and by using properly designed road drainage systems. Because of seasonal wetness, roads for year-round use need heavy base rock.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants on the soil.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of plant competition for available soil moisture and soil nutrients. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade for seedlings.

Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow because of limited rooting depth.

This map unit is in capability subclass VIe, nonirrigated.

52—Kerby loam. This deep, well drained soil is on low stream terraces. It formed in alluvium of mixed origin. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, California black oak, and grasses. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark brown loam about 7 inches thick. The subsoil is brown loam about 33 inches thick. The substratum to a depth of 60 inches or more is brown and very dark grayish brown extremely gravelly sandy loam and extremely gravelly sand.

Included in this unit are about 10 percent Takilma soils and 5 percent Evans soils on flood plains. Also included are small areas of Central Point and Foehlin soils. Many areas include stringers of a soil that is similar to this Kerby soil but is more than 35 percent rock fragments in the upper 40 inches. These areas are several feet wide and 100 to 200 feet long in places. They do not occur in a predictable pattern, but they make up about 10 percent of the soils in the unit. The percentage of included soils varies from one area to another.

Permeability of this Kerby soil is moderate to a depth of 40 inches and rapid below this depth. Available water capacity is about 7.5 to 10 inches. Water supplying capacity is 18 to 21 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for recreation, dryland pasture, and adapted cultivated crops.

Hay and pasture.—This unit has few limitations for hay and pasture (fig. 10). In summer, irrigation is needed for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Leveling helps to insure the uniform application of water.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to

Figure 10.—Well managed irrigated hay and pasture on Kerby loam.

insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer and poor tilth. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—This unit is suited to homesite development. The main limitations are seepage and the susceptibility of cutbanks to caving in. Septic tank absorption fields may not function properly because the gravelly sand substratum is a poor filter. Ground water may be contaminated by sewage that is not properly filtered and treated.

Recreation.—This unit is limited for recreation by the tendency of the surface layer to become dusty when dry.

This map unit is in capability class I, irrigated, and subclass IVc, nonirrigated.

53B—Manita loam, 2 to 7 percent slopes. This deep, well drained soil is on fans and hills. It formed in colluvium and alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, black oak, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of decomposed forest litter about 1/2 inch thick. The surface layer is dark reddish brown loam about 11 inches thick. The upper 9 inches of the subsoil is reddish brown clay loam. The lower 30 inches is reddish brown clay. Depth to weathered bedrock ranges from 40 to 60 inches. In some areas depth to bedrock is more than 60 inches.

Included in this unit are about 10 percent Abegg soils and 5 percent Ruch soils. Also included are small areas of Pollard soils. Seeps or springs are in some areas of soils that generally have a dense clay layer below a depth of 40 inches. The percentage of included soils varies from one area to another.

Permeability of this Manita soil is moderately slow. Available water capacity is about 5 to 12 inches. Water suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Using management that maintains optimum vigor and quality of forage plants is a good practice. The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Flooding can be controlled only by use of major flood control structures, which should be located above the expected flood level.

Recreation.—This unit is suited to recreational development. It is limited mainly by the hazard of flooding, which limits the use of this unit mainly to picnic areas and paths and trails.

This map unit is in capability subclass IIw, irrigated.

58F—Pearsoll-Rock outcrop complex, 20 to 60 percent slopes. This map unit is on mountainsides. Elevation is 750 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 50 percent Pearsoll extremely stony clay loam and 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 25 percent Dubakella soils. Also included are small areas of McMullin and Witzel soils that are underlain by altered sedimentary and extrusive igneous rock. The percentage of included soils varies from one area to another.

The Pearsoll soil is shallow and well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark reddish brown extremely stony clay loam about 5 inches thick. The subsoil is reddish brown extremely cobbly clay about 9 inches thick. Serpentine bedrock is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of this Pearsoll soil is slow. Available water capacity is about 1 inch to 2.5 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed bedrock. Runoff from these areas is very rapid.

This unit is used for livestock grazing, wildlife habitat, and recreation.

Livestock grazing.—The present vegetation in most areas is mainly wedgeleaf ceanothus, whiteleaf manzanita, Idaho fescue, and Lemmon needlegrass. The production of vegetation suitable for livestock grazing is limited by the low fertility of the soil and droughtiness. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Slope limits access by livestock and promotes overgrazing of the less sloping areas. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical because of the stony surface layer and steepness of slope.

Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of the shallow depth to bedrock and steepness of slope.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and large stones on the surface. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

58G—Pearsoll-Rock outcrop complex, 60 to 90 percent slopes. This map unit is on highly dissected mountainsides. Elevation is 750 to 4,000 feet. The average annual precipitation is 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 50 percent Pearsoll extremely stony clay loam and 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 25 percent Dubakella soils. Also included are small areas of McMullin and with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Recreation.—If this unit is used for recreational development, the main limitation is dustiness when the soil is dry.

Woodland.—This unit is well suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 126 for Douglas-fir, the potential production per acre is 7,440 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 71,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Reforestation must be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Hand planting of nursery stock is usually necessary to establish or improve a stand, but machine planting is sometimes practical in dry years. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have a high rate of survival.

This map unit is in capability subclasses IIe, irrigated, and IVe, nonirrigated.

61C—Pollard loam, 7 to 12 percent slopes. This deep, well drained soil is on terraces, in saddles, and on hills. It formed in colluvium and alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, tanoak, hazel, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown loam about 3 inches thick. The next layer is reddish brown clay loam about 4 inches thick. The upper 29 inches of the subsoil is dark red and red clay. The lower 24 inches is red clay loam. Bedrock is at a depth of 60 inches or more.

Included in this unit are about 10 percent Abegg soils and 5 percent Selmac soils in depressional areas. Also included are small areas of soils, adjacent to Selmac soils, that have a dense clay layer below a depth of 40 inches. The percentage of included soils varies from one area to another.

Permeability of this Pollard soil is slow. Available water capacity is about 5.5 to 8 inches. Water supplying capacity is 16 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. It is also used for cultivated crops, recreation, and wildlife habitat.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitations are the hazard of erosion, steepness of slope, and slow permeability of the subsoil.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion. The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are slow permeability of the subsoil, steepness of slope, the potential for king and swelling of the soil, and low soil strength. pe limits use of the steeper areas of this unit for ing site development. The hazard of erosion is ased if the soil is left exposed during site elopment. Preserving as much of the existing plant r as possible during construction helps to control ion.

eptic tank absorption fields may not function properly ng rainy periods because of slow permeability. Use of ndy backfill for the trench and long absorption lines s to compensate for the slow permeability. Slope o is a concern in installing septic tank absorption ds. Absorption lines should be installed on the tour.

he effects of shrinking and swelling can be minimized using proper engineering designs and by backfilling material that has low potential for shrinking and lling. Buildings and roads should be designed to et the limited ability of the soil in this unit to support ad. The possibility of settlement can be minimized by pacting the building site before construction is un.

lans for homesite development should provide for the servation of as many trees as possible. Selection of pted vegetation is critical for the establishment of ns, shrubs, trees, and vegetable gardens. It is difficult establish plants in areas where the surface layer has n removed. Topsoil can be stockpiled and used to aim these areas. Mulching and fertilizing cut areas to establish plants.

ecreation.—If this unit is used for recreational elopment, the main limitations are steepness of slope d dustiness when the soil is dry.

Woodland.—This unit is well suited to the production Douglas-fir, ponderosa pine, and sugar pine. Based on e index of 126 for Douglas-fir, the potential duction per acre is 7,440 cubic feet from an even-ed, fully stocked stand of trees 60 years old or 71,010 rd feet (International rule, one-eighth inch kerf) from even-aged, fully stocked stand of trees 90 years old. Conventional methods of harvesting timber generally suitable, but the soil may be compacted if it is wet en heavy equipment is used. Minimizing the risk of sion is essential in forest management.

Reforestation must be carefully managed to reduce petition from undesirable understory plants. mpeting vegetation can be controlled by properly paring the site and by spraying, cutting, or girdling to inate unwanted weeds, brush, or trees. Hand nting of nursery stock is usually necessary to blish or improve a stand, but machine planting is etimes practical in dry years. Among the trees that suitable for planting are Douglas-fir, ponderosa pine, d sugar pine. Tree seedlings have a high rate of vival.

This map unit is in capability subclass IVe, irrigated d nonirrigated.

61D—Pollard loam, 12 to 20 percent slopes. This deep, well drained soil is in saddles and on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, tanoak, hazel, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark reddish brown loam about 3 inches thick. The upper 12 inches of the subsoil is dark reddish brown clay loam, and the lower 45 inches is dark red clay. Bedrock is at a depth of 60 inches or more.

Included in this unit are about 10 percent Josephine soils, 5 percent Abegg soils, and 5 percent Selmac soils in depressional areas. Also included are small areas of soils, adjacent to Selmac soils, that have a dense clay layer below a depth of 40 inches and some small areas of Cornutt and Brockman soils. The percentage of included soils varies from one area to another.

Permeability of this Pollard soil is slow. Available water capacity is about 5.5 to 8 inches. Water supplying capacity is 16 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and irrigated hay and pasture. It is also used as homesites and for wildlife habitat, recreation, and watershed.

Woodland.—This unit is well suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 126 for Douglas-fir, the potential production per acre is 7,440 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 71,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are the hazard of erosion and difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have a high rate of survival.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Hay and pasture.—This unit is suited to irrigated hay and pasture. The main limitations are the hazard of erosion and steepness of slope.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are steepness of slope and slow permeability of the subsoil. Slope limits use of the steeper areas of this unit for building site development. The hazard of erosion is increased if the soil is left exposed during site development. Preserving as much of the existing plant cover as possible during construction helps to control erosion.

Septic tank absorption fields may not function properly during rainy periods because of steepness of slope and slow permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for the slow permeability. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

61E—Pollard loam, 20 to 35 percent slopes. This deep, well drained soil is on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, tanoak, hazel, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark reddish brown loam about 3 inches thick. The upper 12 inches of the subsoil is dark reddish brown clay loam. The lower 45 inches is dark red clay. Bedrock is at a depth of 60 inches or more.

Included in this unit are about 15 percent Josephine soils and 5 percent soils that are more than 35 percent rock fragments. Also included are small areas of Cornutt and Brockman soils and Pollard soils that have a gravelly loam surface layer. The percentage of included soils varies from one area to another.

Permeability of this Pollard soil is slow. Available water capacity is about 5.5 to 8 inches. Water supplying capacity is 16 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and as watershed. It is also used for dryland and irrigated hay and pasture, homesites, recreation, and wildlife habitat.

Woodland.—This unit is well suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 126 for Douglas-fir, the potential production per acre is 7,440 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 71,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are the hazard of erosion and difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are ponderosa pine and Douglas-fir. Tree seedlings have a low rate of survival because of the lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Minimizing the risk of erosion is essential in forest management. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

68B—Selmac loam, 2 to 7 percent slopes. This deep, moderately well drained soil is in drainage basins. It formed in alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, black oak, Pacific madrone, poison-oak, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsoil is dark yellowish brown clay loam and reddish brown gravelly clay loam about 12 inches thick. The substratum to a depth of 60 inches or more is olive brown and olive gray clay.

Included in this unit is about 5 percent Abegg soils, 5 percent Pollard soils, and 5 percent Manita soils. The percentage of included soils varies from one area to another.

Permeability of this Selmac soil is very slow. Available water capacity is about 2 to 4 inches. Water supplying capacity is 11 to 15 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 18 to 36 inches in winter and spring. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture, timber production, and homesites. It is also used for recreation and wildlife habitat.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by wetness and the very slow permeability of the substratum. Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is also needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table, and drainage may also be needed.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Woodland.—This unit is poorly suited to the production of Douglas-fir, ponderosa pine, and incense-cedar. Based on a site index of 87 for Douglas-fir, the potential production per acre is 4,690 cubic feet from an even-aged, fully stocked stand of trees 70 years old or 38,280 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concern in producing and harvesting timber is the difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Minimizing the risk of erosion is essential in forest management.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Only trees that can tolerate seasonal wetness should be planted. Among the trees that are suitable for planting are ponderosa pine, incense-cedar, and Douglas-fir. Tree seedlings have only a moderate rate of survival because of intermittent wet and dry periods. Lack of adequate moisture during the growing season is also a concern.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Homesites.—If this unit is used for homesite development, the main limitations are wetness, the very slow permeability of the subsoil, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the very slow permeability and wetness.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. A seasonal high water table is perched above the claypan, and drainage should be provided for buildings with basements and crawl spaces. Wetness can be reduced by installing the vegetation downslope of roadbuilding sites can be oided by hauling away waste material. Some slumping the soils onto the roadway may occur. Road cuts and s need to be seeded to permanent vegetation. Grass w mulch helps to stabilize cuts.

Steepness of slope limits the kinds of equipment that n be used on this unit. High-lead logging and other ble logging systems that fully or partially suspend the gs damage the soil surface less and generally are less stly than some of the more conventional methods of vesting timber. Harvesting timber and building roads ing methods that cause excessive disturbance to the ils increase the loss of soil material, thus leaving a eater number of rock fragments on the surface.

The soils in this unit are subject to compaction if they re wet when heavy equipment is used. Soil compaction mits the movement of air and water in the soils, and it stricts the growth of roots. When the soils are dry, skid ils and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soils decreases seedling survival. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIe, nonirrigated.

73—Takilma cobbly loam. This deep, well drained soil is on low stream terraces. It formed in cobbly alluvium derived dominantly from metavolcanic, sedimentary, and ultramafic rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly scattered oaks, shrubs, and grasses. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark brown cobbly loam about 6 inches thick. The subsoil is dark brown very cobbly loam about 12 inches thick. The substratum to a depth of 60 inches or more is dark brown extremely cobbly sandy loam.

Included in this unit are about 10 percent Kerby soils, 5 percent Foehlin soils on low stream terraces, 5 percent Abegg soils on the higher stream terraces, and 5 percent Camas soils on flood plains. Also included are small areas of Foehlin Variant soils in drainageways and Takilma soils that have a surface layer of gravelly and very gravelly loam. The percentage of included soils varies from one area to another.

Permeability of this Takilma soil is moderately rapid. Available water capacity is about 2.5 to 4.5 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight.

This map unit is used mainly for hay and pasture. It is also used as homesites.

Hay and pasture.—This unit is suited to hay and pasture. The main limitations are droughtiness and large stones on the surface, which limit the use of equipment on this unit.

Crops that are tolerant of drought are best suited to this unit because the available moisture is not adequate for good growth of most other crops. In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Because the soil in this unit is droughty, light and frequent applications of water are needed.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed for optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to phosphorus and sulfur.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—If this unit is used for homesite development, the main limitation is cobbles. Use of the soil in this unit for septic tank absorption fields is limited because the extremely gravelly substratum is a poor filter and there is a hazard of polluting water supplies. If the density of housing is moderate to high, community sewage systems are needed.

The use of equipment on this unit is limited by cobbles throughout the soil. Removal of pebbles and cobbles in disturbed areas is required for best results when landscaping, particularly in areas used for lawns. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. In summer, irrigation is required for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

areas dominated by deep, well drained to excessively drained soils on flood plains

This group consists of one map unit. It makes up about 2 percent of the survey area. The soils in this group are on flood plains along the major rivers and streams throughout the county. They formed in alluvium of mixed origin.

This group is used mainly for irrigated hay and pasture, recreation, and wildlife habitat.

1. Newberg-Camas-Evans

Deep, well drained to excessively drained fine sandy loam, gravelly sandy loam, and loam

This map unit is mainly along the Applegate, Illinois, and Rogue Rivers. The vegetation in areas not cultivated is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 0 to 3 percent. Elevation is 750 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free season is 150 to 170 days.

This unit makes up about 2 percent of the survey area. It is about 30 percent Newberg soils, 25 percent Camas soils, and 15 percent Evans soils. The remaining 30 percent is Cove, Takilma, and Wapato soils, Dumps, and Riverwash.

Newberg, Camas, and Evans soils formed in alluvium derived dominantly from granitic rock and altered sedimentary and extrusive igneous rock. Unprotected areas of these soils are subject to occasional, brief periods of flooding.

Newberg soils are somewhat excessively drained. The surface layer is fine sandy loam. The substratum to a depth of 60 inches or more is stratified sandy loam, loamy fine sand, and loamy sand.

Camas soils are excessively drained. The surface layer is gravelly sandy loam, and the substratum is variegated very gravelly sand.

Evans soils are well drained. The surface layer is loam, and the substratum is silt loam and very fine sandy loam.

This unit is used mainly for irrigated hay and pasture, recreation, and wildlife habitat. A few areas are used for corn silage.

If this unit is used for irrigated hay and pasture, the main limitations are the hazard of flooding, droughtiness, and the gravelly surface layer of the Camas soils. Construction of dwellings, small buildings, roads, and recreation facilities is limited by the hazard of flooding.

areas dominated by deep, well drained to somewhat poorly drained soils on low stream terraces, alluvial fans, and hillsides and in drainageways

This group consists of four map units. It makes up about 9 percent of the survey area. The native vegetation in areas not cultivated is mainly conifers, hardwoods, shrubs, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 55 degrees F, and the frost-free season is 120 to 170 days.

The soils in this group are well drained to somewhat poorly drained. They formed in alluvium derived dominantly from granitic rock, altered sedimentary and extrusive igneous rock, and ultramafic rock.

This group is used mainly for irrigated hay and pasture and as homesites. It is also used for timber production, corn silage, wildlife habitat, and recreation.

2. Takilma-Foehlin-Kerby

Deep, well drained cobbly loam, gravelly loam, and loam

This map unit is mainly on low stream terraces and alluvial fans in the Illinois, Applegate, and Rogue River Valleys. It is also in Deer Creek Valley and some other small valleys. The vegetation in areas not cultivated is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 0 to 12 percent. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the frost-free season is 140 to 170 days.

This unit makes up about 3 percent of the survey area. It is about 25 percent Takilma soils, 15 percent Foehlin soils, 15 percent Kerby soils, 5 percent Banning soils, and 5 percent Central Point soils. The remaining 35 percent is Brockman, Cove, Manita, Selmac, Takilma Variant, and Wapato soils.

Takilma and Kerby soils are on low stream terraces, and Foehlin soils are on low stream terraces and alluvial fans. These soils formed in alluvium derived dominantly from altered sedimentary and extrusive igneous rock.

The surface layer of the Takilma soils is cobbly loam. The subsoil is very cobbly loam, and the substratum is extremely cobbly sandy loam.

The surface layer of the Foehlin soils is gravelly loam, and the subsoil and substratum are gravelly clay loam.

The surface layer and subsoil of the Kerby soils is loam, and the substratum is extremely gravelly sandy loam and extremely gravelly sand.

This unit is used mainly for irrigated hay and pasture and as homesites. A few areas are used for corn silage and wildlife habitat.

If this unit is used for irrigated hay and pasture, the main limitation is the droughtiness of the Takilma soils. If the unit is used as homesites, the Kerby and Takilma soils have few limitations. The Foehlin soils are limited by moderately slow permeability, low soil strength, and shrinking and swelling of the subsoil.

3. Clawson-Jerome

Deep, somewhat poorly drained sandy loam

This map unit is mainly on alluvial fans and in drainageways in the Rogue River Valley. The vegetation in areas not cultivated is willows, grasses, and sedges. Slopes are 0 to 7 percent. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 52 to 55 degrees F, and the average frost-free season is 140 to 170 days.

This unit makes up about 1 percent of the survey area. It is about 45 percent Clawson soils and 20 percent Jerome soils. The remaining 35 percent is Barron, Cove, and Wapato soils.

Clawson and Jerome soils formed in alluvium derived dominantly from granitic rock.

The surface layer and subsoil of the Clawson soils are sandy loam. The substratum is sandy loam and coarse sandy loam.

The surface layer, subsoil, and substratum of the Jerome soils are sandy loam and are underlain by a buried soil of silty clay and clay.

If this unit is used for irrigated hay and pasture, the main limitation is wetness. If it is used as homesites, the main limitation is wetness on the Clawson soils and wetness, very slow permeability, and low soil strength on the Jerome soils.

4. Pollard-Abegg

Deep, well drained loam and gravelly loam

This map unit is mainly on high stream terraces and hillsides in the Illinois River Valley and Deer Creek valley. It is also in many other valleys throughout the county. The vegetation in areas not cultivated is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 2 to 20 percent. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free season is 140 to 170 days.

This unit makes up about 3 percent of the survey area. It is about 50 percent Pollard soils and 45 percent Abegg soils. The remaining 5 percent is Brockman Variant and Selmac soils.

Pollard and Abegg soils formed in alluvium and colluvium derived dominantly from altered sedimentary and extrusive igneous rock.

The surface layer of the Pollard soils is loam, and the subsoil is clay.

The surface layer of the Abegg soils is gravelly loam, the subsoil is very gravelly clay loam, and the substratum is extremely gravelly loamy sand.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. A few areas are used for recreation and wildlife habitat.

If this unit is used for irrigated hay and pasture, the main limitations are steepness of slope and droughtiness. The main limitation for homesites is the slow permeability of the Pollard soils. This unit has few limitations for timber production.

5. Brockman

Deep, moderately well drained cobbly clay loam and clay loam

This map unit is mainly on alluvial fans in the Illinois River Valley and in areas near the towns of Murphy, Merlin, and Hugo. The vegetation in areas not cultivated is conifers, hardwoods, shrubs, and grasses. Slopes are 2 to 20 percent. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free season is 120 to 170 days.

This unit makes up about 2 percent of the survey area. It is about 50 percent Brockman soils. The remaining 50 percent is Copsey, Cornutt, Dubakella, Jumpoff, and Selmac soils.

Brockman soils are on alluvial fans. They formed in alluvium derived dominantly from ultramafic rock. The surface layer is cobbly clay loam or clay loam, and the subsoil and substratum are cobbly clay.

This unit is used mainly for irrigated pasture and hay and for wildlife habitat. A few areas are used as homesites.

If this unit is used for irrigated pasture and hay, the main limitations are the low fertility of the soils and the very slow permeability of the subsoil. If this unit is used as homesites, the main limitations are wetness, low soil strength, and the very slow permeability of the subsoil.

areas dominated by moderately deep and deep, well drained and somewhat excessively drained soils on hillsides, toe slopes, and alluvial fans

This group consists of one map unit. It makes up about 3 percent of the survey area. The soils in this group are in the Grants Pass, Merlin, and Williams area. They formed in material derived dominantly from granitic rock. When the soils in this group are disturbed, the hazard of erosion is high.

This group is used mainly for irrigated hay and pasture and as homesites.

6. Holland-Barron-Siskiyou

Deep and moderately deep, well drained and somewhat excessively drained sandy loam, coarse sandy loam, and gravelly sandy loam

This map unit is mainly on hillsides, toe slopes, and alluvial fans in the Grants Pass, Merlin, and Williams areas. The vegetation in areas not cultivated is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 2 to 35 percent. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free season is 120 to 170 days.

This unit makes up about 3 percent of the survey area. It is about 70 percent Holland soils, 15 percent Barron soils, and 10 percent Siskiyou soils. The remaining 5 percent is Clawson, Jerome, and steep Siskiyou soils.

Holland, Barron, and Siskiyou soils formed in alluvium, colluvium, and residuum derived dominantly from granitic rock.

Holland soils are deep to granodiorite and are well drained. The surface layer and substratum are sandy loam. The subsoil is sandy clay loam.

Barron soils are deep and somewhat excessively drained. They are coarse sandy loam throughout.

Siskiyou soils are moderately deep to granodiorite and are somewhat excessively drained. The surface layer is gravelly sandy loam. The subsoil and substratum are sandy loam.

This unit is used mainly for irrigated hay and pasture and as homesites. A few areas are used for timber production and wildlife habitat.

If this unit is used for irrigated hay and pasture, the main limitation is the high hazard of erosion. If the unit is used as homesites, the main limitations on the Holland soils are moderately slow permeability, shrinking and swelling of the soils, and low strength of the subsoil. The Barron and Siskiyou soils are limited for use as homesites by steepness of slope.

areas dominated by shallow to deep, moderately well drained to somewhat excessively drained soils on mountainsides, hillsides, ridges, alluvial fans, and stream terraces

This group consists of eight map units. It makes up about 86 percent of the survey area. The native vegetation is mainly conifers, hardwoods, shrubs, and grasses. Elevation is 1,000 to 7,000 feet. The average annual precipitation is 30 to 70 inches, the average annual air temperature is 40 to 54 degrees F, and the frost-free season is less than 100 days to 170 days.

The soils in this group are moderately well drained to somewhat excessively drained. They formed in alluvium, colluvium, and residuum dominantly from granitic rock, altered sedimentary and extrusive igneous rock, and ultramafic rock.

This group is used mainly for timber production, wildlife habitat, watershed, and recreation.

7. Vannoy-Manita-Voorhies

Deep and moderately deep, well drained silt loam, loam, and very gravelly loam

This map unit is in areas throughout the county that receive less than 35 inches of precipitation. The vegetation is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 2 to 55 percent. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 6 percent of the survey area. It is about 40 percent Vannoy soils, 30 percent Manita soils, and 10 percent Voohries soils. The remaining 20 percent is Beekman, Colestine, Debenger, Jumpoff, McMullin, Ruch, Selmac, and Witzel soils.

Vannoy and Voorhies soils are on mountainsides. Manita soils are on mountainsides, hillsides, and alluvial fans. These soils formed in colluvium and alluvium derived dominantly from altered sedimentary and extrusive igneous rock.

Vannoy soils are moderately deep. The surface layer is silt loam. The subsoil is clay loam and is underlain by weathered metamorphic rock.

Manita soils are deep. The surface layer is loam. The subsoil is clay loam and clay and is underlain by metamorphic rock.

Voorhies soils are moderately deep. The surface layer is very gravelly loam. The subsoil is very gravelly clay loam and is underlain by fractured metamorphic rock.

The unit is used mainly for timber production, wildlife habitat, recreation, and watershed. A few areas are used as homesites.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is essential in forest management. The main limitations for homesites in the gently sloping areas are moderately slow permeability and shrinking and swelling of the soils.

8. Josephine-Speaker-Pollard

Deep and moderately deep, well drained gravelly loam and loam

This map unit is mainly on mountainsides in areas throughout the county that receive more than 35 inches of precipitation. The vegetation is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 20 to 55 percent. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 17 percent of the survey area. It is about 60 percent Josephine soils, 20 percent Speaker soils, and 10 percent Pollard soils. The remaining 10 percent is Beekman, Colestine, Cornutt, Dubakella, Jumpoff, McMullin, and Witzel soils.

Josephine and Speaker soils are on mountainsides and ridges. Pollard soils are on high stream terraces, in saddles, and on hillsides. These soils formed in colluvium and residuum derived dominantly from altered sedimentary and extrusive igneous rock.

Josephine soils are deep to weathered metasedimentary rock. The surface layer is gravelly loam, and the subsoil is clay loam.

Speaker soils are moderately deep to weathered bedrock. The surface layer is gravelly loam, and the subsoil is gravelly clay loam.

Pollard soils are deep. The surface layer is loam, and the subsoil is clay.

The unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is the steepness of slope. Minimizing the risk of erosion is essential in forest management.

9. Beekman-Vermisa-Colestine

Moderately deep and shallow, well drained and somewhat excessively drained, extremely gravelly loam and gravelly loam

This map unit is mainly on mountainsides throughout the county in areas that receive more than 35 inches of precipitation. The vegetation is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 50 to 100 percent. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 160 days.

This unit makes up about 36 percent of the survey area. It is about 30 percent Beekman soils, 25 percent Vermisa soils, and 10 percent Colestine soils. The remaining 35 percent is Josephine, Jumpoff, Pollard, and Speaker soils and areas of Rock outcrop.

Beekman, Vermisa, and Colestine soils formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock.

Beekman soils are moderately deep to hard metamorphic rock and are well drained. The surface layer is gravelly loam, and the subsoil is very gravelly loam.

Vermisa soils are shallow to fractured metamorphic rock and are somewhat excessively drained. The surface layer is extremely gravelly loam, and the subsoil is very gravelly loam.

Colestine soils are moderately deep to hard metamorphic rock and are well drained. The surface layer is gravelly loam, and the subsoil is gravelly clay loam.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is essential in forest management.

10. Siskiyou-Tethrick

Deep and moderately deep, somewhat excessively drained and well drained gravelly sandy loam and gravelly fine sandy loam

This map unit is mainly on mountainsides in the Grants Pass, Williams, and Grayback Mountain areas. Slopes are 35 to 70 percent. The vegetation is mainly conifers, hardwoods, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 55 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 3 percent of the survey area. It is about 70 percent Siskiyou soils and 25 percent Tethrick soils. The remaining 5 percent is Holland soils (fig. 1).

The Siskiyou and Tethrick soils formed in colluvium and residuum derived dominantly from granitic rock.

Siskiyou soils are moderately deep to granodiorite and are somewhat excessively drained. The surface layer is gravelly sandy loam, and the subsoil and substratum are sandy loam.

Tethrick soils are deep to quartz-diorite and are well drained. The surface layer is gravelly fine sandy loam, and the subsoil and substratum are fine sandy loam.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is essential in forest management. The soils are subject to a high hazard of erosion when disturbed.

11. Pearsoll-Dubakella-Eightlar

Shallow to deep, well drained and moderately well drained extremely stony clay loam, very cobbly clay loam, and extremely stony clay

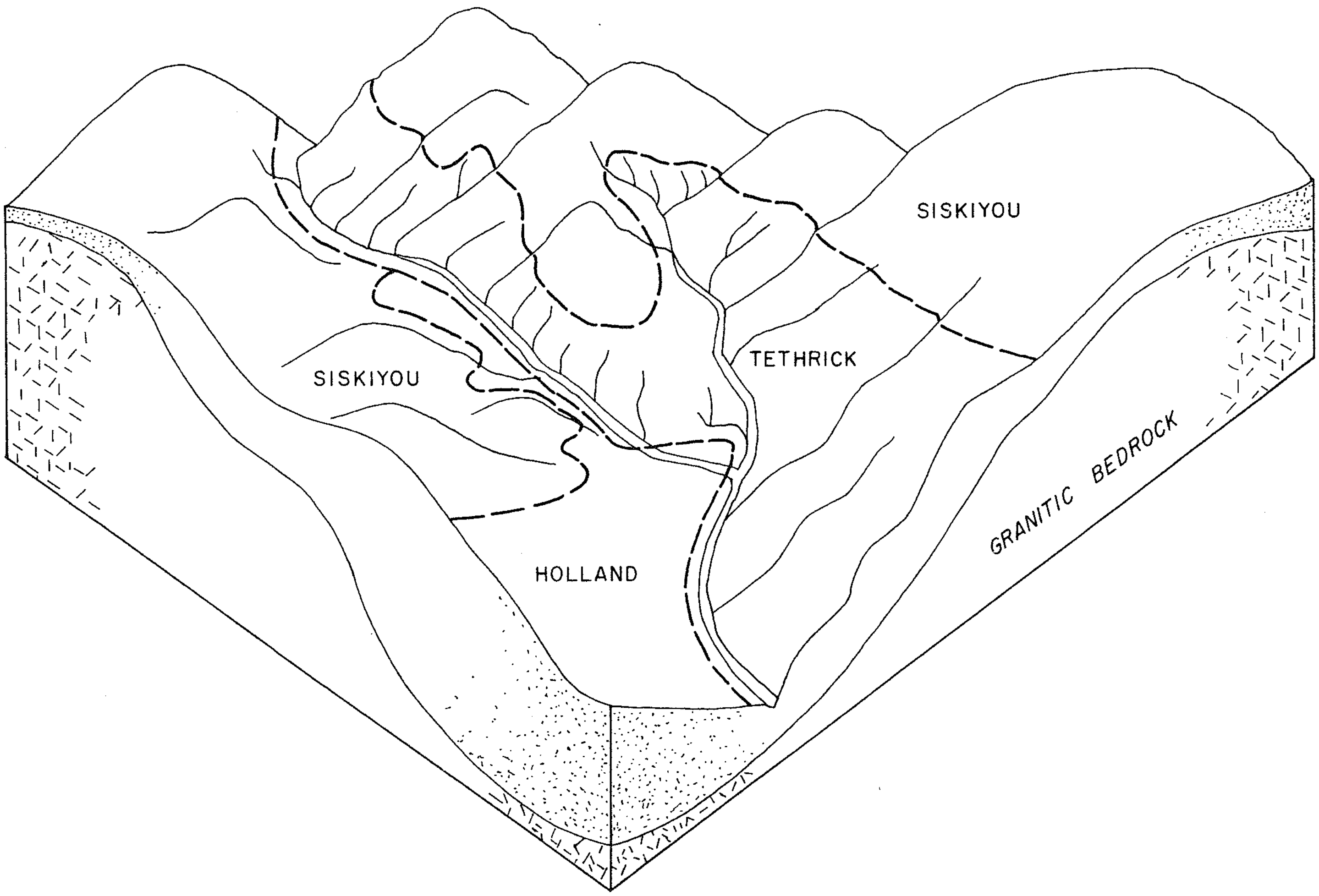


Figure 1.—Typical pattern of soils in the Siskiyou-Tethrick general map unit.

This map unit is mainly on mountainsides and alluvial fans in the southwestern part of the county. The vegetation is mainly Jeffrey pine, incense-cedar, shrubs, and grasses. Slopes are 5 to 90 percent. Elevation is 750 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 10 percent of the survey area. It is about 40 percent Pearsoll soils, 20 percent Dubakella soils, and 15 percent Eightlar soils. The remaining 25 percent is Brockman, Cornutt, and Perdin soils and Rock outcrop (fig. 2).

Pearsoll and Dubakella soils are mainly on mountainsides. Eightlar soils are on mountainsides and alluvial fans. These soils formed in colluvium, residuum, and alluvium derived dominantly from serpentinite and peridotite.

Pearsoll soils are shallow to serpentinite and are well drained. The surface layer is extremely stony clay loam, and the subsoil is extremely cobbly clay.

Dubakella soils are moderately deep to serpentinite and are well drained. The surface layer is very cobbly clay loam, and the subsoil is very cobbly clay loam and extremely cobbly clay.

Eightlar soils are deep and moderately well drained. They are extremely stony clay throughout.

This unit is used for wildlife habitat, recreation, watershed, and livestock grazing.

The main limitations of this unit for most uses are the low fertility of the soils and steepness of slope. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth.

12. Cornutt-Dubakella

Deep and moderately deep, well drained cobbly clay loam and very cobbly clay loam

This map unit is mainly on mountainsides and alluvial fans throughout the county. The vegetation is mainly

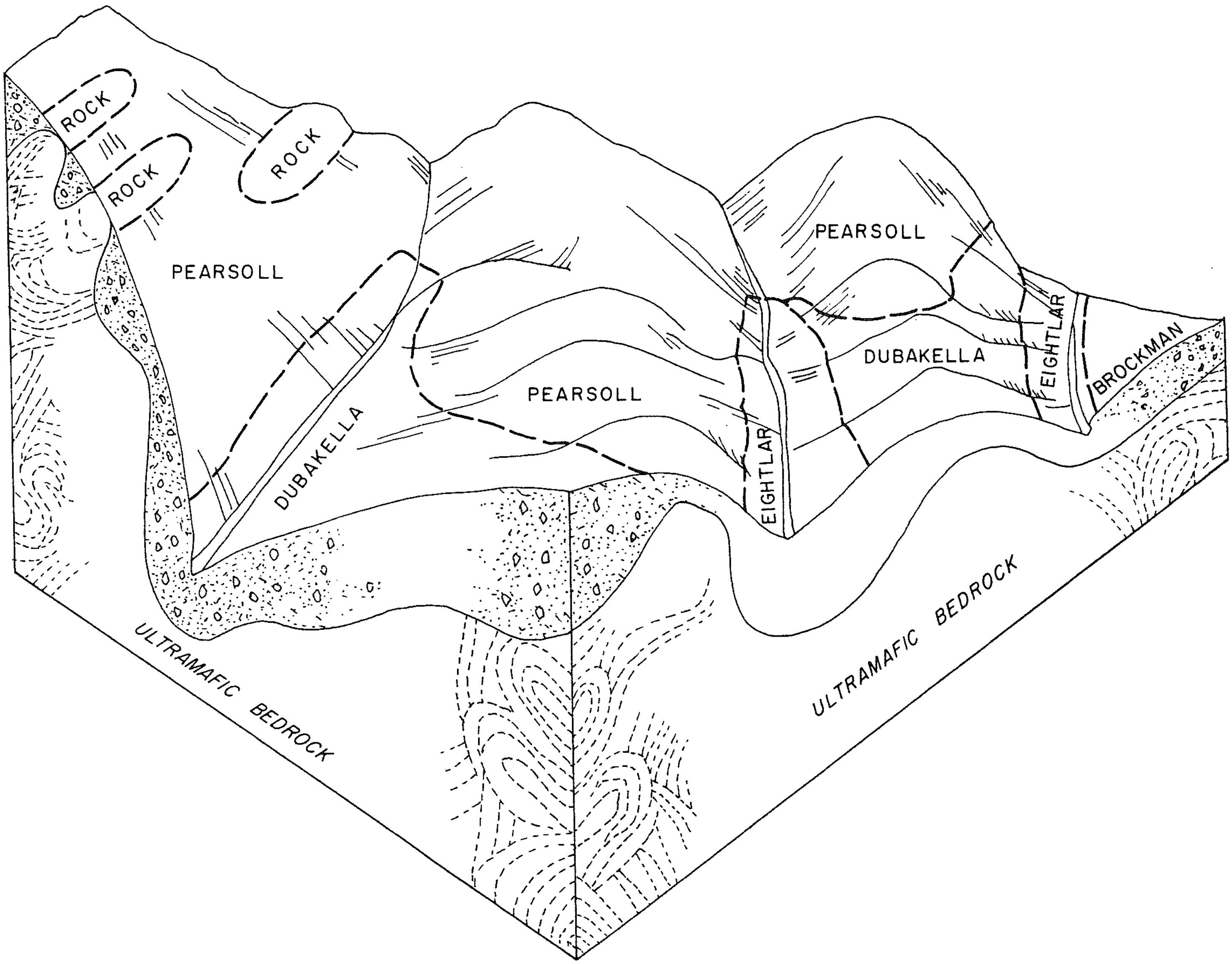


Figure 2.—Typical pattern of soils in the Pearsoll-Dubakella-Eightlar general map unit.

conifers, shrubs, and grasses. Slopes are 7 to 55 percent. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 5 percent of the survey area. It is about 40 percent Cornutt soils and 35 percent Dubakella soils. The remaining 25 percent is Brockman, Josephine, Pearsoll, and Speaker soils.

Cornutt soils are on mountainsides and alluvial fans, and Dubakella soils are on mountainsides and ridgetops. These soils formed in colluvium and residuum derived dominantly from ultramafic rock and altered sedimentary and extrusive igneous rock.

Cornutt soils are deep to metavolcanic rock. The surface layer is cobbly clay loam, and the subsoil is clay.

Dubakella soils are moderately deep to serpentinite. The surface layer is very cobbly clay loam, and the subsoil is very cobbly clay loam and extrémely cobbly clay.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitations of this unit for most uses are low fertility of the soils and steepness of slope. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth.

13. Jayar-Althouse

Moderately deep and deep, well drained very gravelly loam and very gravelly silt loam

This map unit is mainly on mountainsides and ridges. It is in areas that have cold soil temperatures, dominantly in the southeastern part of the county. The vegetation is mainly true firs, Douglas-fir, cedars, shrubs, and grasses. Slopes are 20 to 75 percent. Elevation is 3,600 to 5,500 feet. The average annual precipitation is 40 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is less than 100 days.

This unit makes up about 6 percent of the survey area. It is about 55 percent Jayar soils and 20 percent Althouse soils. The remaining 25 percent is Perdin and Woodseye soils and Rock outcrop.

Jayar soils are on mountainsides and ridges. Althouse soils are on mountainsides. These soils formed in colluvium and residuum dominantly from altered sedimentary and extrusive igneous rock.

Jayar soils are moderately deep to metavolcanic rock. The surface layer is very gravelly loam, and the subsoil is extremely gravelly loam.

Althouse soils are deep to metavolcanic rock. The surface layer is very gravelly silt loam, and the subsoil and substratum are extremely gravelly silt loam.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is essential in forest management.

14. Crannler-Goodwin-Rogue

Moderately deep and deep, somewhat excessively drained and well drained very stony sandy loam and stony coarse sandy loam

This map unit is mainly on mountainsides. It is in the southeastern part of the county in areas where soil temperatures are cold. The vegetation is mainly true firs, cedars, shrubs, and grasses. Slopes are 5 to 90 percent. Elevation is 3,600 to 7,000 feet. The average annual precipitation is about 50 to 80 inches, the average annual air temperature is 38 to 45 degrees F, and the average frost-free season is less than 100 days.

This unit makes up about 3 percent of the survey area. It is about 30 percent Crannler soils, 25 percent Goodwin soils, and 15 percent Rogue soils. The remaining 30 percent is Bigelow soils, Cryaquepts, Cryumbrepts, and Rock outcrop.

The soils in this unit formed in colluvium and residuum derived dominantly from granitic rock.

Crannler soils are moderately deep to quartz-diorite and are somewhat excessively drained. The surface layer is very stony sandy loam, and the substratum is extremely stony sandy loam.

Goodwin soils are deep to quartz-diorite and are well drained. The surface layer is very stony sandy loam. The subsoil is extremely gravelly sandy loam, and the substratum is very gravelly sandy loam.

Rogue soils are deep to granodiorite and are somewhat excessively drained. The surface layer is stony coarse sandy loam. The subsoil is gravelly coarse sandy loam, and the substratum is gravelly loamy coarse sand.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is essential in forest management.

broad land use considerations

About 7,800 acres in the survey area is urban land. In addition, many acres in the area have now been divided into small parcels for rural or recreational use. Generally, the soils in the valleys have good potential for irrigated crops as well as for community developments, such as dwellings, roads, and many other related uses. The soils on the mountains have good potential for timber production, watershed, wildlife habitat, and recreation.

In the following paragraphs information is given on the broad land use considerations for the general soil map units. This information will assist decisionmakers and enhance the general public's understanding of the kind, extent, and location of soils in the area. It will be invaluable in planning future land use patterns.

Areas of soils that are favorable for timber production are throughout the survey area, but they are most extensive in general map units 7, 8, 9, 10, 13, and 14. Steepness of slope, droughtiness, and the difficulty of reforestation are major concerns for producing and harvesting timber on the soils in these units. Potential for production of timber varies widely. Proper management practices need to be used to insure successful reforestation. Soil erosion is a severe problem when areas of these soils are disturbed. Minimum disturbance will preserve the productivity of the soils and limit sedimentation of streams and rivers, thus protecting important fish life and water quality.

Units 4 and 6 are capable of producing good stands of timber. These units are being converted from forest land to farmland and into home subdivisions. The mountainous areas of units 11 and 12 are unfavorable for timber production. Low soil fertility is the primary limitation for timber production on the soils in these units.

Areas of units 1, 2, 3, 4, and 6 are favorable for farming. Irrigation is needed for high production of crops. Some areas of these units are limited by slope, wetness, the hazard of flooding, or rock fragments in the soil. Drainage needs to be provided for the soils in unit 3. The hazard of flooding limits the choice of crops and irrigation practices on unit 1. Some areas of unit 6 are too steep to safely cultivate. Soil erosion is a severe hazard on the granitic soils when they are disturbed. Generally, units 2 and 4 are suited to a variety of crops and cultural practices.

Areas of soils that are mostly favorable for urban or homesite development are in units 2, 4, 6, and 7. These units are mainly in valleys and on foothills. Shrinking and swelling of the soils, low soil strength, and steepness of slope can result in higher construction costs. Units 1, 3, and 5 are mostly unfavorable for community development. The hazard of flooding, low soil strength, shrinking and swelling of the soil, and wetness are limitations that must be overcome.

Areas of units 11 and 12 are used for mining. Mineral ore deposits of gold, silver, and other metals are in the rocks associated with the soils in these units. Recreation and watershed are also very important uses. The soils need to be protected from erosion if they are managed for these uses. Most areas of these units are managed by public agencies.