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DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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1964

GEOLOGY OF THE DALLAS AND VALSETZ QUADRANGLES, OREGON

By
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FOREWORD TO THE FIRST EDITION

The reconnaissance geologic maps of the adjoining Dallas and Valsetz 15-minute quadrangles, together with the descriptive text in this bulletin, are the results of work undertaken by the State geological survey. This important survey work was discontinued during the war and resumed in 1946. The two quadrangles are located in northwestern Oregon, mainly in Polk County, and cover a section of the summit and eastern slope of the Coast Range and a portion of the western part of the Willamette Valley.

The selection of the Dallas-Valsetz area for geological survey work stemmed primarily from the Department's efforts to find limestone deposits of better quality than those now known in the area. Such deposits are badly needed both for industry and agricultural stone. The survey was not successful in finding commercial deposits of high-grade stone but information was obtained which indicates the favorable geological horizon where limestone deposits could probably be found and where further prospecting should be done.

This study of the area allows a clearer understanding of stratigraphy, structure, and geologic history of the Coast Range. In addition, the intrusives described by Dr. Baldwin present a new chapter in knowledge of Coast Range eruptive rocks and physiography. This survey work, as represented by the bulletin and geologic maps, is an important contribution to the geological knowledge of northwestern Oregon.

F. W. Libbey
Director

March 27, 1948

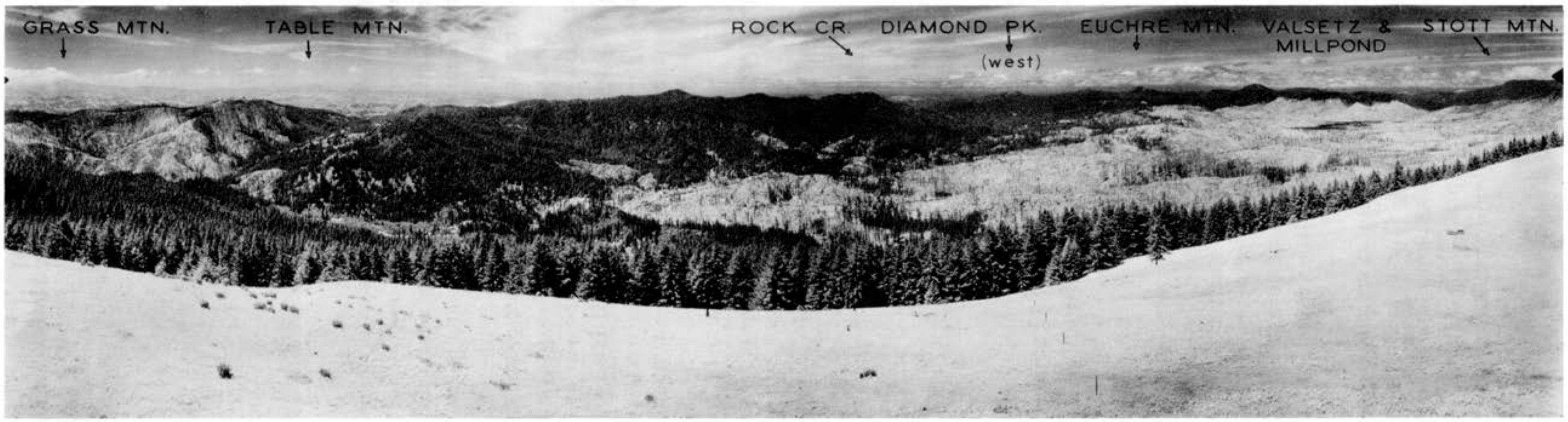
FOREWORD TO THE REVISED EDITION

The decision of the Department to revise Bulletin 35 was based on several factors, namely, easier accessibility to the area than when it was first mapped in 1946-47; better definitions for the stratigraphic units in the Coast Range after 16 years of fairly concentrated field work by the U.S. Geological Survey and this Department; and, lastly, an increased demand for information on the Coast Range as an aid to interpretation of the geology of the Willamette Valley and Oregon's continental shelf. Significant to the revision of the geologic map accompanying the new bulletin was the availability of a more legible base map for the geologic overprint. The author, Prof. Ewart M. Baldwin of the University of Oregon, who did the original work in the Dallas and Valsetz quadrangles as a member of this Department, has, in the period 1944 to date, mapped or cooperated in the mapping of approximately 4,000 square miles in the Coast Range of Oregon. The revised edition of these two quadrangles embodies the knowledge he has gained over the years. Anyone who is interested in the geology of western Oregon will find this bulletin invaluable.

Hollis M. Dole
State Geologist

October 12, 1964


SUGARLOAF MTN.
FANNO RIDGE
LAUREL MTN. (north)
WILLAMETTE VALLEY
Base of sill


GRASS MTN.
TABLE MTN.
ROCK CR.
DIAMOND PK. (west)
EUCHRE MTN.
VALSETZ & MILLPOND
STOTT MTN.


(east)
WILLAMETTE VALLEY
MARYS PEAK (south)

Panorama from the Bald Mountain (Monmouth Peak) Lookout, Valsetz Quadrangle
Each photograph represents 120° of a complete circle

Upper: The view northward from Bald Mountain (Monmouth Peak) shows the Fanno Ridge sill which caps the plateau between Fanno Ridge and Laurel Mountain and which extends many miles northwestward. Sills also dip gently eastward beneath the sediments in the Willamette Valley.

Center: The erosional basin in the foreground has been eroded in the relatively nonresistant sediments of the Tyee Formation by the Luckiamute River, which flows to the left, and by the South Fork of the Siletz River, which flows to the right (west) through the notch near the Valsetz milldam. There is a low drainage divide in the center of the photograph. The Luckiamute River has cut downward to a point several hundred feet lower than the Siletz River near Valsetz. The Luckiamute River has already captured the head of Siletz drainage, which formerly flowed westward from Bald Mountain, and now encircles the peak and drains eastward to the Willamette River. It is very close to the complete capture of the drainage in the vicinity of Valsetz. The timbered ridge across the Luckiamute River valley, as well as the prominent peaks shown on the skyline, is composed of intrusive igneous rock.

Lower: The Luckiamute River flows eastward between Marys Peak and Bald Mountain to Kings Valley (middle distance) and then turns northward for a few miles as shown near the center of the photograph. The ridge between Kings Valley and the Willamette Valley is composed of westward-dipping basaltic flows and tuffaceous sediments.

Photographs courtesy of Oregon State Department of Forestry.

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GEOLOGY OF THE

DALLAS AND VALSETZ QUADRANGLES, OREGON

By Ewart M. Baldwin

ABSTRACT

The Dallas and Valsetz quadrangles are located along the eastern slope of the Oregon Coast Range west of Salem. The area is underlain by a thick sequence of submarine volcanics and marine sedimentary rock. The oldest formation is a thick series of submarine flows, breccias, and intercalated water-laid tuff called the Siletz River Volcanics of early Eocene age. The mass is thoroughly zeolitized in places. A tuffaceous sedimentary member near the top of the volcanic mass is correlated with the Kings Valley Siltstone Member of the volcanic series mapped in the nearby Corvallis and Marys Peak quadrangles.

The Tyee Formation of middle Eocene age rests unconformably upon the volcanic rock in the southern and western parts of the area. It is made up of relatively thick, rhythmically bedded, micaceous sandstone. The northern and eastern part of the area contains the Yamhill Formation, which is predominantly siltstone and thin-bedded micaceous sandstone. A basal member, herein named the Rickreall Limestone Member, is present southwest of Dallas where approximately 60 to 80 feet of impure limestone is exposed in the Oregon Portland Cement Co. quarry. The limestone is composed of shell fragments, foraminifera, and calcareous algae. Some of the better limestone averages 60 to 70 percent $CaCO_3$ and is utilized in the manufacture of cement and at times for agricultural purposes.

The Yamhill Formation rests on the volcanics along the northern and eastern parts of the area occupying the position of the Tyee Formation. Where it is in contact, it appears to interfinger with the upper part of the Tyee and represents a continuation of deposition in the northern part of the Coast Range basin, perhaps equivalent to the Elkton Siltstone Member and Lorane Member of the Tyee Formation. The Yamhill Formation is late middle to late Eocene in age.

The Spencer Formation of late Eocene age occupies the eastern edge of the area mapped. It is composed of cross-bedded, shallow water, sandstone and sandy siltstone. Associated flow (?) basalt is present on the east slope of Mt. Pisgah.

The region was intruded by granophyric gabbro and diorite sills and dikes during the late Oligocene or early Miocene. The largest intrusive mass caps Fanno Ridge and Laurel, Sugarloaf, and Stott Mountains. The sills are as much as 600 to 800 feet thick but they appear to split into multiple sills in places. Uplift of the Coast Range occurred in the late Cenozoic, during which time the streams were incised. Narrow canyons occur where the streams cut through the intrusive masses. Where the sills cap the hills, the valley widens by undercutting and landsliding.

Decomposed terrace gravels are present in the area north and east of Dallas. Recent alluvium covers a wide area in the Willamette Valley and along its tributaries.

AREA OF THIS REPORT

OTHER AREAS:

1. Warren and others (1945)
2. Baldwin and Roberts (1952)
3. Baldwin and others (1955)
4. Snavely and Vokes (1949)
5. Allison (1953)
6. Vokes and others (1949)
7. Baldwin (1955)
8. Vokes and others (1954)
9. Baldwin (1956)
10. Vokes and others (1951)
11. Baldwin (1961)
12. Hoover (1963)
13. Diller (1901) and Allen and Baldwin (1944)
14. Diller (1898)

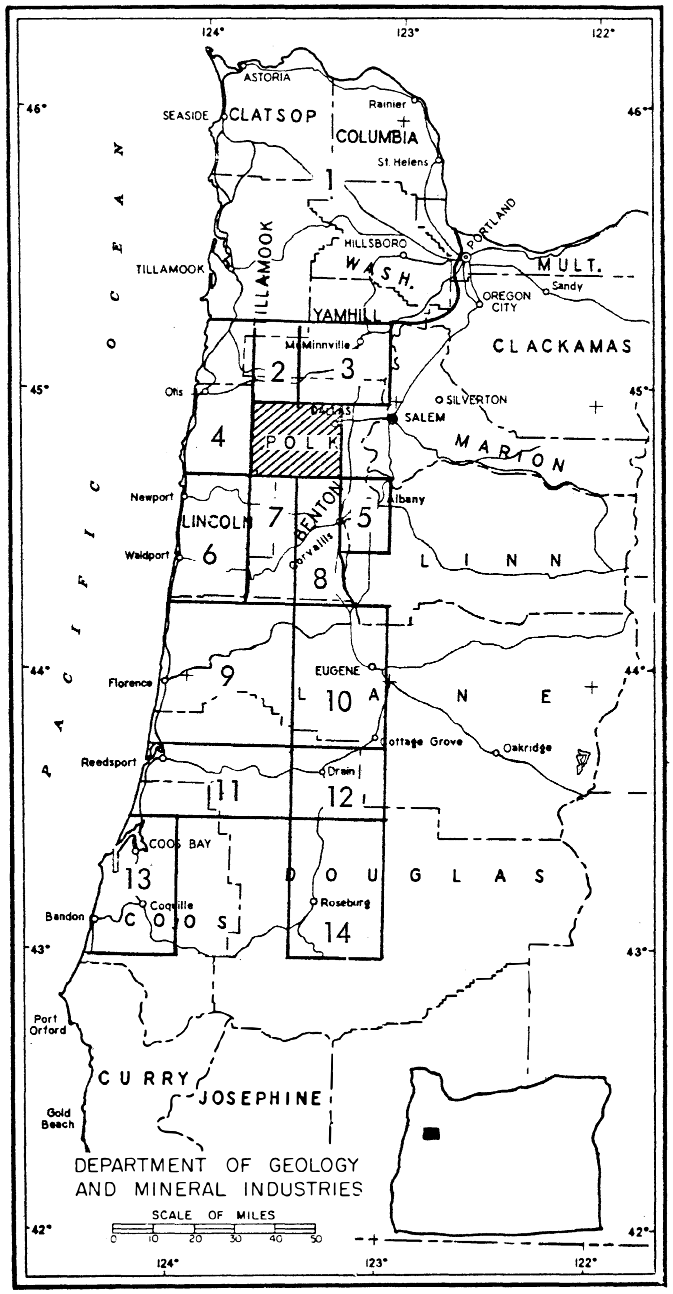

Figure 1. Index map of western Oregon showing location of the Dallas and Valsetz quadrangles. Other areas in Coast Range mapped by the State of Oregon Department of Geology and Mineral Industries and the U. S. Geological Survey are shown by number and author.

INTRODUCTION

Location and Accessibility

The Dallas and Valsetz quadrangles cover parts of the western edge of the central Willamette Valley and the eastern slope and summit of the central Coast Range of Oregon. All of this area is within Polk County, with the exception of the extreme western edge, which is in Lincoln County. The area mapped lies between 123° 15' and 123° 45' longitude and 44° 45' and 45° 00' north latitude (see index map, figure 1).

Dallas, the county seat of Polk County, is the largest town in the area with a population of 5,058 in 1960. It is located just north and east of the center of the Dallas quadrangle and is reached by Oregon State Highways 22 and 223 and by a connecting road to U. S. Highway 99W 5 miles to the east. Falls City and Valsetz are two smaller towns which lie to the south and west of Dallas; both are primarily concerned with the lumbering industry. Both Dallas and Falls City are located on a branch of the Southern Pacific Railroad which extends as far west as Black Rock. Valsetz, the largest community in the Valsetz quadrangle, is the western terminus of the Valley & Siletz Railroad. The name Valsetz, according to McArthur (1952) , was derived from these two words.

Although most of the Dallas quadrangle is readily accessible by excellent state and county roads, the highland north of Rickreall Creek can be reached only by private logging roads. The Valsetz quadrangle is reached by three county roads; one extends up the Little Luckiamute River to Black Rock; a second leads directly to Valsetz from Falls City; and a third parallels the North Fork of Rock Creek to Valsetz from the south. A network of privately owned logging roads connects with these county roads and others to the north and east outside of the area. Many abandoned logging roads are maintained by the Oregon State Department of Forestry to allow access during the fire season; other abandoned logging roads and rail grades, more or less grown over by brush, allow access by foot. Gravelled logging roads extend westward to the coast by way of the Siletz River below the forks and also along Sunshine Creek. A road maintained by logging companies reaches Rock Creek to the south by way of Big Rock Creek.

Relief and Drainage

The maximum relief near the summit of the Coast Range is nearly 3,000 feet. Laurel Mountain, the highest peak within the area, is 3,700 feet in elevation. Fanno Peak, Bald Mountain (Monmouth Peak), and Sugarloaf Mountain are each more than 3,000 feet in elevation.

Drainage east and north to the Willamette River consists of the Luckiamute and Little Luckiamute Rivers and Rickreall and Ash Creeks. Salt, Mill, Gooseneck, Gold, Rowell, and Rock Creeks flow northward into the Yamhill River, which is a tributary of the Willamette River. Drainage westward reaches the ocean directly by way of the Siletz River and its tributaries. The most important branches are the North Fork of the Siletz River, which receives the water from Warnick, Boulder, and Little Boulder Creeks; the South Fork of the Siletz River, which receives the overflow from the Valsetz millpond and Rogers Creek; and Sunshine and Mill Creeks and Big Rock Creek, which flow to the Siletz south and west of the Valsetz quadrangle boundaries. Drainage from the central highland between Fanno Peak and Laurel Mountain is radial, in that the streams flow outward in nearly all directions.

The topographic expression is directly affected by the underlying rock types. Differential erosion has accentuated the dike ridges and narrow gateways in the stream valleys. Many of the falls, rapids, and narrow places within the valleys are caused by dikes or sills. The broad erosional basin surrounding the town of Valsetz is caused by the erosion of weak sediments beneath the sill that forms Fanno Ridge. Blocks of the intrusive slide down as they are undermined by erosion. The broad valleys on the edge of the Willamette Valley are eroded in soft sediments and the intervening divides are relatively low and rounded.

In general, the valleys cut in the early Eocene volcanic series are steep-walled and relatively narrow. Peaks within this mass are sharp and ridges are narrow and serrated, as shown by Dorn Peak and the surrounding area.

Climate and Vegetation

The 20-year average rainfall from 1940 to 1959 inclusive shows an average of 125 inches for Valsetz, one of the wettest parts of the state; 70 inches for Falls City; and 50 inches for Dallas. Thus the rainfall along the western edge of the Willamette Valley is much less than at the crest of the Coast Range. Most of the rainfall occurs during the winter and spring; the summer and autumn periods are quite dry. Oak and poison oak cover most of the low, rounded hills in the eastern half of the Dallas quadrangle. The more abundant rainfall of the mountainous area has produced an excellent stand of virgin timber, remnants of which still exist in much of the North Fork of the Siletz River drainage. Douglas fir is the commonest species of tree, succeeded by less abundant western hemlock and some red cedar. One of the few stands of white pine (Pinus monticola) in western Oregon grew in upper Warnick Creek drainage.

Where the timber has been cut, second-growth timber of varying sizes, brush, and berry vines predominate. As elsewhere in western Oregon, mapping is hampered by the thick underbrush, the heavy rainfall, and the deep mantle of residual soil which make it difficult to obtain accurate data.

A large forest fire in 1945 swept much of the area lying near the head of Mill, Boulder, and Little Boulder Creeks and near Laurel Mountain.

Previous Work

The Valsetz quadrangle has been relatively inaccessible and therefore practically unexplored. The recent network of logging roads has changed this condition within the last few years but even yet certain parts are very difficult to reach. Several geologists have made reconnaissance trips along the eastern edge of the Coast Range.Washburne (1914) referred to various features within the Dallas quadrangle. Harrison and Eaton (1920) covered nearby areas. Schenck (1928) referred to the "Dallas limestone" member of the Eocene and discussed nearby regions. Stokesbary (1933) made a faunal study of the limestone near Dallas. As the fauna did not correspond to any on the West Coast, he tentatively assigned it to the upper Eocene because of its lack of characteristic Oligocene forms. Schenck (1936) published several faunal lists of fossils collected from the Dallas quadrangle or adjacent areas which aided in dating the sedimentary formations. A species of Pleurotomaria collected by H. E. Wheeler in the Oregon Portland Cement Co.'s limestone quarry about $1\frac{1}{2}$ miles southwest of Dallas was assigned to the upper Eocene by Schenck and Turner (1935). Mundorff (1939) mapped the Salem quadrangle to the east of the Dallas quadrangle.

The report on the Dallas and Valsetz quadrangle was published by the State of Oregon Department of Geology and Mineral Industries as Bulletin 35 (Baldwin, 1947). Since then considerable work has been done in the Coast Range. The U.S. Geological Survey and the Department initiated a cooperative mapping program in which adjacent areas were mapped (see index map, Fig. 1). Vokes, Norbisrath, and Snavely (1949) mapped the Newport-Waldport area to the west; Snavely and Vokes (1949) mapped the coastal area from Cape Foulweather to Cape Kiwanda to the northwest; Baldwin and Roberts (1952) mapped the Spirit Mountain quadrangle; Baldwin, Brown, Gair, and Pease (1955) mapped the Sheridan and McMinnville quadrangles to the north; Baldwin (1956) mapped the Marys Peak and Alsea quadrangles to the south; and Vokes, Myers, and Hoover (1954) mapped the Corvallis and Monroe quadrangles to the southeast. Schnaible (1958) studied the southwestern third of the Valsetz quadrangle.

Field Work and Acknowledgments

The original field work in the Dallas and Valsetz quadrangles began in March, 1946 and continued with intermittent interruptions until November of the same year. Nearly two months were spent during the spring and summer of 1947 in additional work. As the Dallas area contains the largest known deposits of limestone in northwestern Oregon, it was hoped that detailed work would disclose other commercial deposits. A study of this area is but a step in deciphering the stratigraphy and structure of the western Oregon Tertiary section. Stratigraphic data may have a bearing on the oil and gas possibilities and perhaps aid in the exploitation of other economic products such as gravel and sand, clay, and building stone.

The revision of Bulletin 35 was undertaken during the field season of 1960 and two months were spent in the field. Work on the manuscript and additional field checking continued into 1963. Although the revised map reflects the newer terminology in keeping with the more recent studies in the Coast Range and includes considerable new information, many areas are still virtually inaccessible or so covered that contacts must be inferred. When additional roads are extended into these areas many of the contacts will need revision. The thick brush, even in areas that had been logged, thick soil mantle, and prevalence of landslides all hampered mapping.

Particular attention was paid to the contact between the Siletz River Volcanics and overlying sedimentary rocks because of the location of limestone lenses along this contact. More time was spent in mapping this contact than those of the intrusive bodies whose contacts were often idealized. Many small sills and dikes, as well as irregularly shaped igneous masses, penetrate the sedimentary rock throughout the Valsetz quadrangle and the western edge of the Dallas quadrangle. A few of these intrusives are shown on the accompanying geologic map but many, because of their small size and unknown extent, were not mapped. Boulders eroded from the intrusive rock are found on the slopes below known outcrops and it is sometimes difficult to determine the proximity of the contacts.

The writer wishes to acknowledge the aid of the many lumber and logging companies that allowed access by way of their private roads. The officials of the Willamette Valley Lumber Co., Pope & Talbot Lumber Co., International Paper Co., Georgia Pacific Lumber Co., the Boise Cascade Lumber Corp., and several independent operators were particularly helpful. Officials of the Oregon Portland Cement Co. and Mr. T. T. Leonard gave assistance during the study of the limestone deposits on their property. Many local residents furnished helpful information.

The writer benefited greatly from discussion of the regional geology with Mr. Parke D. Snavely, Jr., and other members of the U.S. Geological Survey. Dr. J. Wyatt Durham and Dr. H. E. Vokes identified megafossils, and Mr. R. E. Stewart and Dr. Weldon W. Rau identified microfossils. Dr. W. D. Lowry and Mr. Andrei Isotoff aided in petrographic descriptions. Dr. J. E. Allen, Mr. Ralph Mason, and Mr. Herbert Schlicker accompanied the writer into some of the more inaccessible areas. The writer is indebted to Mr. F. W. Libbey and Mr. Hollis M. Dole, former and present directors of the Oregon Department of Geology and Mineral Industries, and their staff for aid in editing and drafting the report. Some information gathered by Dean Schnaible in the southwestern third of the Valsetz quadrangle for his thesis presented to the University of Oregon (1958) has been used in revision.

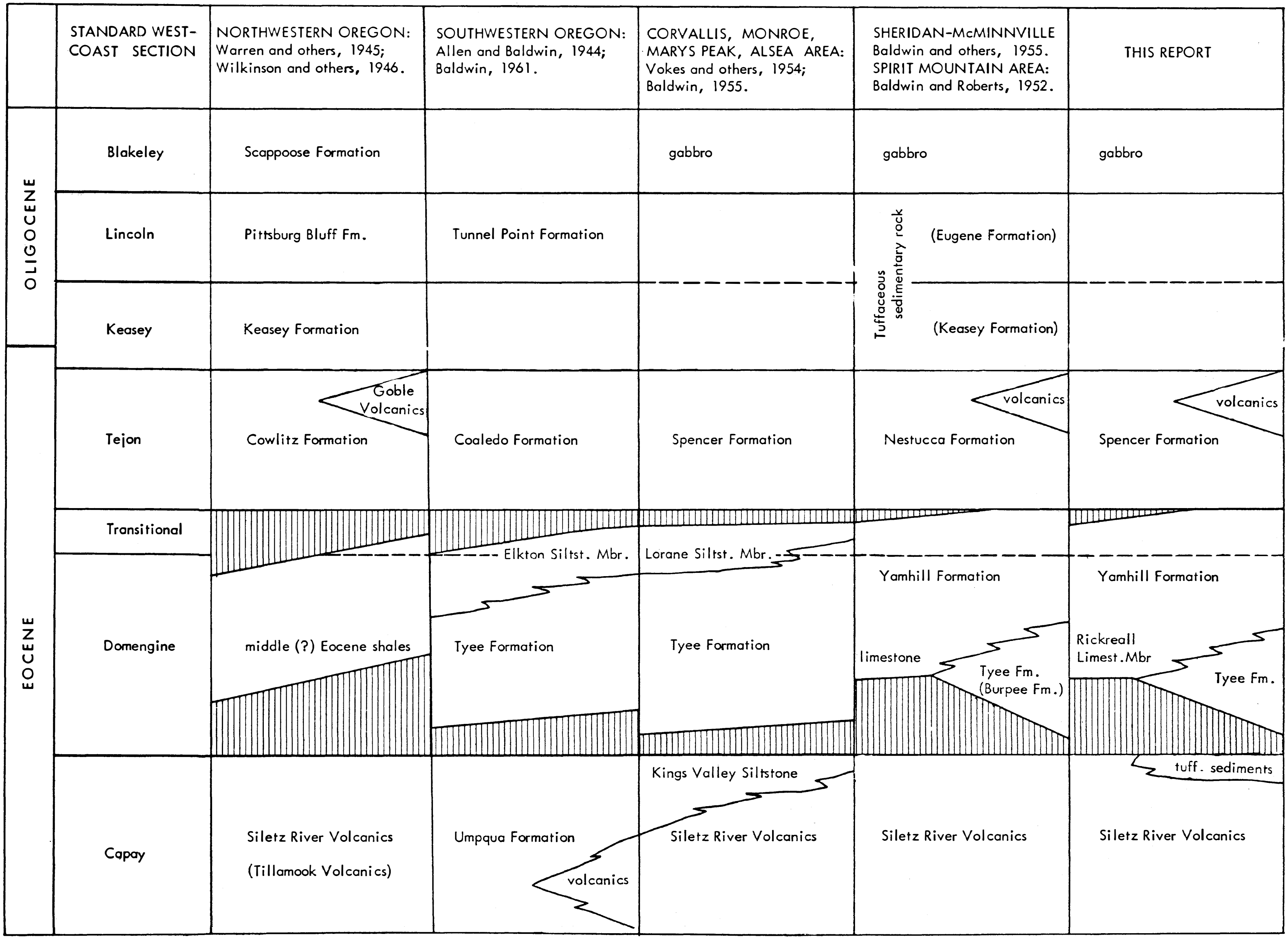

Figure 2. Correlation chart for the Coast Range of Oregon, adapted from references cited.

STRATIGRAPHY

The stratigraphic units, mostly of Eocene age, exposed within the Dallas and Valsetz quadrangles are given in order of their ages, beginning with the oldest: (1) Siletz River Volcanics, composed of brecciated and zeolitized basalt flows, pillow basalt, and minor amounts of tuffaceous sedimentary rocks intercalated in places but mostly at the top of the formation; (2) Tyee Formation, a rhythmically bedded sandstone and siltstone of marine origin, sparingly fossiliferous; (3) Yamhill Formation, a marine argillaceous formation composed more of siltstone and less of sandstone than the Tyee Formation, yet probably in part a facies of the Tyee Formation. The base of the Yamhill Formation contains a prominent, impure limestone member frequently called the "Dallas limestone" but herein named the Rickreall Limestone Member; (4) Spencer Formation, a marine shallow-water and in part near-shore formation that contains some basalt flows; (5) widespread granophyric gabbro and diorite sills and dikes that intrude Eocene formations within the area; (6) Pleistocene and Recent alluvial deposits including terrace and floodplain alluvial deposits.

Beds of Keasey age (lower Oligocene) crop out just east of the northeast corner of the Dallas quadrangle. Scattered upon the alluvial deposits in the valley below 400 feet are glacial erratics that were ice rafted into the valley during the Missoula Flood of late Pleistocene time.

The stratigraphic relationship of the above rock sequence to that in other mapped areas of the Coast Range is shown in figure 2.

Siletz River Volcanics

Distribution and thickness

A series of basaltic flows, breccia, and pillow lavas, together with tuffaceous sedimentary beds, is exposed in the valleys of Rickreall, Salt, Gooseneck, Gold, Rowell, and Sunshine Creeks and in the main valley and tributaries of the Siletz River (see plate 1 in pocket). This series was named the "Siletz River volcanic series" by Snavely and Baldwin (1948), but in the present report the unit is referred to as the "Siletz River Volcanics"*.

The minimum thickness in the valley of the South Fork of the Siletz River ranges from 3,000 to 5,000 feet. This estimate is based on an assumed average dip of 15° to 20° (Baldwin, 1947, p. 6). Dips as much as 30° to 40° are present, but they may be either initial dips or the result of faulting. If, however, the average dip is 30°, more than 8,000 feet is exposed within the Valsetz quadrangle. Since the base of the formation is not exposed, only an approximate thickness can be determined. Baldwin (1955) suggests a thickness of more than 10,000 feet from exposures along the Marys Peak road in the Marys Peak quadrangle to the south.

Sedimentary beds are present in many sections. One of the thickest crops out in Boulder Creek just above the falls; others are located near the head of Deer Creek west of the Polk County line, at the Valsetz dam, between Mill Creek and the West Fork of Salt Creek, and along Rickreall Creek, both upstream and downstream from the Ellendale basalt quarry.

Lithology

Basaltic rocks: Most of the Siletz River Volcanics are composed of basaltic breccia whose fragments usually range from 1 to 6 inches in diameter. Some mudflow and pyroclastic material may be present and, in the upper part of the series west of Dallas, rather well-defined flows occur.

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* Use of the time-stratigraphic term "series" in a rock-stratigraphic sense is not recommended by the Code of Stratigraphic Nomenclature, Am. Assoc. Petroleum Geol. Bull., vol. 45, p. 651, 1961.

The unweathered fragments of basalt in the breccia are embedded in a matrix of finer particles and palagonite. The rock, cut occasionally by calcite veinlets, is usually zeolitized, in some places so thoroughly that it has a mottled appearance. Random pillow structure occurs within the breccia but is seldom concentrated in any particular flow within the area mapped.

The fresher fragments of the breccia have a dark color when newly exposed; the palagonitic coating is dark green to almost black. The basalt fragments are fine grained, slightly porphyritic to almost glassy. Upon exposure to the atmosphere the rock crumbles to its component particles and becomes brownish buff in color. The palagonite breaks down to yellow clay. Definite lava flows are rarely exposed within the breccia series, but occasional tabular bodies of columnar basalt, which appear to be flows, are interstratified within the series (figure 3). Many of the pillows are composed of short radial columns of basalt. Irregularly shaped larger masses with radial or rosette patterns of columnar basalt are also common.

Roughly stratified basaltic material resembling pyroclastic deposits, together with zeolitized breccia, is exposed in road cuts along the South Fork of the Siletz River near the mouth of Short Creek, about 2 miles northwest of the Valsetz dam. Albitization, common in some submarine extrusions of similar basalt, has not been found in the Siletz River Volcanics.

Near the uppermost part of the series, particularly in the area between Mill and Rickreall Creeks in the Dallas quadrangle, are rather massive, well-defined flows which appear to be subaerial. Such flows contain rock that is relatively unweathered and can be utilized for road construction. Radial clusters of zeolitic minerals were noted in some of the flows along the upper part of the South Branch of Mill Creek and along the north rim of the Applegate Creek Valley, but zeolitic minerals are not disseminated throughout the mass as they are in the breccias.

Thin sections of the Siletz River Volcanics were studied by W. D. Lowry, who reported the following mineral assemblages:

Sample No. P-3342 - Basalt from the quarry near Ellendale, approximately $2\frac{1}{2}$ miles west of Dallas.

The rock is dark gray and fine grained and under the microscope is seen to be hemicrystalline and slightly porphyritic with an intersertal texture. Phenocrysts of labradorite (Ab_5An_5-Ab_4An_6) and augite make up about 2 and 1 percent of the rock respectively. The groundmass contains labradorite (Ab_5An_5-Ab_4An_6), 45 percent; augite, 25 percent; magnetite, 15 percent; and volcanic glass, 15 percent.

Sample No. P-4650 - Zeolitic, porphyritic, basaltic breccia from the roadcut at the forks of the Siletz River, just west of the bridge.

The rock is a dark gray and white brecciated basalt with abundant zeolite minerals. In thin section it is seen to be porphyritic and hemicrystalline with a trachytic groundmass. Phenocrysts of augite, 2 percent, and plagioclase, 3 percent, are embedded in partly devitrified basaltic glass which makes up 65 percent of the rock. Secondary minerals such as palagonite and zeolite (stilbite?) make up about 30 percent of the rock.

There is some evidence of hydrothermal alteration, perhaps caused by submarine extrusion.

Sample No. P-4893 - Porphyritic basalt from the south branch of Mill Creek in the $SE\frac{1}{4}$ sec. 19, T. 17 S., R. 6 W.

The rock is dark gray and porphyritic and under the microscope is seen to be glomeroporphyritic with an intersertal texture. Phenocrysts of labradorite (Ab_4An_6-Ab_3An_7) and augite make up about 7 and 1 percent of the rock respectively. The matrix is composed of labradorite (Ab_4An_6), 35 percent; augite, 30 percent; magnetite, 5 percent; and volcanic glass, 15-20 percent. There is perhaps some palagonite (?) and some alteration by hydration.

Figure 3. Basalt in Siletz River Volcanics exposed along upper Rickreall Creek.

Figure 4. Ellendale basalt quarry in Siletz River Volcanics. Upper few feet is bedded clastic material containing fossils.

Sample No. P-5500 - Basalt from a pillow in the breccia a short distance south of the mouth of Gravel Creek along the west bank of the Siletz River in sec. 18, T. 8 S., R. 8 W.

The rock is dark gray and slightly porphyritic and, in thin section, is seen to have an intersertal texture. Phenocrysts of labradorite (Ab_4An_6-Ab_3An_7) and augite make up 15 and 5 percent of the rock respectively whereas the matrix is composed of labradorite, 40 percent; augite, 10-15 percent; magnetite, 5 percent; and volcanic glass, in part altered to palagonite, about 25 percent.

Additional description of the basalt is given by Snavely and Baldwin (1948); Baldwin and Roberts (1952); Vokes, Myers, and Hoover (1954); and Baldwin (1955). Waters (1955) discusses the basaltic rocks of the Siletz River Volcanics and classifies them as uniformly tholeiitic lava. He notes no change of composition, either regionally or from top to bottom, within the thick piles of lava.

Sedimentary beds: Sedimentary beds are of especial importance because of enclosed fossils that aid in correlating the volcanics with other sections, such as the Umpqua Formation in southwestern Oregon. Nearly all of the prominent sedimentary members are at the top of the formation and occupy a position similar to that of the Kings Valley Siltstone Member as described by Vokes, Myers, and Hoover (1954). One section of sedimentary rock associated with the basalt series is exposed in the creek beds at the junction of Boulder Creek and the branch from the northeast that descends from the Willamette Valley Lumber Co. camp. Here approximately 200 feet of tuffaceous sedimentary rock is composed of distinctly bedded siltstone, sandstone, and conglomerate. The fine-grained rocks are flintlike in hardness. The basal part of the section contains basaltic conglomerate and dark-green basaltic angular fragments and sandstone. Nearly all the sedimentary rock has a greenish color derived from the tuffaceous material. The series of beds has been intruded a short distance below the forks of Boulder Creek by a sill over which the water drops to form the falls.

At the junction of the two forks of Boulder Creek, the siltstone strikes N. 65° W. and dips 18° N., whereas about a third of a mile up Boulder Creek the strike is N. 25° E. and the dip is 25° W. It is doubtful if this deformation is the result of the intrusion of either the sill at Boulder Creek Falls or the overlying Fanno Ridge sill. The steeper dips in the volcanic series when compared with the relatively flat-lying sill and the Yamhill Formation support the supposition that there is an angular unconformity in places between the Siletz River Volcanics and the overlying sedimentary series.

A sample of tuffaceous sedimentary rock taken near the forks of the stream was examined in thin section by W. D. Lowry and he reports as follows:

Sample No. P-4975 - Partially altered basic tuffaceous sandstone from sec. 27, T. 7 S., R. 8 W.

The rock is a fine-grained greenish tuffaceous sandstone which is composed of basic lithic fragments, partially altered or hydrated, augite, and altered feldspar. Secondary minerals are chlorite, epidote, and zeolite (stilbite ?).

Another sedimentary section is exposed in a road leading to Big Tip near the head of Deer Creek in secs. 35 and 36, T. 8 S., R. 9 W., and on the ridge southwest of Big Tip near the Polk County line. The sedimentary section, which is nearly horizontal, begins with basal massive calcareous sandstone containing abundant shell fragments and a few megafossils. This gives way upward to bedded tuffaceous and calcareous sandstone. The sandstone tends to weather spheroidally and the soil derived from this unit is generally dark brown in color. Fine-grained sandstone and siltstone occur higher in the section. The entire sedimentary section may total 300 feet in thickness. The impure limestone just southeast of the center of section 36 contains many of the large disc-shaped Foraminifera resembling Pseudophragmina. They are seldom visible in plan view, except as external molds on weathered surfaces; but in cross section their edges show abundantly as thin, white lines. Analysis of a typical specimen of the rock showed 44.6 percent $CaCO_3$. A small megafauna was collected and will be discussed under the age of the volcanic series.

A thick sedimentary section crops out along upper Rickreall Creek. It is conglomeratic at the base but grades upward into tuffaceous sandstone and siltstone.

A sequence of sedimentary rock that appears to be intercalated at the base with the volcanic series is exposed in Rickreall Creek near Ellendale. The beds underlie the Rickreall Limestone Member of the Yamhill Formation and extend upstream, apparently interfingering with basalt west of the Ellendale quarry. These beds contain medium- to coarse-grained basaltic sandstone. Basalt flows along the Ellendale-Oakdale road are topographically higher than the tuffaceous sediments and appear to be higher in the section, unless a fault parallels Rickreall Creek and is upthrown on the south side.

A lens of calcareous sandstone and included pyroclastic fragments directly overlies the basalt in the Ellendale quarry (figure 4). The sedimentary rock contains both a megafauna and a microfauna.

Sedimentary rock similar to the units described is present south of the fault between Mill Creek and the West Fork of Salt Creek. Like the sedimentary rock at the other localities, it too is at the top of the Siletz River Volcanics. This series of beds was probably much more widespread but has been removed in part by erosion during the interval preceding the deposition of the Yamhill Formation.

Mode of origin

The Siletz River Volcanics are in large part submarine, as is indicated by the pillow lavas and fossiliferous calcareous sedimentary rock associated with the volcanic rock. A study of the fauna from Deer Creek (a branch of Sunshine Creek) by Durham (in Baldwin, 1947) indicated that the calcareous sandstone was deposited in water less than 37 meters in depth, which points to shallow-water extrusion for part of the nearby flows. Perhaps the volcanic rocks piled up above sea level from time to time, with the result that subaerial flows, mudflows, and pyroclastics are included in the series. The sedimentary rock associated with this series is highly tuffaceous and no doubt originated from the volcanic mass itself.

Brecciation, which is particularly abundant in the submarine flows, may be caused in part by steam explosions that took place as the rock poured out in the water. The zeolitization and hydrothermal alteration that show in parts of the mass probably occurred at the time of extrusion or very soon thereafter.

The environment of extrusion of the basalt breccia, pillow lavas, and tuffaceous interbeds is believed to be similar in large part to that of the Crescent Formation of the Olympic Peninsula described by Brown, Gower, and Snavely (1960).

Age and correlation

The sedimentary beds contain a megafauna and a microfauna, both of which are correlated with the early to middle Eocene Umpqua Formation of southwestern Oregon, the Crescent Formation of Washington, and the Capay stage of the Eocene of California. Both the Umpqua and Crescent Formations include thick basaltic members.

Megafossils were collected in a few places; the largest assemblage was found within a calcareous tuffaceous grit which crops out in the upper part of the Ellendale basalt quarry (figure 4). This fauna was identified by J. Wyatt Durham of the University of California, Berkeley, who reported the following assemblage (M-1):

Pelecypoda
- Barbatia cf. cowlitzensis (Weaver and Palmer)
- Lima n. sp. A
- Lima n. sp. B
- Ostrea n. sp.
- Pecten cf. interradiatus Gabb
- Pelecypod spp. indet.
- Plicatula (?) sp.
- Spondylus carlosensis Anderson
- Venericardia sp. indet., cf. ? crescentensis Weaver and Palmer
- Volsella cf. kelsoensis (Weaver and Palmer)
- Teredo sp.

Gastropoda
- Acmaea n. sp.
- Calyptraea sp. indet.
- Gastropod sp. indet.
- Nerita n. sp.
- "Pleurotomaria" sp. indet.
- Spiroglyphus ? sp.
- Turritella andersoni cf. subsp. susanae Merriam
- Turritella sp. indet. (not andersoni)

Coelenterata
- Caryophyllia ? sp.

Echinodermata
    Echinoid spines

Crustacean cheliped
Crustacean borings

Bryozoa
    Heteropora sp.
    bryozoan spp.
    calcareous algae

Brachiopoda
    Gryphus washingtonsensis Grant and Hertlein (?)
    Terebratulina (?) n. sp.
    Terebratulina tejonensis Stanton
    Terebratulina ungicula weaveri Grant and Hertlein

Durham further states:

> "On the basis of the brachiopoda, and particularly Turritella andersoni cf. subsp. susanae Merriam, this fauna appears to be about equivalent in age to the Capay stage of the Eocene of California.
>
> "The bryozoa, calcareous algae, Spondylus, Acmaea, Nerita, etc., indicate that the containing sediments were probably deposited in water less than 20 meters deep, and of a tropical temperature."

A fairly large microfauna was obtained in the same beds that yielded the megafauna at the Ellendale quarry, as well as in the bed of Rickreall Creek a few yards south of the quarry and opposite the gate at the end of the public road. These have been examined by R. E. Stewart, formerly of the State of Oregon Department of Geology and Mineral Industries, who submitted the following conclusions regarding their probable age correlation:

> "Foraminifera are abundant in the calcareous beds which overlie the basalt in Ellendale quarry about 2½ miles west of Dallas. In the sediments exposed along Rickreall Creek opposite the quarry they are present, but rather rare. None of the samples obtained from either locality contain many species.
>
> "Amphisteginas and forms which have heretofore usually been assigned to the genus Discocyclina are found at both of these localities, and are believed to indicate middle Eocene age for the sediments in which they occur.
>
> "All published references to Amphistegina and Discocyclina in Oregon and Washington that have come to hand have assigned a middle Eocene age to the sediments in which these genera were found.
>
> "Turner (1938), in a comprehensive study of the stratigraphy and mollusca of the Eocene of western Oregon, lists Discocyclina clarki Cushman from middle Eocene Umpqua localities along the Umpqua and Coquille Rivers both easterly and westerly from Roseburg, and from the middle Eocene Umpqua-Tyee[1] series exposed along and near the Pacific Highway northeasterly from Drain.
>
> "Berthiaume (1938) records both Amphistegina and Discocyclina from the Crescent Formation of Washington, to which he assigns a lower middle Eocene age. He discusses the basis for his correlation at some length and gives a number of significant references.

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[1] This location appears to be at the top of the Umpqua Formation in that area.

"Bandy (1944) records an assemblage of foraminifera from Cape Blanco, Oregon, and notes that the most abundant and highly specialized species is Amphistegina simiensis (Cushman and McMasters). He assigns a middle Eocene age to the gray shales from which his material was obtained and briefly discusses the evidence for this correlation.

"The files of the Oregon Department of Geology and Mineral Industries contain no record of the occurrence of Discocyclinas or Amphisteginas in Oregon rocks known to be younger than middle Eocene, although it is not at all uncommon to find them in rocks of known middle Eocene age.

"Available microfaunal evidence, therefore, indicates that the calcareous beds in Ellendale quarry and the sediments exposed along Rickreall Creek opposite the quarry are middle Eocene, probably Umpqua, in age. A warm-water environment is also indicated.

"From correspondence between Dr. Baldwin and Dr. W. Storrs Cole of Cornell University it appears that the forms referred to genus Discocyclina in the preceding discussion may actually belong under genus Pseudophragmina, subgenus Proporocyclina. This does not affect the conclusions regarding geologic age, however, since it is upon the occurrences and not the names of fossils that correlation is based."

Another faunal assemblage was collected along the logging road that crosses the headwaters of Deer Creek, a north branch of Sunshine Creek, at a point about a mile west of the Polk County line. The fauna occurs in calcareous tuffaceous sandstone, some of which has a particularly abundant amount of large disc-shaped Foraminifera. J. Wyatt Durham identified the fauna from this locality and gave the following conclusions regarding its probable correlation and environment at the time of deposition (M-2):

Coelenterata
- Leptoseris sinuata (Nomland)
- Leptophyllastrea ? sp.

Pelecypoda
- Glycimeris sp. indet.
- Macrocallista ? sp.
- Nemocardium cf. linteum (Conrad)
- Ostrea sp. indet.

Pelecypoda, continued
- Pitar californiana (Conrad) ?
- Schedocardia ? sp. indet.
- Spondylus cf. carlosensis Anderson
- Venericardia cf. crescentensis Weaver and Palmer

Echinoid spines

Indet. gastropod

"Age Eocene, probably equivalent in age to Capay or Domengine stages of California; most likely Capay. Equivalent to part of Crescent Formation (s.l.) of Washington. Determination based on the corals, plus general appearance of the fauna. Deposited in water less than 37 meters in depth on basis of reef dwelling type of corals and Spondylus. The corals also indicate an average yearly minimum marine temperature of not less than 20° C."

Fossils were collected from the N$\frac{1}{2}$ sec. 7, T. 8 S., R. 8 W., along the North Fork of the Siletz River a short distance east of the mouth of Stub Creek, by P. D. Snavely, Jr., and N. S. McLeod of the U.S. Geological Survey (U.S.G.S. Cenozoic Loc. M1807). The fossils were identified by W. O. Addicott of the U.S. Geological Survey, who furnished the following list and age determination:

Gastropoda
- ?Amaurellina sp.
- Amaurellina cf. A. hendoni Turner
- Cerithid
- Turritella andersoni Dickerson
- Turritella cf. T. andersoni glidensis Merriam in Turner

Gastropoda, continued
- Turritella cf. T. andersoni mulleri Merriam
- Turritella merriami n.subsp. aff. T. merriami brevitabulata Merriam and Turner

Pelecypoda
- Crassatella n.sp. aff. T. meganosensis Clark and Woodford
- Glycymeris sp.
- Macrocallista cf. M. conradiana (Gabb)
- Ostrea sp.

Pelecypoda, continued
- Pitar sp.
- Pitar cf. P. uvasanus coquillensis Turner
- ?Spondylus sp.
- Venericardia sp.

"The age is early Eocene in the Pacific Coast provincial chronology. The presence of Turritella andersoni Dickerson and other tentatively identified species indicates that these strata should be assigned to the Capay "stage" as used by Weaver and others (1944). An undescribed Turritella in the collection is referable to the T. merriami Stock, an early Tertiary group which is known to range from late Paleocene to early Eocene on the Pacific Coast."

The Siletz River Volcanics may be in part equivalent to a series of volcanic rock a few miles north of the Dallas and Valsetz area which was named the Tillamook Volcanics and defined and described as follows (Warren, Norbisrath, and Grivetti, 1945):

> "The oldest rocks in the region are a series of basaltic lavas and tuffs which form the backbone of the Coast Range in the south-central portion of the area mapped. They are exposed along most of the large streams in eastern Tillamook County and are here named the Tillamook volcanic series. A thickness of from 6,000 to 10,000 feet of lavas with minor amounts of tuff is exposed along the Trask River from the mouth of its canyon to its forks. Sandstone and shale are exposed near the forks but it is not known whether they underlie or are interbedded with the volcanic series. Along the west and north sides of the volcanic series, lava is the predominant rock type; but, toward the east and south, tuffs and, next, tuffaceous shales become increasingly abundant...."

Snavely and Baldwin (1948) suggest that the Tillamook Volcanics of Warren, Norbisrath, and Grivetti (1945) contained basalt flows equivalent to those in the Umpqua Formation to the south and another and younger series equivalent to the Goble Volcanics of Wilkinson, Lowry, and Baldwin (1946) in the St. Helens area. A study of Coast Range stratigraphy indicates that the Tyee and Yamhill Formations were deposited during a relatively quiet interval between stages of volcanism. Baldwin, Brown, Gair, and Pease (1955) confirm this conclusion in their mapping in the Sheridan quadrangle, where both volcanic series are present. The greater part of the flows along the Wilson and Trask Rivers is probably equivalent to the Siletz River Volcanics, whereas basalt around the periphery is probably interfingered with the upper part of the Nestucca Formation of Snavely and Vokes (1949) and the Cowlitz Formation of the St. Helens area.

Volcanic rocks interbedded with the Umpqua Formation in the Roseburg region have been described and discussed by Wells and Waters (1935) and by Turner (1938). These basalts were mapped as diabase by Diller (1898). They are zeolitized and altered basaltic flows and breccia similar in most ways to the Siletz River Volcanics.

Volcanic rocks associated with the Umpqua Formation in the Coos Bay area were mapped by Allen and Baldwin (1944). They were studied petrographically by W. D. Lowry and the descriptions of the rocks are included in the report of that area.

The Siletz River Volcanics probably represent but a phase of widespread volcanism during the lower to middle Eocene, which at some places accumulated as thick series of volcanic material such as occur in the Tillamook area along the Trask and Wilson Rivers of the northern Coast Range, and the Siletz River section of the central Coast Range, and also in parts of the Roseburg and Coos Bay areas of the southern Coast Range. All of these sections have, in varying degree, associated tuffaceous sedimentary rock which bear a generally related fauna.

Paleontological evidence presented herein by J. W. Durham and R. E. Stewart points strongly to a lower to middle Eocene age, similar to that of the Capay stage of California and the Umpqua Formation of southwestern Oregon.

Tyee Formation

Distribution and thickness

A thick sequence of rhythmically bedded sandstone and sandy siltstone is present throughout the central Coast Range and extends into the southern part of the Dallas quadrangle and southern and central parts of the Valsetz quadrangle. The sequence of sedimentary rocks is exposed along the Yaquina River in the Toledo quadrangle and was named the Burpee Formation by Schenck (1927) who designates the old Burpee quarry in sec. 21, T. 11 S., R. 10 W. as the type locality. Schenck also suggests that the Burpee Formation might be a northward extension of the Tyee Formation of Diller (1898). More recent mapping in the Coast Range in Oregon has shown that the Burpee Formation is generally equivalent to the Tyee Formation and the latter name, having priority, has been used in the surrounding quadrangles. Baldwin (1947), during initial mapping in this part of the Coast Range, also concludes that the micaceous sandstone is generally equivalent to the Tyee Formation, but refers to it as the Umpqua-Tyee series awaiting mapping in the intervening area between the Dallas and Valsetz quadrangles and the Roseburg region where these formations were originally defined.

The Tyee Formation becomes increasingly silty as traced northward in the Dallas and Valsetz quadrangles until it appears to grade upward into beds described and named the Yamhill Formation by Baldwin and others (1955) in Mill Creek and the South Fork of Yamhill River valleys in the Dallas and Sheridan quadrangles.

Southwest of the mapped area, in the Toledo and Tidewater quadrangles, a thickness of 6,000 to 7,000 feet was reported for the Tyee Formation by Vokes, Norbisrath, and Snavely (1949). Baldwin (1961) reports approximately 8,000 feet of Tyee Formation in the Drain and Elkton quadrangles. Most of it is exposed along Oregon Highway 38. The lower 5,000 feet is typical rhythmic micaceous sandstone extending as far west as Elkton but the upper 3,000 feet, the Elkton Siltstone Member of the Tyee Formation, lies south of Elkton. It is siltier and resembles the Yamhill Formation. Other localities in which similar siltstone members lie at the top of Tyee sandstone are reported at Lorane in the Eugene area by Vokes, Snavely, and Myers (1951) and in the Monroe area by Vokes, Myers, and Hoover (1954). In all of these areas the siltstone lies at the top of the more massive Tyee sandstone section with an apparent gradation upward to micaceous siltstone. The thickest continuous section of Tyee sandstone observed in the mapped area lies between Big Tip and the center of a north-plunging syncline to the east. There may be approximately 2,000 to 2,500 feet exposed along the western limb.

Lithology

Lithologically the Tyee Formation is a bluish-gray rhythmically bedded micaceous and arkosic sandstone and sandy siltstone. The sandstone is firmly compacted and is characterized by an abundance of muscovite and bleached biotite flakes. Each bed represents a graded sequence of sediments 1 to 5 feet thick, with the medium-grained sandstone making up most of the bed but grading upward rapidly into fine-grained sandstone and siltstone. The base of each bed of sandstone is sharply defined. The upper surface of the underlying siltstone commonly is ripple marked or cut by small scour channels into which the overlying sand has been deposited. This feature imparts a ropy appearance to the base of the sandstone beds. Plant fragments are almost everywhere present, being more abundant in the uppermost silty parts of the rhythmically bedded units. The basal part of the Tyee Formation in most places throughout the Coast Range is remarkably free from material reworked from the underlying Siletz River Volcanics. Conglomerate at the Valsetz dam and along Rogers Creek reported by Baldwin (1947, p. 16) has been reassigned to the underlying Siletz River Volcanics.

The Tyee Formation in the Marys Peak quadrangle is described by Baldwin (1955) as follows:

> Thin sections showed that the sandstone is made up of angular to subangular grains set in a matrix of calcite and clay minerals. The rock contains approximately 20 to 30 percent quartz, 30 to 40 percent plagioclase, of which soda-rich plagioclase predominates; 5 to 10 percent mica; and 10 percent, fragments of volcanic rocks, tuff, and chert. Grains

of apatite and magnetite are present in minor amounts. Much of the sandstone is cemented with calcium carbonate.

The sandstones in the Tyee and Yamhill Formations are similar and in places it is very difficult todifferentiate between the two. The contact as drawn on the accompanying geologic map is approximate and if there is a slight break between the two formations it is difficult to determine (figure 5).

Several specimens of Tyee sedimentary rocks were examined petrographically by W. D. Lowry. One of these, Sample No. P-5499, a medium-grained, calcareous, micaceous sandstone, came from a roadcut along Fourth of July Creek in sec. 7, T. 9 S., R. 8 W., in the Valsetz quadrangle and was described as follows:

> Quartz, part of which is strained, biotite, muscovite, and grains containing both biotite and muscovite, and chert are common. Microcline, schistose, and other lithic fragments, plagioclase (some groins as basic as Ab_7An_3) are also present. The matrix contains calcite. The mineral grains are angular to subangular.

Mode of origin

Sandstone from the Burpee quarry along the Yoquina River, which presumably is the type Burpee (Schenck, 1927) but now considered to be Tyee (Vokes, Norbisrath, and Snavely, 1949), compares very closely with the above description as did another sample from a roadcut on Marys Peak a few feet above the basalt-sandstone contact. The Tyee sedimentary rocks evidently came from outside the area, probably from the south. A few random measurements on current markings on the base of sandstone beds rather uniformly point to currents from the south with trends deviating only a few degrees east or west of north. Beds of Tyee sandstone farther south in the Coast Range are in general thicker but the same rhythmic bedding is apparent. The formation was probably laid in an arm of the sea, perhaps shielded to the west by a peninsula of land with a source to the south, perhaps in part from the Klamath Highland. Fossils are not abundant in the arenaceous part of the Tyee Formation but it is considered marine, and, because of the graded bedding, perhaps deposited in fairly deep water. Deposition may have been rapid, creating an environment not favorable for marine life. Fragments of reedy types of plants are abundant throughout the whole Tyee Formation and they must have been washed in with the sediments.

Age and correlation

The age of the Tyee Formation is based on several rather meager megafaunos outside the map area and on preliminary study of Foraminifera together with stratigraphic position and lithologic similarity. No megafossils are known from the Tyee Formation of the Dallas and Valsetz quadrangles. The Basket Point fauna (Turner, 1938) and the fauna a short distance west of Elkton (Baldwin, 1961) are situated just above the massive Tyee sandstone and near the

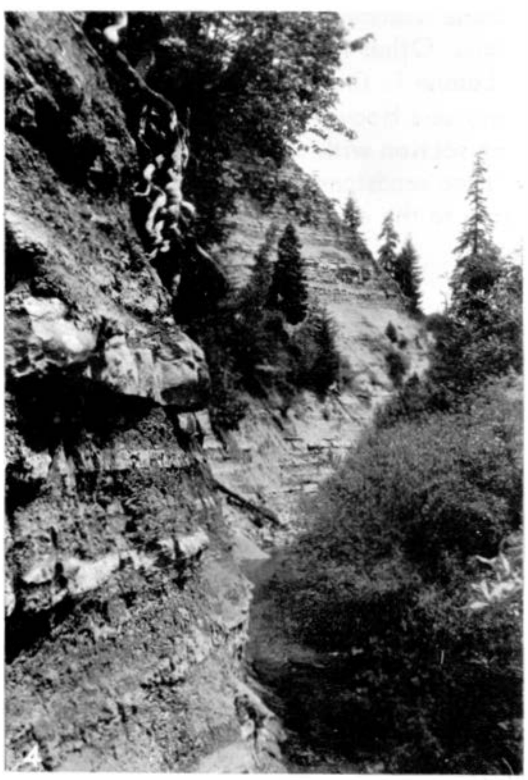

Figure 5. Well-bedded micaceous sedimentary rock exposed along the Little Luckiamute River west of Black Rock. This section is more argillaceous than most of the Tyee Formation and may represent a transition between the Tyee and Yamhill Formations.

base of the Elkton Siltstone Member. Foraminifera from Basket Point collected by the writer and H. M. Dole in 1947 were examined by R. E. Stewart. They appear to be about equivalent to Laiming's (1940) lower Domengine zone B-1. Turner (1938) considered the Tyee to be generally equivalent to the Domengine stage of California.

Rau (in Baldwin, 1961) considered the basal part of the Elkton Siltstone Member of the Tyee Formation to be generally equivalent to the B-1 zone of Laiming. On this premise, the massive Tyee sandstone which underlies the Elkton Siltstone Member would be no younger than the B-1 zone. Little new information was obtained in the Dallas and Valsetz quadrangles but the age is considered comparable to that of Tyee sandstone in areas to the south.

Yamhill Formation

Distribution, thickness, and lithology

The Yamhill Formation in the map area is composed chiefly of thin-bedded sandstone and siltstone, with conglomerate and limestone locally present at or near the base, and appears to have a maximum thickness of 6,500 feet. The formation is widely distributed in the northern half of the Valsetz quadrangle and in the western half of the Dallas quadrangle, but its boundaries as drawn on the map are largely arbitrary because of the obscure relation of these beds to the underlying Tyee Formation and the overlying Spencer Formation. In the vicinity of the contacts, the rocks of the Yamhill Formation are lithologically similar to Tyee and Spencer and in places appear to be of a transitional nature.

Relation to type locality: The Yamhill Formation was named and described by Baldwin, Brown, Gair, and Pease (1955) in the area immediately to the north of the Dallas quadrangle, as follows:

> "The type section of the Yamhill Formation is designated as the exposure along Mill Creek from a point six-tenths of a mile south of the Sheridan quadrangle to a point one-tenth of a mile southeast of Mill Creek School. These sedimentary rocks have been known locally as the 'Mill Creek beds'.
>
> "The contact between the Yamhill Formation and the underlying Siletz River Volcanic Series is exposed near the covered bridge across Mill Creek about six-tenths of a mile south of the mapped area. At this locality beds of the Yamhill Formation overlie basalt breccia of the Siletz River Volcanic Series. The sedimentary rocks that compose the lower 500 feet of the Yamhill Formation and that overlie the Siletz River Volcanic Series on Mill Creek are predominantly dark-gray shale and siltstone with occasional beds of lime-cemented sandstone. The siltstone and shale weather to small blocky fragments, which are reddish brown on exposed surfaces.
>
> "The siltstone and shale sequence exposed along Mill Creek is overlain by a sequence of massive sandstone beds that crop out about two-tenths of a mile south of the Sheridan quadrangle. The sandstone is medium gray to greenish gray, thick bedded, and generally fossiliferous. The greenish color of the sandstone is imparted by partly chloritized basaltic debris, which may have been derived from the underlying Siletz River Volcanic Series. This sandstone is approximately 500 feet thick and grades upward into more argillaceous rock.

> "The greenish-gray sandstone beds of the Yamhill Formation are in turn overlain along Mill Creek by approximately 4,000 feet of finely micaceous siltstone and mudstone. Siltstone and mudstone are exposed from the mouth of Gooseneck Creek downstream to the vicinity of Mill Creek School. These beds are typical of most of the Yamhill Formation exposed in the Sheridan quadrangle. The siltstone and mudstone are medium- to dark-gray, rather uniform in texture, and generally massive to faintly bedded. A few thin limestone concretion zones and fine-grained sandstone lenses are interbedded with the finer grained clastic rocks. Petrographic examination showed the composition of the mudstone of the Yamhill Formation to be approximately: Oligoclase and andesine 68 percent, hornblende 15 percent, quartz 10 percent, chlorite 3 percent, biotite 2 percent, muscovite 2 percent, and limonite a stain."

The oldest part of the Yamhill section in Mill Creek is made up of tuffaceous siltstone dipping 35° northward. The siltstone is overlain by about 500 feet of sandstone, which, in turn, apparently grades upward into the typical Yamhill siltstone with thin micaceous beds of sandstone that is so typical of the formation. It is not known positively whether or not the sandstone is conformable upon the lower siltstone.

During a reconnaissance of the Little Luckiamute River valley in the summer of 1958, W. W. Rau and the writer collected samples of rock containing microfossils along the prominent cliffs one to two miles upstream from Black Rock. The formation in this area is made up of relatively thin, rhythmically bedded micaceous sandstone and siltstone (figure 5). Although the beds appeared to be more typical of the Tyee Formation, they are thinner and contain perhaps a greater percentage of argillaceous material and are tentatively mapped as Yamhill Formation. At F-1, farthest upstream, a few badly distorted Foraminifera were found, including *Bulimina* sp. and *Virgulina* sp. However, a dark siltstone that crops out on the north bank of the Little Luckiamute River a short distance upstream from the Willamette Valley Lumber Co. road at Black Rock contained a significant fauna (F-2). According to Rau, a fairly large fauna is present and he states:

> "This assemblage compares well with some known from the Umpqua Formation, both in Rock Creek in the Bone Mountain quadrangle and also along the Umpqua River in the Glide quadrangle. The assemblage may also be compared generally with those from the lower part of the section along Mill Creek in the northern part of the Dallas quadrangle. *Amphistegina californica* Cushman and M. A. Hanna is present, together with other forms that suggest a middle to possible lower Eocene age."

Field evidence did not indicate that this part of the river traverse was pre-Tyee, although the dark indurated siltstone is not typically Tyee at this point. Since the Siletz River Volcanics crop out through the hill that divides this area from the Rickreall Valley, it is possible that a high of early to middle Eocene sedimentary rock from that terrane crops out at this place. General equivalence of this fauna and those in the lowest part of the Mill Creek section suggests that beds in section 4 below the site of the old covered bridge on Mill Creek are related to the Siletz River Volcanics, as are the beds in section 3 to the east that are almost surely so situated. Stewart (in Baldwin, Brown, Gair, and Pease, 1955) also noted that the basal beds contained an assemblage older than the greater part of the Yamhill Formation. It is entirely possible that the greenish sandstone intervening between the basal siltstone and the more typical Yamhill sedimentary rock should be considered the basal part of the Yamhill Formation at its type locality, whereas the lower siltstone may be pre-Tyee in age.

On Sugarloaf Mountain and beneath the sills in that vicinity, basal beds of the Yamhill Formation are composed of 4 to 10 feet of conglomerate, while the rest of the section is typical siltstone and thin-bedded, fine-grained sandstone. Siltstone predominates in the valley of the Luckiamute River near Falls City and in McTimmonds Valley. The Yamhill Formation seems to be angularly unconformable upon the Siletz River Volcanics on Sugarloaf Mountain, thus indicating a break in deposition prior to a probable overlap on a volcanic highland. However, eastward along Fanno Ridge the silty phase of the Eocene sedimentary rock rests upon more typical Tyee sandstone. It is altogether possible that the Yamhill Formation overlaps both the Tyee and Siletz River Formations unconformably near the old high, but perhaps farther out in the basin the Tyee grades upward into the Yamhill Formation.

Rickreall Limestone Member: A lens of impure limestone located at or near the base of the Yamhill Formation in the vicinity of the Oakdale School southwest of Dallas has been referred to as the "Dallas limestone" by many workers. This is an informal name and invalid because of prior usage as noted by Stokesbary (1933). It is referred to herein as the Rickreall Limestone Member of the Yamhill Formation. The limestone is well exposed in the quarry of the Oregon Portland Cement Co. and to a lesser extent in a quarry on property owned by T. T. Leonard in the NW$\frac{1}{4}$ sec. 12, T. 8 S., R. 6 W.

The limestone in the cement company quarry is a massively bedded gray rock with variable content of calcareous material (figure 6). Rock containing as little as 50 percent $CaCO_3$ is quarried. The limestone is composed of medium-grained, partially rounded shell fragments, abundant tests of Foraminifera, and calcareous algae mixed with tuffaceous material in large part derived from the underlying basalt series. Carbonaceous material in the form of leaves and bits of tree trunks is common. The beds are not sharply set off by bedding planes but do have darker, more argillaceous layers between the thick limestone strata. In a few places along prominent joints or small faults, water has dissolved and removed the calcium carbonate, leaving a rust-colored, spongy sandstone composed of the tuffaceous and other noncalcareous constituents of the sedimentary rock in addition to a certain amount of silt carried in by the water from the overlying shale (figure 7).

One of the more clastic beds in the Oregon Portland Cement Co. quarry was examined petrographically by W. D. Lowry, who reports:

Sample No. P-5501 - A calcareous siltstone interbed within limestone from Oregon Portland Cement Co.'s quarry, Dallas quadrangle.

> Although much of the rock is composed of calcite, clastic grains of basic rock fragments make up about 2 percent; augite, 2 percent; and quartz, 1 percent. Secondary calcite constitutes 25 percent; opal (?), 15 percent; and greenalite, 10 percent. The latter mineral, which may include glauconite, formed in lath-like and in part radial arrangement within the chambers of abundant Foraminifera.

A bed of conglomerate about 30 inches thick lies between the limestone and basalt of the Siletz River Volcanics along the road that leads into the Oregon Portland Cement Co.'s quarry. More conglomerate is present in places in the quarry.

Sedimentary rock lies beneath the limestone lens in the Lime Products' quarry. Hole 31 in the quarry was reported as follows by T. T. Leonard: (The cores were examined by the writer and the Foraminifera were examined by W. W. Rau.)

Hole 31 -

Upper 40 feet already quarried.
40 - 50 feet averaged 39.2 percent $CaCO_3$.
50 - 60 feet averaged 41.7 percent $CaCO_3$.
60 - 110 feet indurated calcareous sandstone, probably of low $CaCO_3$ composition.
110 - 155 feet siltstone and sandstone beneath limestone.
Base still in sedimentary rock.

Other drill holes in the vicinity prove that the limestone is not basal everywhere but apparently is a part of an onlapping series of beds.

Limestone in the same lens crops out in Rickreall Creek at a point where the creek crosses the line between sections 30 and 31, T. 7 S., R. 5 W. The limestone here is about 8 feet thick and rests on tuffaceous sandstone of the Siletz River Volcanics.

Impure limestone beds are present at the base of the Yamhill Formation two miles northwest of Buell in the Sheridan quadrangle. Traces of impure limestone were found in the W$\frac{1}{2}$ sec. 7, T. 7 S., R. 5 W., along the faulted contact between the Yamhill Formation and the Siletz River Volcanics.

A section of impure limestone more than 50 feet thick crops out at the head of Mill Creek in secs. 13 and 24, T. 7 S., R. 8 W., in the Valsetz quadrangle. Another limestone body of undetermined

Figure 6. Rickreall Limestone Member of the Yamhill Formation exposed in Oregon Portland Cement Co. quarry southwest of Dallas.

Figure 7.

Solution channeling in the upper part of the limestone forming a Karst-like topography at the Oregon Portland Cement Co. quarry.

thickness lies about a mile to the north at the head of Rowell Creek in sec. 12, T. 7 S., R. 8 W. The two deposits rest on Siletz River Volcanics and lie beneath a sill at the base of the Yamhill Formation. They appear to occupy the same stratigraphic horizon as the Rickreall Limestone Member and are shown as such on the geologic map.

Calcareous conglomerate occurs at the base of the Yamhill Formation at various places in the Valsetz quadrangle. It crops out near the bridge across Rickreall Creek on the road that leads to Black Rock, in sec. 10, T. 8 S., R. 7 W. It is present at points overlooking Rickreall Creek at the extreme end of the lower branch of the abandoned Willamette Valley Lumber Co. K-line railroad in sec. 33, T. 7 S., R. 7 W.

There is evidently a direct relationship between the Rickreall Limestone Member and the Siletz River Volcanics. Calcite occurs fairly abundantly in veinlets and interstices in the volcanic rocks. It can be suspected, therefore, that lime-rich streams draining the volcanic highland flowed into local embayments or lagoons where, with the aid of marine organisms in the warm sea water, limestone was deposited. Basaltic tuffaceous material mixed with the limestone also points to the volcanic mass as a source. It is probable that the limestone bodies were deposited in restricted areas favorable to deposition and were little more extensive than we see them today.

Age and correlation

The age of the Yamhill Formation is based on several megafaunas and abundant Foraminifera, together with stratigraphic position and lithologic similarity. Since the upper and lower parts of the formation have somewhat different faunas, they are discussed separately below.

Lower part of the Yamhill Formation: Megafossils occur in the basal limestone lenses (Rickreall Limestone Member) and in some cases in the calcareous conglomerates. The following fauna (M-3) was reported from the limestone in the Oregon Portland Cement Co.'s quarry by Schenck (1936, p. 61): Raninoides oregonensis Rathbun and Crassatellites dalli Weaver. Additional specimens were contributed from an unpublished manuscript by Schenck (written communication), as follows: Cinnamomum and a fossil fern referable to the family Polypodiaceae (identifications by R. W. Chaney); Mesophyllum sp.; Bryozoa of several species; shark teeth; Robulus and other Foraminifera; a circular echinoid 110+ mm in diameter; Nautiloid mollusk.

A species of Pleurotomaria* was reported by Schenck and Turner (1935). Additional fossils found in

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* A comparison of the Rickreall Limestone Member of the Yamhill Formation and the sedimentary beds apparently associated with the Siletz River Volcanics in and near the Ellendale basalt quarry may be of interest because of specimens of the large, exotic gastropod Pleurotomaria found in both places. Mr. Lambert, operator of the Ellendale basalt quarry, donated the first, and to date the best, specimen to the Oregon Department of Geology and Mineral Industries. This and succeeding specimens were borrowed by H. G. Schenck of Stanford University, who was making a special study of this family. He had in his collection a specimen of this genus found by Harry Wheeler in the Oregon Portland Cement Co. quarry 2 miles south, and the possibility that they could be approximately the same age called for a critical investigation of the two localities.

The impure limestone in the cement quarry almost surely rests unconformably upon the Siletz River Volcanics and occurs at or near the base of the Yamhill Formation. Exposures in the quarry coupled with drill records and fossil data both above and below the limestone points to a middle to late Eocene age. Conglomerate at the base of the limestone in the quarry also suggests the presence of an unconformity.

The calcareous tuffaceous sandstone and pebbly sandstone that overlie the basalt at the Ellendale quarry, and from which fossils including the Pleurotomaria were collected, is not as well exposed. In the quarry a few well-rounded cobbles are present at the base and the surface of the basalt is irregular.

Although basalt crops out in Rickreall Creek opposite the Ellendale quarry in section 36, tuffaceous beds appear to interfinger with basalt upstream for nearly a mile. Downstream from the bridge over Rickreall Creek near Ellendale the basalt is overlain by tuffaceous sandstone to a point where the creek crosses the section line between 30 and 31. The sandstone contains large Amphistegina commonly found with the Siletz River Volcanics. At this point a channel by-pass has been excavated and approximately 8 feet of fragmental limestone almost identical to that in the quarries near Oakdale crops out. It is essentially parallel to the underlying strata but clearly higher in the section. Faunal evidence supports the correlation of the sedimentary rock in the Ellendale quarry with that of the Umpqua Formation of lower and middle Eocene age, whereas the limestone is late middle to late Eocene in age.

The description of the Pleurotomaria had not been received at the time of publication.

the quarry by the writer include Epitonium sp. and crab sp. (other than Raninoides).

The fauna of the Rickreall Limestone Member collected from the NW¼NW¼ sec. 12, T. 8 S., R. 6 W. (same general area as M-3) was studied in some detail by Stokesbary (1933), who listed the following fauna:

Nautilus 2 n. sp.
Nautilus sp. a.
Spatangus tapinus Schenck
Zanthopsis n. sp.
Crassatellites dalli Weaver
Crassatellites n. sp.
Pitar cf. dalli Weaver
Quinqueloculina yeguaensis Weinzierl-Applin
Triloculina trigonula Lamarck
T. circularis Bornemann
Triloculina sp. a.
Trillina n. sp.
Mychostomina revertens Thumbler
Orbulina universa d'Orbigny
Amphistegina sp. a.
Robulus sp. a.
Nodosaria kressenbergensis Gümbel
Bennettites sp. indet.

Stokesbary summarizes the age of the fauna as follows (p. 12-13):

"The fauna of the Dallas beds may be assigned to upper Eocene on the basis of lack of Oligocene forms and the presence of fossils typical of upper Eocene beds. The three species of Nautilus although not definitely upper Eocene are more typical of that period than of either Oligocene or Miocene. Spatangus tapinus described by Schenck from upper Eocene sediments of California has never been described from later beds. Crassatellites dalli Weaver, another upper Eocene species of the West Coast, is very common in the Tejon sediments of Lewis and Cowlitz Counties, Washington,... The genus Trillina has never been found in Tertiary beds later than Eocene. The only form comparable to Oligocene species is Pitar which resembles Pitar dalli (Weaver) from the lowermost Oligocene of western Washington.

"Although the majority of determinable species of the Dallas fauna are of upper Eocene age and are forms common to West Coast and Gulf Coast beds, the fauna cannot be correlated with other horizons of California, Oregon, or Washington."

The disassociation of some of the valves of bivalves, the absence of appendages on crustacea, and the abundance of shell fragments suggested strong currents to Stokesbary. He reported that species of Amphistegina were the most abundant of Foraminifera present. Although this is a warm, shallow-water form which may be more indicative of a facies than an age, it is generally associated with lower and middle Eocene beds where found in Oregon and Washington.

Miller (1947, p. 34 and pl. 21) describes and illustrates Eutrephoceras oregonense, new species from the Rickreall Limestone Member at the base of the Yamhill Formation, from the Oregon Portland Cement Co. quarry. The specimen collected by Miss Ruby B. Oldham of Eugene, Oregon, was loaned to him by Prof. W. D. Smith. E. oregonense is one of the largest known representatives of the genus. Although listed as Oligocene by Miller, it is probable that the age of the limestone member is middle to late Eocene as discussed in this bulletin.

A fauna from beds believed to be in the lower part of the Yamhill Formation was identified by Schenck (1936, p. 61) from the NE¼ sec. 4, T. 7 S., R. 6 W., along Mill Creek (northwest corner of the Dallas quadrangle) a short distance upstream from the Dallas-Buell highway bridge. It contained:

Polinices sp.
Turritella uvasana Conrad
Turritella uvasana Conrad var.
Glycymeris sp.
Pitar conradi (Dickerson)?
Pitar conradi (Dickerson) var.
Psammobia sp.
Venericardia hornii, cf. var. calafia Stewart

Of the above species, the Venericardia hornii var. calafia is listed by Turner (1938, p. 18) as one of the index fossils of the Tyee Formation. However, as the above species was referred to this variety, it is only suggestive of the age of the beds and further work is necessary to confirm the possible Tyee age. The writer collected Acila cf. decisa from approximately the same locality along Mill Creek.

Specimens of large disc-shaped Foraminifera from the Buell limestone quarry in sec. 19, T. 6 S., R. 6 W., a short distance north of the Dallas quadrangle, were sent to Dr. W. Storrs Cole of Cornell University, who tentatively identified them as follows:

"In general, they are very close to Pseudophragmina (Proporocyclina) psila (Woodring). However, there are certain slight discrepancies. I am certain that they are not Pseudophragmina clarki."

Schnaible, 1958, p. 48-51, describes fossil assemblages found on Sugarloaf Mountain, Stott Mountain, and Big Tip in the Valsetz quadrangle. The megafossils are found within a calcareous granule conglomerate at the base of the Yamhill Formation as mapped in this report. Some megafossils from Stott Mountain (M-7 of this report) contain two forms, Lucina sp. and Lyria andersoni Waring identified by Joseph Peck of the University of California Museum of Paleontology. Additional megafossils from the same locality identified by Schnaible include the following forms:

Nuculana sp.
Glycymeris sagittata (Gabb)
Mytilus dichotomus Cooper
Crasssatellites dalli Weaver
Venericardia hornii (Gabb)
    subsp. clarki Weaver and Palmer
Venus (Mercenaria) sp.
Microcallista (Costacallista) conradiana (Gabb)
Pelecyora aequilateralis (Gabb)
Amaurellina hendoni Turner
Turritella uvasana Conrad
T. vaderensis Weaver and Palmer
Ectinochilus sp.

According to Schnaible (1958, p. 50), Peck tentatively gave this bed a middle Eocene age (Domengine) based upon the presence of Lyria andersoni Waring. Schnaible concluded that it may represent the upper part of the Domengine.

Schnaible (1958, p. 50-51) notes that in the Sugarloaf Mountain area a distinct fossil layer is found and he describes it as follows:

> "This zone is within both pebble and granule conglomerates and overlying tuffaceous sandstones found immediately above the basalts (M-4, M-5, and M-6 of this report). From this locality (Sugarloaf Mountain) fossils identified by L. G. Hertlein of the University of California are as follows: Trochocyathus sp.; Terebratulina aff. T. washingtonia Weaver; and Eogryphus cf. E. tohnani Hertlein and Grant."

Schnaible identified additional forms as follows:

Trochocyathus sp.
Acila n. sp. (identified by Peck)
Acila (Truncacila) decisa (Conrad)
Nuculana cowlitzensis (Weaver and Palmer)
Yoldia (Portlandia) duprei (Weaver and Palmer)
Palliolum (Delectopecten) sp.
Lucina washingtonensis Turner
Epitonium sp.
Polinices sp.
Turritella uvasana Conrad
    subsp. stewarti Merriam
Cymatium washingtonianum (Weaver)
Pseudoperissolax blakei (Conrad)
Urosalpinx tejonensis (Weaver)
orbitoidal Foraminifera
bryozoa
crustacean parts

Schnaible concludes that the faunas on Sugarloaf Mountain compare with fossils reported from the Yamhill Formation and appear younger than those of the Tyee Formation.

The Foraminifera of the Mill Creek section have been examined by Stewart, and a check list of genera and a discussion of age given in the report on the Sheridan and McMinnville quadrangles by Baldwin, Brown, Gair, and Pease (1955). Although the section is in part just north of the Dallas quadrangle, its age has a direct bearing on the age of strata within the mapped area.

Faunas typical of the greater part of the Yamhill Formation in its type area are present in beds cropping out near Falls City. Faunas F-3 and F-4 collected in the east edge of Falls City and beneath the railroad bridge over the Little Luckiamute River about a mile to the east were examined by Rau, who states:

> "The fauna compares well with many of those known from the Mill Creek traverse in the Sheridan quadrangle. It is almost certainly younger than that of F-2 at Black Rock as it suggests an age of early late Eocene or at least no older than late middle Eocene. Significant species are Textularia aff. T. mississippiensis Cushman, Bulimina jacksoensis Cushman, B. cf. B. lirata Cushman and Parker, and Amphimorphina californica Cushman and McMasters."

A fauna, F-5, was collected from a road cut near the center of sec. 8, T. 8 S., R. 6 W., overlooking Rickreall Creek and a few feet above the contact with the Siletz River Volcanics. Tuffaceous sandstone in approximately the same stratigraphic position as the limestone in the cement quarry, yielded the following fauna:

Spiroplectamina sp.
Gaudryina sp.
Quinqueloculina sp.
Robulus sp.
Dentalina spp.
Nonion sp.
Bulimina cf. B. lirata Cushman and Parker
Bulimina corrugata Cushman and Siegfus
Bolivina sp.
Trifarina sp.
Valvulineria chirana Cushman and Stone
Valvulineria cf. V. jacksonensis Cushman
Gyroidina soldanii d'Orbigny
Gyroidina sp.
Cibicides cf. C. sandiegensis Cushman and M. A. Hanna

According to Rau this fauna is comparable to those from the east edge of Falls City and represents a late Ulatisian to early Narizian age of Mallory (1959), or may be assigned to the early late Eocene.

Drilling for limestone reserves by T. T. Leonard in the SE$\frac{1}{4}$ sec. 11, T. 8 S., R. 6 W. (hole 31) penetrated the limestone body and continued in sedimentary rock. Cores from a depth of between 123$\frac{1}{2}$ to 138 feet yielded the following fauna (F-6):

Spiroplectammina (?) sp.
Robulus spp.
Planularia sp. (may be new species)
Dentalina spp.
Bulimina cf. B. elongata d'Orbigny
Bulimina corrugata Cushman and Siegfus
Bolivina sp.
Bifarina nuttalli Cushman and Siegfus
Uvigerina churchi demicostata Mallory
Amphimorphina californica Cushman and McMasters
Trifarina cf. T. advena californica Mallory
Valvulineria jacksonensis welcomensis Mallory
V. cf. V. indiscriminata Mallory
Globigerina sp.
Cibicides spp.

Rau states:

> "The assemblage listed above from locality F-6 correlates best with that from F-5, from approximately 3$\frac{1}{2}$ miles to the west near the center of section 8. Two other assemblages from drill cores in the same general vicinity but from above the limestone member suggest a slightly younger age than is indicated by the assemblage from F-6."

The above fauna aids in determining the lower age limit for the limestone member of the Yamhill Formation and indicates that this member is younger than the Siletz River Volcanics and most of the Tyee Formation.

Upper part of the Yamhill Formation: Faunas along the Little Luckiamute River east of Bridgeport and along Rickreall Creek east of Ellendale are not typical of the Yamhill Formation, but instead appear to be more closely related to the late Eocene Spencer faunas. The enclosing strata, however, are generally composed of siltstone more typical of the Yamhill Formation and are mapped as such in this report.

A late Eocene megafauna (M-8) from the north side of Oregon Highway 223 between Monmouth and Kings Valley in sec. 31, T. 8 S., R. 5 W. was collected by W. C. Warren, H. Norbisrath, and R. M. Grivetti, then with the U.S. Geological Survey, and identified by H. E. Vokes. It yielded the following species:

Nucula n. sp.
Acila (Truncacila) decisa (Conrad) var.
Nuculana (Saccella) gabbi (Gabb)
Portlandia (Portlandella) duprei (Weaver and Palmer)
Thracia dilleri Dall
Thracia (?) n. sp.
Lucina (Here) aragoensis Turner
"Lucina" washingtonensis Turner
Pitar californiana (Conrad) cf. Pitar quadratus (Gabb)
Macoma (?) n. sp. A small concentrically ribbed form - the most abundant species in the fauna.
Tellina cowlitzensis Weaver
Tellina cf. castacana Anderson and Hanna
Tellina n. sp.?
Polinices sp.
Sinum obliquum (Gabb)
Ficopsis cowlitzensis (Weaver)
Pseudoperissolax blakei (Conrad)
Siphonalia sopenahensis (Weaver)
Exilia cf. E. dickersoni (Weaver)
Dentalium sp.
Decapod crustacean

Microfaunas F-12, F-13, and F-14 along the Little Luckiamute River downstream from Bridgeport have been determined by Rau to be late Eocene in age. One of the largest assemblages is from F-12. The following species were identified by Rau:

Quinqueloculina sp.
Robulus inornatus (d'Orbigny)
R. welchi Church
Dentalina spp.
Lagena costata (Williamson)
Nonion applini Howe and Wallace
Plectofrondicularia oregonensis Cushman and R.E. and K.C. Stewart
Amphimorphina jenkinsi (Church)
Globobulimina pacifica oregonensis Cushman and R.E. and K.C. Stewart
Bolivina basisenta Cushman and Stone
Uvigerina garzaensis Cushman and Siegfus
Valvulineria chirana Cushman and Stone
Gyroidina condoni (Cushman and Schenck)

Rau states: "The foraminiferal assemblage from F-12 in all respects is diagnostic of a late Eocene age. It can be referred to the Narizian stage of Mallory and the presence of Amphimorphina jenkinsi (Church) suggests that it represents the A-1 zone of Laiming."

In Rickreall Creek the lowest occurrence of Amphimorphina jenkinsi (Church) indicative of a late Eocene age is at F-8. A fauna from a point a third of a mile upstream at F-7 is somewhat older. According to Rau, it is fairly diagnostic of an early late Eocene age. It contains Robulus welchi (d'Orbigny), Valvulineria chirana Cushman and Stone, and Bulimina corrugata Cushman and Siegfus. However, F-8 is described as follows by Rau:

"This assemblage represents a late Eocene age. Significant species are Amphimorphina jenkinsi (Church) and Valvulineria chirana Cushman and Stone. The fauna compares well with that from F-12 (see above)."

From the standpoint of microfauna, the base of the Spencer Formation appears to lie approximately just below F-8.

Localities F-14 east of Bridgeport along the Little Luckiamute River and F-10 and F-11 in Rickreall Creek are described by Rau as follows:

"These assemblages all represent a late Eocene age. Although all three assemblages are small, the presence of Plectofrondicularia packardi Cushman and Schenck and Bulimina schencki Beck suggests that they can be referred to the Narizian stage of Mallory and either the A-1 or A-2 zone of Laiming."

The upper part of the Yamhill Formation as mapped appears to be late Eocene and differs little faunally from beds mapped as Spencer Formation. However, the contact between the Yamhill and Spencer Formations is tentatively placed higher on the basis of lithology. There may be no significant break between them in this area.

The distribution of the strata on a regional basis, however, suggests deformation of the Yamhill Formation prior to onlap of the Spencer seas. There is 4,000 feet of the Yamhill Formation in the southern part of the Yamhill Valley and practically none at the extreme eastern outcrop of Siletz River Volcanics 3 miles north of Dallas. A thickening occurs in the structural basin occupied by the Little Luckiamute River near Falls City, and extreme thinning or pinching out takes place near Airlie along the southern border of the Dallas quadrangle. No beds equivalent to the Yamhill Formation were mapped by Vokes, Myers, and Hoover (1954) south of Airlie, although they may be overlapped by the Spencer Formation. The regional distribution of the late Eocene Spencer Formation argues for onlapping on a partially deformed and eroded land mass.

Conclusions: It is generally agreed that farther south in the Coast Range, for instance near Elkton and Lorane, the Tyee Formation grades upward into a fossiliferous siltstone. It has been suggested that the Yamhill Formation is a facies of the Tyee Formation, perhaps the upper part of the Tyee Formation. However, the type Yamhill Formation lies on the north side of an older volcanic high, and it appears to rest unconformably upon it in certain places, such as along Little Boulder Creek east of Sugarloaf Mountain. Possibly the beds mapped as Yamhill Formation that rest with apparent unconformity upon the Siletz River Volcanics on Sugarloaf Mountain project eastward and rest with slight unconformity on Tyee strata beneath Fanno Ridge. The syncline shown on the map south of the Valsetz basin is not apparent under Fanno Ridge sill where either a slight unconformity is present or transitional beds lie on more typical Tyee strata.

The principal places where Yamhill-like strata come in contact with beds more typical of the Tyee Formation are along the west edge of McTimmonds Valley, in the valley of Teal Creek, and along the upper part of the Little Luckiamute River valley. In these areas, the contact is most indefinite and the Tyee and Yamhill lithologies are difficult to separate because of gradational character. The Tyee-like sedimentary rock in the vicinity of the contact contains an increased percentage of argillaceous material, which points to an upward rather than a lateral gradation into the Yamhill Formation. The more argillaceous rock typical of the Yamhill Formation appears to be generally higher in the section.

The Foraminifera in the Yamhill assemblages, particularly those above the basal members in Mill Creek, appear to be younger than those typical of the Tyee elsewhere. It should be noted that nearly all of the Tyee microfaunas of other areas come from either the Elkton or Lorane Members in the uppermost part of the Tyee Formation.

Farther south in the Coast Range, the late Eocene Coaledo Formation is slightly unconformable upon the Elkton Siltstone (Baldwin, 1961). The writer feels that in the map area the lower part of the Yamhill Formation may be generally equivalent to the Elkton and Lorane Members of the Tyee Formation, but the upper part represents continued sedimentation that may be younger than any of the pre-Coaledo units to the south and may be essentially conformable with the overlying Spencer Formation.

Spencer Formation

A series of late Eocene sedimentary rocks, herein referred to as the Spencer Formation, overlies the Yamhill Formation in the Dallas quadrangle. A basalt flow in the eastern part of the quadrangle apparently is associated with these sedimentary rocks. The formation contains a fauna similar to the Cowlitz Formation of Washington and northwestern Oregon; the upper part of the Nestucca Formation north of the map area; the Spencer Formation of the southern Willamette Valley; and the Coaledo Formation of the Coos Bay area. It was probably deposited during the same invasion of the sea. The late Eocene sedimentary rock of the map area is a direct continuation of the Spencer Formation a few miles to the south, and the name "Spencer Formation" is extended into the Dallas quadrangle. Mundorff (1939), who mapped the adjacent Salem quadrangle, referred to the late Eocene sedimentary rock as the "Helmick beds." The microfauna from Helmick Hill was described by Cushman, Stewart, and Stewart (1947). Schlicker (1962) mapped a Spencer sandstone in the Yamhill quadrangle that is similar to Spencer sandstone exposed at the crest of the hill west of Monmouth in the Dallas quadrangle.

Distribution and thickness

Although the contact between the Spencer Formation and the somewhat similar sedimentary rock of the Yamhill Formation is not well known, the late Eocene sedimentary rock within the area mapped appears to be restricted to the eastern half of the Dallas quadrangle. Because of poor exposures and lack of contrast in lithology, the contact is only approximately located.

The thickest continuous section is exposed in cuts along Oregon Highway 223 from Cooper Hollow eastward toward Monmouth. The section is not complete, but the formation is probably at least 1,500 feet thick. The gray, friable sandstone exposed in the deep cut at the top of the hill between Cooper Hollow and Monmouth is nearly horizontal but beds on the slope facing Monmouth are disturbed, probably by faulting or slumping.

Lithology

The sedimentary rock is predominantly dark gray, sandy, micaceous siltstone. It shows fairly well-defined stratification in fresh exposure. When weathered, it breaks down to a yellow clay and signs of bedding are extremely difficult to find. Friable micaceous sandstone is exposed in roadcuts along the east side of Cooper Hollow near the top of the hill. The section is particularly well exposed in the deep cut at the summit of the road to Monmouth. Bits of charcoal and cross-bedding are common. The micaceous friable sands, although gray when fresh, like the underlying Yamhill beds become yellow and iron-stained in the weathered outcrop. They are present along the summit of the ridge toward and in Mt. Pisgah. The beds show current sorting with much less graded bedding than that exhibited by the Tyee or even the Yamhill Formations. Thus the Spencer Formation probably represents shallow-water deposits.

Sedimentary rock of this series in the Albany quadrangle was described by Allison (1953, p. 5) as follows:

> "The upper Eocene marine sediments include two unlike facies. One of these is not well exposed but it occurs in Spring Hill and vicinity, in the small hill half a mile southwest of Lewisburg, and elsewhere. It is typically a medium-grained, light-colored, leached or poorly cemented sandstone consisting mainly of volcanic glass, feldspar, quartz, and muscovite in varying proportions. Certain tuffaceous shales of the area are perhaps a part of the same sequence. Its bedding is poorly exposed and hence its structure in places is not clear.
>
> "The other facies shows a marked change in composition and texture, as it contains large quantities of basic ash, lapilli, and small rock fragments. The two facies may be seen in contact in a hillside road cut about one mile north of Granger, where coarse-grained brown-weathering, fossiliferous vitric tuff of the second facies, with minor admixture of the earlier micaceous sand at its base, overlies the lighter-colored crystal tuff of the earlier facies."

The younger tuffaceous facies described above by Allison has not been recognized within the Dallas quadrangle, but the earlier micaceous sandstone is present along the west slope of Mt. Pisgah and at the crest of the hill between Cooper Valley and Monmouth. This is the facies that commonly rests on the Tyee Formation farther south in the Corvallis, Monroe, and Eugene quadrangles.

The problem in mapping the Spencer Formation in the Dallas quadrangle is where to draw the basal contact. The sedimentary rocks between Cooper Hollow and Bridgeport are not typical of the Spencer Formation but, instead, resemble the finely micaceous Yamhill siltstone. The microfaunas in this section, however, appear to be late Eocene in age and more closely related to those of the Spencer Formation.

A basalt flow (or flows) apparently was once interbedded with the sedimentary rock of the Spencer Formation in the Dallas quadrangle. Basalt boulders occur on a knoll about 1 mile west of Monmouth; near the middle of the line between secs. 11 and 14, T. 8 S., R. 5 W., along the east side of the Middle Fork of Ash Creek; and in a small cemetery by a turn in the road a short distance to the north. The outline of the basalt mass on the top and slopes of Mt. Pisgah is indefinite, but the breadth of its outcrop in relation to its length suggests that the body is a remnant of a gently dipping flow rather than of a dike. The fine texture also indicates an extrusive origin. Perhaps the scattered boulders throughout the fields are reworked from this or similar masses during later stages of alluviation. The scattered boulders and the rock in place are of the same type and of common origin as shown by the following petrographic study by W. D. Lowry:

Sample No. P-4648 - Basalt from center of section line separating sec. 11 and 14, T. 8 S., R. 5 W., Dallas quadrangle.

> The rock is an unweathered, dark-gray porphyritic basalt. Under the microscope it is hemi-crystalline and porphyritic with a tendency to be glomeroporphyritic. The phenocrysts are bytownite with a composition of Ab_3An_7-Ab_2An_8. The rock has an intersertal texture and the matrix contains labradorite (Ab_5An_5-Ab_4An_6) which constitutes 40 percent; augite, 20 percent; magnetite, 3 percent; volcanic glass, partially devitrified, 7 percent.

Sample No. P-4973 - Boulders from roadcut about 1 mile west of Monmouth on the road to Cooper Hollow, in sec. 25, T. 8 S., R. 5 W., Dallas quadrangle.

> The basaltic boulder is a dark-gray porphyritic basalt containing bytownite (Ab_3An_7-Ab_2An_8) phenocrysts which make up 25 percent of the rock. In thin section, it is seen to be hemicrystalline and porphyritic, tending to be glomeroporphyritic, with an intersertal groundmass. It contains labradorite (Ab_4An_6- or more basic), 40 percent; augite, 25 percent; magnetite, 3 percent; volcanic glass, partially devitrified and altered, 7 percent.

Sample No. P-4891 - Float boulder from the top of Mt. Pisgah, Dallas quadrangle.

> The rock is a dark-gray porphyritic basalt with phenocrysts of bytownite (Ab_2An_8) in the amount of 25 percent and olivine, 1 percent. Under the microscope it shows a tendency to be glomeroporphyritic. The intersertal matrix contains labradorite (Ab_4An_6), 37 percent; augite, 25 percent; magnetite, 4 percent; and volcanic glass, partially devitrified, 8 percent.

Compared with other northwest Oregon basalts, neither the Siletz River Volcanics nor the middle Miocene Columbia River Basalt has feldspar commonly as basic as bytownite. Bytownite is common, however, in the upper Eocene Goble Volcanics in northwestern Oregon (Wilkinson, Lowry, and Baldwin, 1946, page 5).

There is little to suggest that the basalt boulders resting upon late Eocene sedimentary rock were derived from either the Siletz River Volcanics to the west or post-Eocene basalt to the east. These boulders and the basalt in place on Mt. Pisgah appear to be from the same source and associated with the sedimentary rock of the Spencer Formation. The basalt may be related to the stage of volcanism that produced the tuff and lapilli in the Albany quadrangle.

Age and correlation

The Spencer Formation has not yielded abundant megafossils in the Dallas quadrangle. Microfossils are present in the fresher outcrops and further work will no doubt help to refine the age assignments.

Schenck (1936, page 61) reports a late Eocene fauna from a cut just west of the Valley View School in the center of sec. 35, T. 9 S., R. 5 W., about half a mile south of the southeast corner of the Dallas quadrangle.

A megafauna of Cowlitz age was reported by Mundorff (1939) at nearby Helmick Hill in the extreme southwest corner of sec. 18, T. 9 S., R. 4 W., Salem quadrangle. An abundant microfauna collected approximately 140 yards north of the Valley & Siletz Railroad overpass over U. S. Highway 99 W. is illustrated and described by Cushman, Stewart, and Stewart (1947). The fauna is correlated as follows by Stewart (written communication):

> "The 'Helmick' fauna is approximately the same age as the Coaledo and Cowlitz Formations of upper Eocene age. The fauna is nearly identical to one which occurs in shale of the Toledo Formation exposed in a hillside cut behind Minnie's Sunset Cafe near the center of the south line of the SE$\frac{1}{4}$ sec. 7, T. 11 S., R. 10 W., in Toledo, Oregon. Both contain an excellent foraminiferal faunule which corresponds very closely with Beck's Cowlitz fauna from sec. 28, T. 11 N., R. 2 W., Lewis County, Washington (Beck: 1943)."

Late Eocene strata throughout western Oregon usually rest unconformably upon Tyee or older strata. The importance of the post-Tyee unconformity in the Coos Bay section was pointed out by Allen and Baldwin (1944) where the Coaledo Formation lapped unconformably upon both the Tyee and Umpqua Formations. This unconformity is more difficult to see in the Dallas quadrangle because of the similarity between sedimentary rocks on either side of the contact and the possibility that sedimentation was more continuous in this area owing to deposition of the intervening Yamhill Formation. There is a variable thickness of sedimentary rock between the Spencer Formation and the Siletz River Volcanics because in some places part or all of the Tyee Formation was removed. Vokes, Myers, and Hoover (1954) show the Spencer Formation in contact with the Tyee Formation in the Corvallis area and apparently wrapping around the north end of a highland of Siletz River Volcanics. In general, the Spencer Formation strikes generally northward, whereas the Tyee and Yamhill sedimentary rocks strike nearly eastward at the southern edge of the basalt mass along upper Rickreall Creek - an attitude that was evidently developed prior to the deposition and deformation of the late Eocene strata.

The relationship between the Spencer Formation and the basalt on Mt. Pisgah appears to be similar to that of the interfingering Cowlitz Formation and Goble Volcanics in northwestern Oregon and southwestern Washington, and basaltic flows that interfinger with the upper part of the Nestucca Formation near Sheridan. Age relations and composition of the lavas support this correlation.

Keasey Formation

The Keasey Formation of latest Eocene or earliest Oligocene age occurs in several places along the western side of the Willamette Valley south of its type locality in the Vernonia area. The sedimentary rock is usually medium- to dark-gray tuffaceous siltstone and sandstone, and in general resembles the late Eocene sedimentary rock. The formation is therefore very difficult to distinguish by means of lithology alone. Where exposed in U. S. Highway 99E roadcuts just northwest of Looney Butte in the Salem quadrangle, the strata of Keasey age include beds of dark-gray, massive, fine-grained sandstone and a few intercalated beds of volcanic grit.

Schenck (1936, page 63) reports a Keasey fauna from the western side of Holmes Gap along U.S. Highway 99W about half a mile east of the northeast corner of the Dallas quadrangle. No beds of Keasey age are known to crop out within the Dallas quadrangle, but it is possible that they are present near the east border (Baldwin, Brown, Gair, and Pease, 1955). Except for the vicinity of Holmes Gap, where the Eola Hills join the low, rolling foothills of the Coast Range, the rest of the Willamette Valley is covered by Pleistocene and Recent deposits which mask the older formations. No contact between the Keasey and Spencer Formations was determined because of general lithologic similarity, widespread covering of alluvium, and lack of abundant fossil evidence. The two formations are generally conformable where observed in other parts of the state.

Gabbroic and Dioritic Intrusives

Distribution and thickness:

Gabbroic and dioritic intrusives, generally occurring in the form of sills or sill-like bodies, are particularly abundant in the southwestern part of the Dallas quadrangle and throughout the Valsetz quadrangle. Similar intrusives are common in adjacent parts of the Coast Range. Marys Peak, Prairie Peak, and Mt. Hebo are part of this same magmatic activity. Within the area mapped, nearly all of the highest peaks and plateaus are capped by sills and directly owe their elevations to the protection afforded by this more resistant rock.

Although the intrusives are in many places true sills, some appear to cut across the strata and it is difficult to determine whether the underlying strata are conformable. Most of the cover has been stripped off and only small patches of overlying sedimentary rock remain. The true relationship between the sills and underlying strata is in large part a stratigraphic problem involving relatively unfossiliferous sedimentary rocks which are difficult to separate upon lithology alone. Unconformities which might explain why the sill-like bodies appear to cut across the strata at a slight angle have not been recognized within the sedimentary series. For convenience the intrusive bodies will be referred to as sills, although it is acknowledged that in several places they may not conform to the strict definition of a sill.

Erosion has removed some parts of the sills and exposed feeder dikes. The relationship is shown by the long dike that extends from Diamond Peak to Fanno Peak (see figure 8). Few elliptical or plug-shaped masses were found in the Dallas-Valsetz area. There is no sign of assimilation of the sedimentary rocks; instead, intrusion was accomplished by parting along the bedding planes and uplift of the cover. Deformation caused by intrusion is minor and localized along the contacts. There is little contact metamorphism other than baking of the sedimentary rock.

One particular sill, which seems to be by far the thickest and most widespread intrusive in the area mapped, caps a plateau between Fanno Ridge, Laurel, Saddleback, and Stott Mountains. It will be

Figure 8. Aerial view looking northwest at Valsetz Lake with dam located at large dike that crosses from left to right, joining the Fanno Ridge sill in upper center. Entire upland is capped by this sill. Sugarloaf Mountain in upper left.

referred to as the Fanno Ridge sill because of its excellent exposure in Fanno Ridge, the rim that borders the Valsetz erosional basin on the north (see plate 1).

Along Boulder Creek in the Valsetz quadrangle the Fanno Ridge sill rests directly upon the Siletz River volcanic mass, but it projects eastward into the upper and more argillaceous part of the Tyee-Yamhill series in Fanno Ridge, where it is at least 1,500 feet above the base of the sedimentary rock. In Saddleback Mountain at the northwest edge of the Valsetz quadrangle and Stott Mountain to the west of Boulder Creek, the sill is underlain by a considerable thickness of sedimentary rock. Some of the varying thicknesses may be explained by folding and faulting that took place prior to the intrusion, and some to an overlapping relationship of the sedimentary rock.

There are several small sills beneath the dominant Fanno Ridge sill. They are between 50 and 150 feet in thickness where exposed in the stream beds. One sill parallels beds in the Siletz River Volcanics at Boulder Creek Falls where the water tumbles over the intrusive (see figure 9). A sill follows the basal contact of the Eocene sedimentary rock with the underlying volcanic series where it is exposed along Warnick Creek about a mile and a half above its mouth. Another sill is exposed in the North Fork of the Siletz River valley above the mouth of Warnick Creek.

Blocks of sedimentary rock were found largely surrounded by intrusive rock in such a position as to suggest that they were partially enveloped by the intruding mass. There is also the probability that the large sills split into two or more smaller sills. Many small sills and dikes a few feet in thickness may be offshoots from nearby feeder dikes. The large erosional basin surrounding Valsetz is remarkably free from intrusions, but they are fairly common between Black Rock and the upper part of Rickreall Creek. These

Figure 9. Boulder Creek Falls. The water drops over a sill intruded between sedimentary beds in the Siletz River Volcanics. The road in the distance is in the Fanno Ridge sill and parallel to its base.

Figure 10. The top of a sill just west of Falls City. Baked platy sediments of the Yamhill Formation overlie the contact.

small intrusives could be traced only with great difficulty, so it was not considered feasible to map their extent. Frequently, they may be seen in roadcuts and many others may be present in areas covered with overburden or thick vegetation. Numerous intrusions are small and irregular so that mapping their extent is difficult.

The Fanno Ridge sill, when traced westward from the central part of the Valsetz quadrangle, is exposed in the long escarpment known as Stott Mountain and it extends into the Euchre Mountain quadrangle. The sill continues northward into Saddleback Mountain, which is just south of the Salmon River valley in the southern edge of the Spirit Mountain quadrangle (Baldwin and Roberts, 1952).

The Fanno Ridge sill dips gently eastward from Laurel Mountain and Fanno Peak, which are more than 3,000 feet in elevation, to the Willamette Valley at Falls City, which is at 500 feet. The contact of the sill and the overlying sandstone is exposed just west of Falls City (see figure 10). The difference in elevation may be attributed in part to the structure existing at the time of intrusion and in part to more recent deformation.

South of its type locality, the Fanno Ridge sill is represented by a peak 4 miles west of Valsetz. The sill, if projected southward to Marys Peak, would pass above most of the prominent feeder dikes in the intervening area. There is no sign of thinning at the southernmost exposure of the Fanno Ridge sill, and at one time it undoubtedly extended much farther southward. Whether the Marys Peak sill-remnant is a direct continuation or not cannot be proved, because the hills between do not attain a high enough elevation. However, the rocks are of the same type and several prominent feeder dikes lie between. There is good reason to believe that a sill or sills originally occupied much of this intervening area.

Lithology

The commonest intrusive igneous rock type in the Dallas and Valsetz quadrangles is a granophyric gabbro. It is medium grained, relatively dark gray in color where freshly exposed. The large Fanno Ridge sill is of this type. Many of the dikes, however, have more acid feldspar so that the rock is dioritic in composition. The micropegmatitic structure so common in the sills occurs in both types.

Particularly on the higher peaks, the weathered rock in most outcrops is lighter in color than the freshly broken rock. The ferromagnesian minerals show as rusty specks which, upon the lighter colored background, give a "strawberry" color. This is particularly true in the large area burned by recent forest fires. In some places, such as in the Little Luckiamute River valley a mile west of Falls City, where the gabbro is deeply weathered, the rock is reddish brown, spheroidally weathered, and decomposed to such a degree that it is friable. Fresher cores of the gabbro may be seen within the weathered blocks in many places.

The large sills are quite uniform in lithology. Lineation of minerals during emplacement was noted in only a few places and differentiation is not particularly marked. The texture is somewhat finer near the borders. The joint blocks are perhaps a little larger in the upper part of the sill. Aplitic dikes, seldom more than 2 or 3 inches in width, are present (see figure 11).

The following specimens of Coast Range intrusives were examined in thin section by W. D. Lowry:

Sample No. P-4649 - Granophyric gabbro (very close to diorite) from the Fanno Ridge sill on old railroad grade across Boulder Creek from the main Willamette Valley Lumber Co.'s road in sec. 26, T. 7 S., R. 8 W., Valsetz quadrangle.

> The rock is gray and granular with visible feldspar and pyribole; the acicular grains of pyribole are as much as 20 mm in length. In thin section the rock is seen to be holocrystalline with a granophyric texture. The myrmekitic and graphic intergrowths are particularly marked. The larger feldspar grains range in composition from Ab_4An_6 to Ab_6An_4 and make up about 40 percent of the rock whereas the feldspar intergrains with quartz is more acid (Ab_8An_2) and constitutes about 15 percent. Augite forms 8 percent; magnetite, 1 to 1.5 percent; quartz, largely in the form of intergrowths, 23 percent of the rock. Secondary minerals are biotite (altered augite), 10 percent; calcite, 1 percent; and serpentine (?), 1 percent. The alteration was probably largely deuteric.

Figure 11. Fanno Ridge sill at east edge of sec. 32, T. 8 S., R. 7 W. Two views of same outcrop showing thin aplitic dike in upper part of sill.

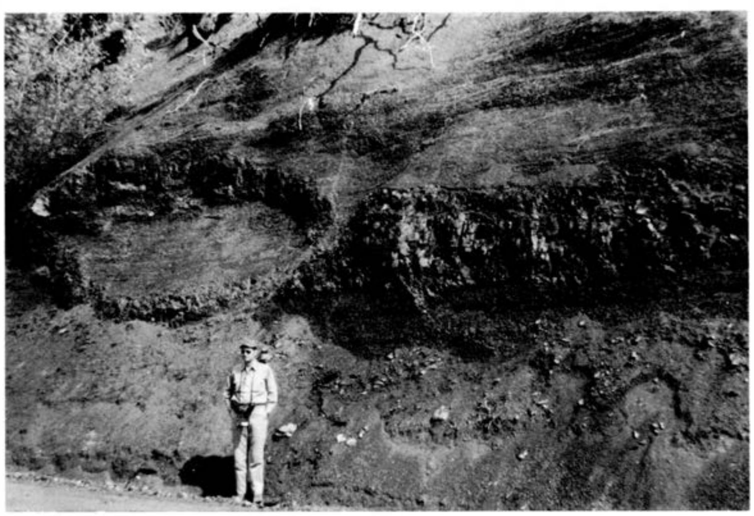


Figure 12. A small sill that split into two smaller sills during emplacement. The location is within the Yamhill Formation along the Willamette Valley Lumber Co. road a short distance north of Riley Peak.

Sample No. P-4583 - Quartz diorite near top of the sill along road to Valsetz a short distance from Falls City in SW$\frac{1}{4}$ sec. 20, T. 8 S., R. 6 W., Dallas quadrangle.

The rock is coarse-grained and grayish in color with visible sulphide and magnetite. Examination under the microscope shows that it has a hypidiomorphic granular texture. It contains feldspar (Ab_6An_4 to Ab_7An_3 and more acid - partly sericitized), 60 percent; augite, titaniferous, 15 percent; quartz, 5 percent; apatite, less than 1 percent; magnetite, 5 percent; and pyrite (?) .05 percent. Secondary minerals include hornblende (uralite [?]) included with augite, biotite, 15 percent; and sericite (included with plagioclase). The alteration was probably in part hydrothermal.

Sample No. P-4892 - Granophyric gabbro from Long Bell Lumber Co.'s quarry in saddle in ridge between Rock and Warnick Creeks near sec. 11, T. 7 S., R. 8 W., Valsetz quadrangle.

This specimen is brownish gray in color, medium- to coarse-grained with darker grains of magnetite. When viewed in thinsection, it is seen to have a granular texture which tends toward granophyric. The rock contains feldspar (Ab_4An_6 to Ab_5An_5 and more acid), 49 percent; acid plagioclase (albite or oligoclase), 6 percent; augite, 14 percent; quartz (in part intergrown with the more acid plagioclase), 15 percent; magnetite, 3 percent; apatite, 0.5 percent. Secondary minerals include uralite, 10 percent; chrysotile (?), 3 percent; and brown hornblende which was included with the augite. Uralitization, a late magmatic phase of alteration, was active.

Sample No. P-2650 - Granophyric diorite collected by S. W. Norris from sec. 27, T. 9 S., R. 6 W., (probably from sill in narrows at south end of McTimmonds Valley, Dallas quadrangle).

The rock is gray in color, coarse-grained, and contains visible sulphides. In thin section it displays a granophyric texture. Minerals include andesine (Ab_7An_3), 49 percent; oligoclase (probably on the acid side) intergrown with quartz, 10 percent; quartz, 20 percent; augite, 6 percent; pyrrhotite, 11 percent; and apatite, less than 1 percent. Secondary minerals include biotite (which may be in part primary), 4 percent; and some calcite. The biotite is in part from augite. The rock was assayed for gold and silver because of its large percentage of sulphide present but showed no appreciable content.

Sample No. P-3439 - Granophyric gabbro from the Marys Peak roadcut west of Gravel Creek, Marys Peak quadrangle. This rock is from a sill which caps Marys Peak, one of the best known examples of a Coast Range intrusive. Although outside of the area studied, it is similar to specimens of the Fanno Ridge sill and given here for comparison.

The rock has a medium-grained texture and is gray in color. Under the microscope the rock shows a granophyric texture. The mineral constituents include labradorite (Ab_4An_6 and less basic) 50 percent; plagioclase (Ab_6An_4 and less basic in part intergrown with quartz), 10 percent; quartz, 15 percent; augite, 12 percent; olivine, 2 percent; magnetite, 2 percent; apatite, 1 percent. Secondary minerals are hornblende (included with augite); biotite, 10 percent; and serpentine (included with olivine). Evidence indicates later magmatic and hydrothermal alteration.

Sample No. P-4582 - One of the typical dioritic dike rocks exposed at the Valsetz mill dam in the N$\frac{1}{2}$ sec. 28, T. 8 S., R. 8 W., Valsetz quadrangle, had the following assemblage:

The rock is salt and pepper in color. Magnetite crystals are visible. Under the microscope it displays a hypidiomorphic granular texture which tends toward diabasic. Minerals present are andesine (Ab_5An_5 to Ab_8An_2), 65 percent; green hornblende, 21 percent; augite, 6 percent; magnetite, 4 percent; apatite, 1 percent; and quartz, 2 percent. Chlorite, 1 percent, was a secondary mineral. Late magmatic alteration resulted in the formation of hornblende from augite and chlorite also probably from augite.

The distribution of intrusive rock in the Coast Range is given by Snavely and Wagner (1961). The mineralogy of the sills and dikes is discussed and chemical analyses and norms given. A more comprehensive discussion of Coast Range intrusives is in preparation for publication by the Oregon Department of Geology and Mineral Industries.

The average gabbroic intrusive rock in the Coast Range has the composition shown in the accompanying box (Snavely and Wagner, 1961).

	Average	Range
SiO_2	54.5	50.5 - 58.0
Al_2O_3	13.1	11.0 - 15.0
Fe_2O_3	3.5	1.3 - 6.3
FeO	9.5	6.7 - 12.8
MgO	2.3	.84 - 4.0
CaO	6.4	4.8 - 7.7
Na_2O	3.3	2.6 - 6.2
K_2O	1.5	.48 - 2.1
H_2O+	1.5	.32 - 2.5
H_2O-	1.0	.25 - 2.8
TiO_2	2.0	1.4 - 3.6
P_2O_5	.53	.16 - 0.94
MnO	.25	.17 - 0.36

Mode of origin

The basaltic magma, such as is now represented by the Fanno Ridge sill, evidently penetrated the enclosing sedimentary rock at a low temperature and crystallized in place without marked gravitational settling. The feldspar crystals, which show fractures, may have already started to form before the final stage of intrusion. The lack of wall rock alteration, other than baking, points to a low-temperature magma without abundant mineralizers. Some small sills and dikes evidently branch off from the larger bodies (see figure 12).

Mineralogically, the sills are remarkably uniform throughout. Sections of roof material which should represent the first cooled part of the melt and therefore approximate its original composition are essentially the same, mineralogically, as sections from deeper in the sill. Primary banding or orientation of crystals which might indicate movement during cooling is usually absent or negligible.

The feeder dikes for the gabbro sills have andesine feldspar and augite that show alteration to green hornblende; otherwise they are similar. The dike at the Valsetz dam, which is typical, contains augite which is partially altered to hornblende, and andesine which is probably due to late magmatic reaction.

The feeder dikes may reflect a slight change in magmatic composition, perhaps through differentiation at depth. Presence of hornblende is taken to mean an abundance of water within the melt. Water may have been added by assimilation of sedimentary rock at depth or from a resurgence of magma.

Feeders for the abundant intrusives originated from a magmatic chamber, probably a batholithic mass, which underlies the Coast Range. The magma as first intruded was a quartz-rich gabbro but tended to be more acid in later phases. Certain phases, such as dikes in the northern part of the Euchre Mountain quadrangle, which are more complex mineralogically, and the nepheline syenites in the Tidewater and Waldport quadrangles, are evidently desilicated differentiates.

Age and correlation

Most of the intrusives of the Coast Range occur within Eocene strata. Oligocene and younger beds are not common throughout most of the Coast Range but are present in a few places along the coast.

Syenite in Blodgett Peak in the Waldport quadrangle penetrates the upper part of the Toledo Formation, which has been assigned by Vokes to the middle Oligocene (Vokes, Norbisrath, and Snavely, 1949). If the syenites are related to the same stage of intrusion as the other prominent intrusives within the range, the intrusives are not older than middle Oligocene. The upper age limit of the intrusives is more difficult to determine in the Coast Range, for younger rocks are missing. It is probable, however, that the intrusions occurred prior to the formation of the prominent erosion surface upon which the middle Miocene Columbia River Basalt poured out. The Columbia River Basalt rests on formations extending in age from Eocene rocks along either side of the lower Columbia River to the lower part of the Miocene Astoria Formation near the mouth of the river. Post-Miocene erosion has been confined largely to dissection of the older erosion surface and the Columbia River Basalt, as is shown in northwestern Oregon where remnants of basalt still cap highlands.

Other corroborative evidence has been found by Vokes, Snavely, and Myers (1951) in their study of Spencer Butte in the Eugene quadrangle. Although the butte is not composed of typical quartz-bearing diorite or gabbro, such as is found in nearby Creswell Butte, it does, nevertheless, appear to be a sill related to this stage of intrusion. Spencer Butte intruded the middle Oligocene Eugene Formation. It was later tilted and eroded and then surrounded by flows of basalt which may be part of the early Miocene basalt flows in the Little Butte Series (Peck, 1960). Because tilting of the Oligocene strata and subsequent erosion took place before extrusion of the flows, the age of intrusion would probably be closer to late Oligocene than to early Miocene.

Assuming that the sills and dikes in the Dallas and Valsetz quadrangles are related to similar intrusives elsewhere in the Coast Range, their emplacement must have occurred some time between middle Oligocene and early Miocene.

Terrace Gravels

Remnants of weathered gravels cover an erosional surface cut upon the early Tertiary formations. These gravels are widespread northeast of Dallas near Polk Station, between Rickreall and Salt Creeks; remnants are present near Falls City and at the entrance to Mill Creek canyon. The contained pebbles are commonly 2 to 4 inches in diameter, medium- to well-rounded, and embedded in a clay soil that is probably decomposed basaltic sand and grit. The gravels are thoroughly decomposed near the surface and grade downward through pebbles with only a shell of decomposed material into stained unweathered pebbles.

Within the map area the gravels are not known to be thicker than 50 feet and the average thickness is believed to be nearer 20 feet. They lie upon a surface of truncated Tertiary strata. The surface of the gravel terrace is gently sloping and in general parallel to its basal contact. Wherever the present streams have cut into the terrace they expose the older strata. The greater part of the terrace near Polk Station is just above 300 feet in elevation but it slopes upward toward the canyon of Rickreall Creek near Ellendale, where it is approximately 450 feet in elevation. Its even surface indicates that it is constructional rather than erosional in origin.

The gravels near Polk Station may be attributed to Rickreall Creek drainage, and similar gravels in the Little Luckiamute and Mill Creek valleys were derived from their respective streams.

Piper (1942, pages 32-33) describes similar deposits throughout the Willamette Valley as follows:

> "Along the outer margin of the main lowland plain, commonly from 30 to 100 feet above the plain and throughout all the length of the Willamette Valley, there are scattered though conspicuous remnants of a terrace formed by a coarse unassorted stream deposit. At most places the deposit appears to be no more than a few tens of feet thick and commonly rests on a bedrock shelf that is higher than the main lowland plain, especially in the northern half of the valley....Everywhere this terrace deposit is weathered rather severely...,"

The gravel stages in the Willamette Valley have been discussed by Allison (1936).

Mundorff (1939, pages 60-64), who mapped the Salem quadrangle to the east of the Dallas quadrangle, notes the gravels west of Rickreall and discusses their origin. He likewise concludes that they were predominantly basaltic in composition and transported from the Coast Range by Rickreall Creek. He states that similar gravels had been described by Allison and assigned by him to the Kansan subdivision of the Pleistocene.

The gravels in the terrace deposit near Polk Station are obviously more weathered than the Portland gravels (Treasher, 1942) and they are probably older even though they lie at about the same elevation. The terrace is covered by a soil derived in part from decomposed gravel and perhaps in part from silt which is probably part of the Willamette Silts. Large granitic erratics are particularly abundant upon the old gravel terrace.

Evidence of an older stage of alluviation is represented by weathered gravels lying at an elevation of 600 or more feet on Red Prairie just north of the Dallas quadrangle. These gravels may be seen along Oregon Highway 22 about a mile southeast of Buell. They are made up of basaltic pebbles, now deeply weathered and stained brick red, that were evidently contributed by Mill Creek when base level was higher in the Willamette Valley. These gravels appear to be more thoroughly weathered and dissected than the gravels near Polk Station and Dallas.

Glacial Erratics and the Willamette Silts

Erratics of granitic rock have been recognized throughout the Willamette Valley for some time because their composition is strikingly different from that of the country rock. Allison (1935) and Lowry and Baldwin (1952) discuss the source and origin of these erratics, note their general upper level of 400 feet, and point out the existence of silts which apparently accompanied the erratics and which are also foreign to the valley.

Allison (1953) proposes the name "Willamette Silts" for the parallel-bedded sheets of silt and associated material that cover the greater part of the Willamette Valley lowland. He states (1953, page 13), "The Willamette Silts are the last of the deposits on the valley plain and though waterlaid are clearly of glacial derivation." The silts, according to Allison (1935, page 624) "...consist of angular grains or shreds of quartz, feldspars, micas, and a variety of other minerals and of fragments of granite, quartzite, basalt, and other rocks." These silts would be those that settled from the temporary body of water that bore the erratics and thus are younger than much of the thicker silt described by Baldwin (1957) that was deposited in a lake of considerably longer duration.

Allison (1935) concluded that the erratics and silt were derived from areas east of the Cascade Mountains and brought in by the Columbia River when it was swollen by melt waters during a stage of glaciation. The erratics were ice-rafted to their present position during stages of ponding in the Willamette Valley, presumably caused by ice jams in the Columbia River below Portland.

Bretz, Smith, and Neff (1956) present revised evidence of late glacial flooding when Lake Missoula broke near the Idaho-Montana border. It seems likely that the ice-rafted erratics came in during the flood, when the front had sufficient gradient to sweep the bergs this far south, and became stranded as the flood water receded.

Erratics were found by the writer in certain parts of the Dallas quadrangle. The occurrence of the larger ones or groups is shown on the accompanying geologic map. They are particularly abundant upon the older gravel terrace near Polk Station, northwest of Dallas, and some occur upon spurs of Tertiary sedimentary rock near Smithfield. The boulders seem to occur in clusters or "nests," although some of this grouping may have been done by the farmers who dragged them from the fields. Many are 3 or 4 feet in diameter and a large percentage are coarse-grained plutonic rocks such as granite. The largest erratic that was found by the writer in this area rests upon a spur west of the road about 1 mile northwest of Smithfield. It was 8 feet by 4 feet by $2\frac{1}{2}$ feet in dimension. However, associated with the granitic rocks are a few large basaltic boulders, some of which are similar to the Cascade Andesite or Boring Lava of Pliocene age. Many of the granitic rocks are relatively fresh, but a few have stained surfaces and exterior grains that have been loosened, perhaps by hydration. The basaltic boulders are usually stained on the outer surface but are fresh within. Although most of these boulders rest upon the surface now, they may have been embedded within a thin veneer of silt. In other parts of the valley some granitic rocks are found deeply buried within the silt.

The following general rock types among the erratics were noted in the Dallas quadrangle: hornblende granite; biotite granite; granodiorite; diorite; Cascade Andesite (Boring Lava); Columbia River Basalt (?); quartzite; and gneiss.

Although the existence of silt is recognized in many places, in the Dallas quadrangle at altitudes of 250 feet or more it usually occurs as a veneer over existing formations. If it is present over the higher gravel terraces, it is mixed with the thin layer of soil that rests on the rotten pebbles. As mapped, the silt is generally included with the alluvium and ignored at levels above the valley bottoms where older formations crop out. It is recognized, however, that a sparse covering of the silt is present in places above the contacts of the alluvium and silt as mapped. Silts deposited from the late Pleistocene lake described by Baldwin (1957), which are so readily observed between Salem and Oregon City predominantly at elevations lower than 225 feet, may be present in the valleys of Rickreall Creek and Little Luckiamute River, but if they exist they are very thin and not separated on the map from the Willamette Silts of Allison.

Recent Alluvium

The present streams have contributed to relatively widespread gravels and flood-plain sands and silts that in general cover the older formations, particularly along the edge of the Willamette Valley in the Dallas quadrangle. Recent gravels are common along such streams as Rickreall Creek and to a lesser extent the Little Luckiamute River. The less distinct channels of Baskett Slough, the various forks of Ash Creek, and even the lower valleys of the major streams are lined by fine-grained alluvium. In the more mountainous parts, the streams are actively moving coarse material, but where the valleys broaden out to join the Willamette Valley finer material is being deposited upon adjacent flood-plains.

STRUCTURAL GEOLOGY

The formations in the Dallas-Valsetz area have been gently folded and in a few places faulted. Several stages of deformation are recognized.

Folds

The Siletz River Volcanics crop out in an east-trending high, bordered along the northern edge by a fault and plunging eastward beneath the Willamette Valley. The volcanics were encountered at a depth of 3,500± feet in the Reserve Oil & Gas Co. well a short distance northeast of the Dallas quadrangle in sec. 31, T. 6 S., R. 4 W.

The Tyee Formation apparently dips southeastward from the southern side of the uplifted volcanics and is warped by a shallow syncline plunging northeast toward Fanno Ridge.

Beds of the Yamhill Formation north of the large fault dip northward toward the axis of a shallow syncline that parallels the upper part of Gooseneck Creek in the Sheridan quadrangle. The upper part of the Little Luckiamute River appears to follow the axis of a gently plunging syncline from its headwaters to Bridgeport.

A shallow syncline plunges southeastward toward Rickreall Creek in the Pioneer Loop area northwest of Dallas. Beds of the Rickreall Limestone Member and the basal part of the Yamhill Formation dip south and southeastward from the high of Siletz River Volcanics paralleling Rickreall Creek.

The structural trends within the late Eocene Spencer Formation are more difficult to determine. In general, the dips are eastward, but many small flexures are present and some of the attitudes shown may be due to slump or local faults.

The sills are gently warped in the central and northern part of the Valsetz quadrangle. It is possible that they are following previously deformed sedimentary rock in part, but this is difficult to establish because, as noted, they rest on the volcanic high in places and within a few miles appear to be well up in the sedimentary section. The relationship implies that there is an unconformity within the sedimentary series, with the sills following higher, less deformed beds. The sills in the upper part of the Little Luckiamute drainage have about the same general attitude as the gently plunging Yamhill sedimentary rocks.

Faults

The major fault recognized within the Dallas and Valsetz quadrangles bounds the northern side of the Siletz River Volcanics highland from Rock Creek valley on the west to Dolph Corners on the east. The fault was not traced farther east; it may be pre-Spencer, thus not affecting late Eocene beds. The northern side is down dropped probably more than 1,000 feet throughout much of its length. It is difficult to determine whether the higher position of the basaltic mass is due to uplift along the fault or to folding. The fault appears to be fairly steep as shown by its relatively straight trace. Branching faults bound the western ends of the intrusive rock in Rock Creek. Unless the intrusions were guided by pre-existing faults, it would appear that faulting accompanied and followed invasion of the sills. A long, prominent dike in the Spirit Mountain quadrangle mapped by Baldwin and Roberts (1952) apparently follows a somewhat parallel fault.

Several other faults, some of little throw, are suggested by offsets of strata. One crossing the divide between Boulder and Mill Creeks offsets the Rickreall Limestone Member. The sills are terminated abruptly in some places, but it is difficult to determine whether this is the result of faulting or of initial intrusion. The magma may have followed strata till it reached pre-existing lines of weakness. Here it may have pushed aside the strata without continuing across, thus reactivating local faults.

It is notable that all of the tributaries of the South Fork of the Siletz River between the dam and the junction with the North Fork are directly opposite each other and may reflect a series of parallel faults.

GEOMORPHOLOGY

Differential erosion has been particularly effective in shaping the varied topography, which ranges from the stage of youth in the Valsetz quadrangle to late maturity in the eastern half of the Dallas quadrangle. The sills cap the higher peaks and their superior resistance to erosion is the direct cause of most of the higher mountains. The Siletz River Volcanics have been eroded to form narrow, steep-walled canyons and serrated ridges such as Dorn Peak and surrounding terrane.

Where the streams cut through sedimentary rock, the valleys broaden noticeably in contradistinction to those cut in either the intrusive or volcanic rock. The broad Valsetz basin has been carved in sedimentary rock. As the basin was eroded, the Fanno Ridge sill was undermined and large blocks fell down the slope. This process is at work along the Little Luckiamute River between Falls City and Black Rock. The canyon is quite narrow where the stream is flowing through the gently dipping sill, but widens noticeably in the vicinity of Black Rock, which is within a sedimentary area beneath the sill. The low, rounded hills nearer the Willamette Valley have been carved in softer sedimentary rock.

In general the sills tend to form relatively flat plateaus or gently dipping slopes. Where the streams have cut through to lower formations, the areal pattern of the interfluves is finger-shaped in outcrop, as is shown by tributaries of the North Fork of the Siletz River. Smaller streams that have not succeeded in cutting through have eroded shallow valleys to the edge of the sills, where they drop rather abruptly into the larger valleys cut in underlying weaker sedimentary rock. There are a few places where the sills are tilted enough to form somewhat higher peaks or ridges. These peaks, such as Laurel, Brown (in sec. 12, T. 8 S., R. 7 W.), and Stott Mountains, are slightly upturned edges of sills that rise a little above the general sill level. Other peaks, such as Fanno and Riley, appear to be higher protuberances above the top of the sill and may have been caused by initial intrusion rather than later deformation. In most instances these peaks are accentuated by deep erosional valleys on one or more sides. An example of this is Fanno Peak, which rises high above the town of Valsetz, yet only a few hundred feet above the general level of the sill to the north.

The dikes and more steeply dipping sills control topography in a different way. The streams have cut valleys that vary in width according to the type of rocks encountered. The majority of the constrictions are caused by dikes. Good examples may be noted along the Luckiamute River south of Bald Mountain (Monmouth Peak), the North Fork of Rock Creek, and Sunshine Creek in the southwestern corner of the Valsetz quadrangle and at the Valsetz dam.

A somewhat different type of constriction takes place where stream valleys cross the sills. As the sills usually dip at a much lower angle than the dikes, the constrictions are longer. Notable examples are seen just west of Falls City and at the mouths of Teal and Grant Creeks.

Most of the waterfalls and cascades are caused by the retreat of the streams to a point where they drop over the edge of sills. Warnick Creek falls, the highest within the area and one of the highest in the Coast Range, tumbles about 200 feet over the Fanno Ridge sill, and its migration upstream is aided by a well-developed joint system in the sill. Boulder Creek falls (figure 8), which drops nearly 40 feet, is caused by a condition similar to that of Warnick Creek falls, although the sill in this instance is smaller and jointing is less evident. Several rapids and cascades, such as those along the Luckiamute River south of Bald Mountain (Monmouth Peak) are caused by intrusives. The Little Luckiamute River descends over several sills forming falls west of Black Rock.

The falls of the Siletz River a few miles below the forks is an exception to the general rule and not caused by intrusive rock. Particularly large masses of basaltic breccia block the river which drops in a series of cascades. Since the walls of the valley are very steep in this canyon, the evidence favors landsliding in the creation of this falls.

Even more complex valley cross-sectional profiles were found where all three units, namely volcanic flows, sediments, and capping intrusives, are present. The generalized cross-sections in figure 13 show the effect of the formations upon the topography.

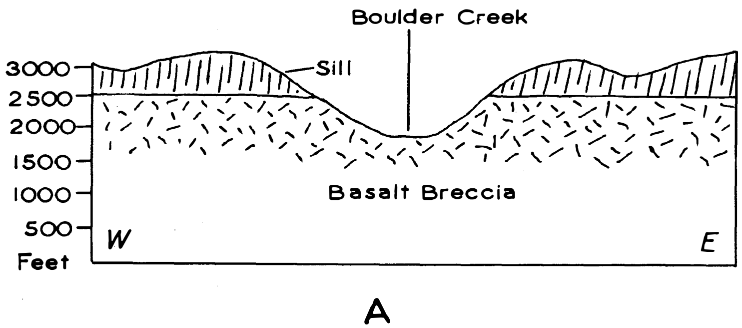
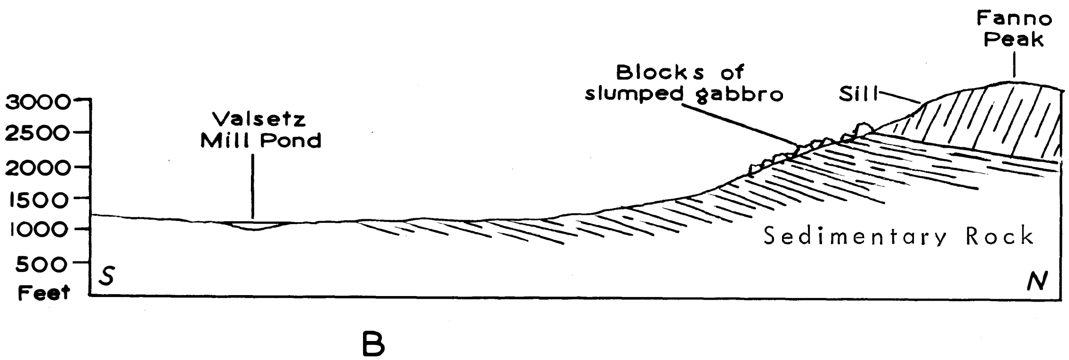


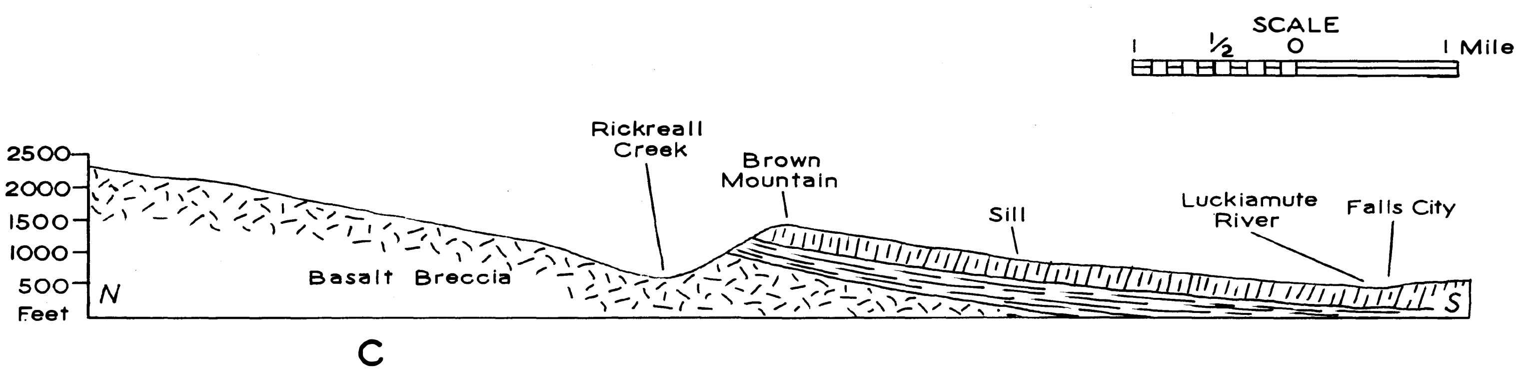
Figure 13. Generalized cross sections showing the effect of the formations upon the topography.

A. Section across upper Boulder Creek parallel to 44° 55' longitude showing the profile where the sill rests directly on the basalt.

B. Section from Fanno Peak southwestward across the Valsetz millpond showing the excavation of the basin in the sedimentary rock, and undercutting and slumpage of blocks of gabbro.

C. Section across Rickreall Creek southward to Falls City, showing relationship between the sill, sedimentary rock, and basaltic breccia. Rickreall Creek has stripped the sill and sedimentary rock from the basalt as it migrated down the dip.





The Coast Range is a positive area which appears to have been rising during the later half of the Cenozoic. The streams were probably consequent upon the sedimentary cover overlying the intrusive rock and governed by its structure. As the uplift continued, most of the sills were uncovered and dissected, and the streams were then superimposed upon the feeder dikes and the Siletz River Volcanics much as they are today. Faults may have helped guide stream pattern in places.

Although some of the watercourses, such as the small south-trending ones south of Dallas, are subsequent and roughly aligned with the strike of the beds, the larger streams have undoubtedly been superimposed upon the strata on which we now find them. Rickreall Creek nearly skirts the edge of the older Siletz River volcanic highland. The structure is shown in figure 13. Perhaps the creek has migrated down the dip since the south side of the valley is much steeper than the longer dip slope to the north.

Ash Creek, an intermittent stream, drains the eastern edge of Mt. Pisgah. The north branch drains the cove south of Dallas. Where the branch goes through the town it shares the same valley as Rickreall Creek and could derive some of its water from a high-water stage of Rickreall Creek, which has been aggrading its channel with gravel and sand. The north branch of Ash Creek, which has a very low gradient and which might normally drain into Rickreall Creek, is crowded against the south wall of the valley.

There are several examples of stream piracy in this part of the Coast Range. The headwaters of the Luckiamute River nearly encircle Bald Mountain (Monmouth Peak). At one time the stream on the north side of Bald Mountain continued westward to the Siletz River through Valsetz, collecting the tributaries flowing from Fanno Ridge. However, the Luckiamute drainage, in working headward, cut to a point 350 feet lower than the upper Siletz, and a tributary of the Luckiamute effected the capture of the uppermost Siletz and diverted it to its present circuitous course.

A second capture by the Luckiamute is imminent at the point where the Valley & Siletz Railroad leaves the Siletz River valley and descends to Camp Walker (SW$\frac{1}{4}$ sec.1, T. 9 S., R. 8 W.). The gap through which the railroad passes is less than one contour interval, perhaps 25 feet, higher than the level of Valsetz Lake. After this piracy takes place, it will be but a short time until the entire erosional basin drains eastward and the narrow valley by the dam becomes a wind gap.

Both the headwaters of Fourth of July Creek and Big Rock Creek have a marked advantage in gradient over the South Fork of the Siletz River in the Valsetz basin. Although they will be slower in capturing the basin than the headwaters of the Luckiamute, there is the probability that they, in particular Big Rock Creek, will eventually win over the Luckiamute River and establish westward drainage again, because they drain more directly to the sea.

Another stream capture is evident where Big Rock Creek beheaded Sunshine Creek. Nearly all the tributaries from the south side of Chandler Mountain once flowed westward by way of Sunshine Creek. Big Rock Creek has lowered the upper valley a little more than 100 feet since capture.

The streams that are effecting the capture of the Valsetz basin, both the Luckiamute River and Big Rock Creek, cut their valleys mostly in sedimentary rock except for a few diorite dikes. However, many miles of the Siletz River, as well as the lower course of Sunshine Creek, are through relatively resistant basalt which has retarded down-cutting. Although Rock Creek, like Sunshine Creek, flows into the Siletz River, its route through sedimentary rock gives it an advantage.

It is possible that late Cenozoic arching of the Coast Range tilted the headwaters of the Siletz eastward. The center of the range is apparently just west of Valsetz. At one time there was slight alluviation in the Valsetz basin, as shown by gravels in the lower part of Fanno Creek. Whether this alluviation was caused by Pleistocene sea level changes, eastward tilting of the drainage, or other causes has not been determined.

HISTORICAL GEOLOGY

The geologic history of the Dallas and Valsetz region starts with the submarine extrusion of a very thick series of early Eocene volcanic breccias, with deposition of marine-laid tuffaceous beds, and perhaps eruption of a few subaerial lava flows. After volcanism ceased, uplift, warping, and erosion occurred. The Tyee Formation was laid as a thick blanket of massive, micaceous sedimentary rock.

Abundant mica, some strained quartz, and other metamorphic minerals point to a southerly source for the Tyee sedimentary rock, perhaps the pre-Tertiary schists of the Klamath and Siskiyou Mountains. There is a tendency for the sedimentary rock to become less massively bedded in the northern part of the Coast Range, the part of the basin that was probably farthest seaward. The Yamhill Formation probably represents a continuation of deposition in the northern part of the Coast Range basin after Tyee deposition to the south had ceased. In the Dallas-Valsetz area, local unconformities developed next to volcanic highs, with possibly continuous sedimentation occurring farther out in the basins. Warping apparently occurred in the map area between deposition of Yamhill and Spencer Formations, with slight unconformities developing in some places, but perhaps with continuous deposition in downwarped basins.

Post-Tyee folding and faulting in the Coast Range, particularly south of the map area, was accompanied by widespread erosion which truncated the folds and in places uncovered the Siletz River Volcanics, so that the sedimentary rocks of the late Eocene seas lie unconformably upon a varying thickness of sedimentary rock. The structural trends established by the post-Tyee stage of deformation is commonly transverse to the north or south trend of the range. The late Eocene beds, instead, seem generally to parallel the edges of the Coast Range. The Keasey sedimentary rocks are more restricted in areal extent than these of the Spencer Formation, and it is doubtful if the succeeding Oligocene deposits ever covered much of the Coast Range. In fact, each younger marine formation appears to have been more restricted, so that the Miocene Astoria Formation did not penetrate inland to any marked degree except along the lower Columbia River valley, the probable pathway for the Oligocene seas into the Willamette Valley.

The late Eocene sedimentary rock was probably in part derived from the crests of the older folded formations as well as the still older highlands. Some contemporaneous volcanism occurred as the Goble Volcanics were extruded along the lower Columbia River and contemporaneous volcanics at Heceta Head. Flows of this stage are evidently present along the eastern boundary of the Dallas quadrangle.

A change in sedimentation during middle Oligocene time accompanied the invasion of the Pittsburg Bluff and Eugene seas, in which the deposits were more arenaceous in nature. Remnants of these formations wrap around the north end of the Coast Range and extend seaward in a belt which roughly parallels the trend of the lower Columbia River. Generally equivalent beds are found in such places along the coast as Coos Bay and Yaquina Bay. From the late Oligocene to the early Miocene a large volume of gabbroic magma was injected into the sedimentary series in the form of widespread sills and dikes.

A long stage of erosion, some of which probably occurred in exposed parts of the Coast Range during the Oligocene, had by middle Miocene formed a mature erosion surface in western Oregon which truncated Eocene and uppermost Oligocene formations alike. It is probable that this stage of erosion had uncovered some of the Coast Range intrusives and contributed sediments to the Astoria seas. The Coast Range seems to have been a positive area since the Oligocene. During the middle Miocene in northwestern Oregon, a widespread sheet of Columbia River Basalt covered the mature topography and extended to the Salem area a short distance east of Dallas.

The Coast Range has been intermittently uplifted throughout the Pliocene and Pleistocene. There is evidence in the northern part of the Coast Range that during the early Pliocene the Columbia River Basalt was folded and large valleys formed. The valleys were partially filled by gravels, sands, and silts similar in age to the Troutdale Formation. Sediments equivalent to the Troutdale Formation have not been recognized in the Dallas and Valsetz area.

Continued Pleistocene uplift of the Coast Range is responsible for the youthful incision of the streams as well as the upraised marine terraces along the coast. It has resulted in V-shaped valleys which cut through the resistant igneous intrusives and flows. Valleys through the less resistant sedimentary rock are broader. Although the coast streams have been recently drowned for several miles upstream, in their upper reaches they have a youthful profile which includes falls and rapids.

Many of the peaks in the central part of the Coast Range are formed of the more resistant intrusives and stand as erosional remnants above a general erosional level approximately 1,250 feet above sea level. This erosional level is best developed upon the sedimentary rock, and dissection of this surface has formed sharp divides, steep slopes, and stream profiles not yet at grade. This relationship was recognized and diagrammed by Smith (1926, p. 279).

ECONOMIC GEOLOGY

Limestone

Introduction

Limestone is produced in the area west of Dallas for agricultural use and for the manufacture of portland cement. The limestone is relatively low grade, containing slightly more than 50 percent calcium carbonate. For this reason it cannot be hauled far for agricultural purposes. On the other hand, the presence of silica and alumina in the limestone makes it valuable for the manufacture of cement. Large tonnages are shipped to Oswego, where it is blended with high-grade limestone imported from Texada Island, British Columbia, and converted into portland cement by the Oregon Portland Cement Co. The demand for limestone in the Willamette Valley will continue to grow and although many of the deposits are not now economically valuable, either because of their quality or location, they may be exploited in the future.

The Oregon Portland Cement Co., the largest producer of limestone in the Willamette Valley, obtains its supply from its quarry near Oakdale Road southwest of Dallas (see figure 14). Two small companies, both producers of agricultural limestone, have at times operated quarries south and east of the

Figure 14. Aerial view looking northeast at Oregon Portland Cement Co. quarry 3 miles southwest of Dallas. Quarry is in the Rickreall Limestone Member of the Yamhill Formation.

cement company quarry. These three quarries are in the Rickreall Limestone Member at the base of the Yamhill Formation.

One of the purposes in mapping the Dallas and Valsetz quadrangles was to determine whether additional deposits of limestone of interesting quality and quantity were available in the area. Several deposits occupying the same stratigraphic horizon as the Rickreall Limestone Member were found (see geologic map, plate 1), but most of these are either impure or relatively inaccessible. Conglomeratic, gritty, calcareous lenses appear at other points at the base of the Yamhill Formation.

A few lenses of calcareous sandstone occur within the upper part of the Siletz River Volcanics.

The Siletz River Volcanics are truncated and overlain unconformably by the basal limestone of the Yamhill Formation, which was laid down during an onlap of the volcanic highland. It can safely be said that the greatest number of limestone deposits lie at or a short distance above the top of the volcanics. A closer search along this contact might disclose workable deposits. Limestone is not common in the thick Tertiary section of sandstone and shale of western Oregon, therefore it is significant that the known limestone deposits, with few exceptions, rest upon or near the Siletz River Volcanics.

Rickreall Limestone Member of the Yamhill Formation

Oakdale deposit: The largest continuous lens of limestone in this region is situated near Oakdale School about 3 miles southwest of Dallas. The lens is part of the Rickreall Limestone Member of the Yamhill Formation.

The Oregon Portland Cement Co. operates a quarry in the NE$\frac{1}{4}$ sec. 12, T. 8 S., R. 6 W. The rock, averaging 55 percent $CaCO_3$, is utilized in the manufacture of cement at the company's plant at Oswego, Oregon. Limestone of similar grade has been quarried for agricultural use from the T. T. Leonard property in the SE$\frac{1}{4}$ sec. 11, T. 8 S., R. 6 W., and from the McBee property near Liberty Road in the NE$\frac{1}{4}$ sec. 12, T. 8 S., R. 6 W.

A close examination of the limestone reveals the presence of many small Foraminifera tests as well as fragments of larger shells and calcareous algae intermixed with tuffaceous material derived from the older volcanics. The rock has been dissolved along prominent joints or small faults so that it is uneven; somewhat like the "Karst" topography that forms in limestone regions in other parts of the world (see figure 7). Dissolving of the limestone apparently occurred after the deposition of the overlying strata. If erosion had occurred prior to the time the overlying shale was deposited, the spongy, residual material would not be present in the uppermost part of the limestone lens. Rather than to postulate erosion of a once continuous layer of limestone, it seems better to conclude that the lenses were laid down in limited areas favorable to deposition.

By far the largest volume of rock quarried from the limestone lens has come from the Oregon Portland Cement Co. property. A small amount was quarried prior to 1911. During the early 1920's extensive drilling was done in an area that is now largely quarried. Drilling during 1946 and 1947 disclosed additional tonnage and exploration has continued intermittently since that time.

In the early days the rock was worked by hand and transported by narrow-gauge railroad to a bunker from which it was loaded for shipment by railroad to the Oswego plant. The first rock quarried was obtained in the bottom of the valley where the small stream had stripped the overburden and exposed the limestone.

The rock is massively bedded and in places separated from underlying beds by more argillaceous layers. It can be quarried in benches. The overburden is stripped; the rock is drilled and blasted and then loaded by power shovel into trucks which convey it to the loading docks beside the company-owned branch of the railroad that leads southward to the Falls City branch of the Southern Pacific Railroad. Expansion of the Oswego plant has led to greatly increased demand for limestone and production has increased to a high degree since the writer published his first report (Baldwin, 1947).

The limestone deposit projects northeastward from the cement quarry through the divide between it and the North Fork of Ash Creek. At the northeast end either it is thinner or much of it has been removed by erosion. Some relatively impure limestone was quarried along the northwest side of this valley of Ash Creek for the construction of the Polk County Courthouse in Dallas.

Impure limestone cropping out on the McBee property near Liberty Road is the farthest eastward that this limestone lens has been traced. As the limestone seems to parallel the slope, there is the possibility that some of it has been stripped by erosion.

The limestone exposed in the T. T. Leonard quarry strikes nearly due east, whereas that in the cement quarry strikes about N. 10° E., which indicates an anticlinal structure plunging to the southeast. The limestone lens apparently projects through the hill to the valley of Waymire Creek and connects with the deposit in that area. Drill records kept by Mr. Leonard show that the limestone thins to the south, grading into calcareous sandstone presumably of the Yamhill Formation.

Beds of impure limestone or calcareous sandstone parallel Canyon Road along Waymire Creek from the upper bridge southwestward for more than a mile before losing most of their calcareous content. The calcareous horizon trends westward to a point where it plunges between a sill and the volcanic mass. The deposit is crossed in at least two places by small stream valleys which cut through a hogback ridge in which the beds strike N. 65° to 80° E. and dip 7° to 10° S. The beds containing limestone may be nearly 100 feet in thickness. Although the lime content is not known, a few of the beds cropping out in the road are of fair quality and drilling could prove the value of the deposit. The overburden consists of soil and weathered rock in place. This deposit is located next to an all-year road and about 2 miles from the Falls City branch of the Southern Pacific Railroad.

Boulder Pass deposit: A section of impure limestone 50 feet thick at the base of the Yamhill Formation crops out in secs. 13 and 24, T. 7 S., R. 8 W. The deposit lies between Boulder Pass and the head of Mill Creek. A road a few feet above the limestone lens parallels the contact of the overlying sill. The relationship of the limestone to the sill is well shown in a roadcut at the northwestern end of the outcrop. The sill lies directly upon the volcanic rock between this limestone mass and the one exposed nearly a mile to the north at the head of Rowell Creek.

A continuous section of nearly 50 feet of limestone of fairly good quality is present, with several feet more of less pure calcareous sedimentary rock both at the bottom and top. In the outcrop nearest the camp, the beds strike N. 20° E. and dip 15° SE., but these beds may have slumped. Several readings on the limestone at other places showed the strike to be N. 35° to 40° W. and the dip to be 10° to 12° SW. The deposit is distinctly bedded and contains a few shell fragments. Four samples selected from various parts of the limestone beds were assayed by L. L. Hoagland, department chemist, with the following results:

Sample No.	($CaCO_3$)
P-5426	59.45%
P-5427	86.68
P-5428	60.52
P-5429	64.60

This deposit is 15 miles from the railroad at Black Rock via private road. With a small amount of road repair, the limestone could be taken out by way of Mill Creek, also by private road. Although this is one of the largest deposits found, it may not be of economic importance because of its remote location. The sill overburden would prevent quarrying far into the hill but it could be worked along the hill for several hundred yards.

Rowell Creek deposit: Limestone similar to, and in the same stratigraphic position as, the deposit near Boulder Pass crops out where the old Polk Operating Co.'s railroad crossed the Rowell Creek-Rock Creek drainage divide in sec. 12, T. 7 S., R. 8 W. The deposit is probably not as thick as the limestone near Boulder Pass or at the Oregon Portland Cement Co.'s quarry, but drilling and further exploration might indicate more tonnage than is now apparent. A grab sample contained 63.37 percent $CaCO_3$.

Rickreall Creek deposit: Weathered limestone composed of fragmental limestone of the same type as that near Oakdale School crops out in Rickreall Creek where the creek crosses the line between secs. 30 and 31, T. 7 S., R. 5 W. About 8 feet of weathered limestone is present. Two grab samples of the more solid rock near the base yield the following:

Sample No.	($CaCO_3$)
P-27358	48.10%
P-27359	63.17

This location is more important stratigraphically than economically, for much has been removed by erosion or weathering and the chance for large tonnage does not appear favorable.

Limy beds in Siletz River Volcanics

Sunshine Creek deposit: A deposit of low-grade limestone (better called a calcareous sandstone) crops out along a logging road that extends to Deer Creek in sec. 36, T. 8 S., R. 9 W. from Valsetz. The calcareous sedimentary rock is about 30 feet thick. A sample of some of the better rock contained 44.57 percent $CaCO_3$. This deposit, which is interbedded within the top of the Siletz River Volcanics, appears to be too impure to exploit.

Building Stone

The area mapped contains sandstone that can be used for building stone. Rock similar to that formerly obtained at the old Pioneer quarry near the Yaquina River in sec. 35, T. 10 S., R. 10 W., Lincoln County, is present in the southern part of the Valsetz quadrangle, some of it near the Valley & Siletz Railroad.

Medium-grained diorite and gabbro crop out in the Dallas and Valsetz region near the Falls City branch of the Southern Pacific Railroad and likewise near the Valley & Siletz Railroad that leads to Valsetz. Although neither the sandstone nor the diorite and gabbro are being quarried for building stone, they might be suitable for this purpose. Similar blocky intrusive rock has been utilized as jetty rock and riprap. The railroad from Falls City to Black Rock was abandoned at last report (1961) and it is possible the Valley & Siletz will be soon.

Calcareous sandstone from the north end of the Rickreall Limestone Member along the North Fork of Ash Creek was used in the construction of the Polk County Courthouse in Dallas. This sandstone turns buff-colored after exposure to the weather but is durable and sufficiently workable to be used in such buildings if building stone comes back into public favor.

Sand, Gravel, and Crushed Rock

Sand and gravel are in demand for road material and construction purposes and are now being obtained from the bed of Rickreall Creek about 1 mile east of Dallas.

Crushed rock, which is used primarily for road material, has been produced at the large quarry located a short distance west of Ellendale along Rickreall Creek (see figure 4). New quarries have been established in the vicinity and up the slope to the west. The lumber companies are large users of rock for road construction. As rock cannot be transported very far profitably, local sources are generally utilized. Some local rock will not meet desired requirements and yet it is used because of its proximity.

Many of the roadways are built through the area of the Siletz River Volcanics. This basalt is notably brecciated, zeolitized, and altered, and good road rock is difficult to obtain. The basalt is utilized largely as it occurs naturally, except at the county quarry near Ellendale, where it is crushed. Otherwise the common practice is to quarry the basalt, utilizing its natural joints. Even though some blocks are fairly solid when originally excavated, they crumble when exposed to the weather.

Quarries are located in a pass between Rock and Warnick Creeks in the northwest part of the Valsetz quadrangle. The rock crushed is a medium-grained, gray gabbro similar to the widespread intrusives throughout the region.

Manganese

Manganese dioxide staining is common in the Siletz River Volcanics, but so far only one small concentration of manganese minerals has been reported. Tuffaceous sedimentary rock showing manganese is exposed in the bank and bed of Rickreall Creek in the NW¼ sec. 36, T. 7 S., R. 6 W. (Oregon Dept. of Geology and Mineral Industries, 1951, p. 145). According to the department report, the tuffs are intruded by dense, fine-grained basalt whose contact is quite irregular. The basalt was greatly brecciated in places along the contact at the time of intrusion. The tuff near this contact is cut by thin veinlets, less than half an inch thick, of manganese mineral (probably hausmannite). Where the veinlets penetrate to a coarse-grained bed of tuff, they spread out and disseminate into the interstices between the tuff grains to form the matrix between the angular fragments. The coarse beds contain 10 to 14 percent manganese. The deposit is exposed in a bed one foot thick and about 20 feet of its length is visible. Although it is too small to be of economic value, better deposits may be present within the volcanic mass.

Oil and Gas Possibilities

There has been intermittent interest in oil and gas in the vicinity of Dallas and nearby points within the Willamette Valley for some time. The record of drilling is briefly outlined below. The writer is indebted to the late Cecil Riggs, who lived at Dallas, for much of the information concerning past oil and gas activity.

Drillings

Whiteaker well: A well was drilled in 1910 to a depth of approximately 2,200 feet on the Whiteaker place southeast of Dallas overlooking the Middle Fork of Ash Creek in sec. 11, T. 8 S., R. 5 W. The well started in sedimentary rock presumably of upper Eocene age. Some gas was reportedly encountered as well as salt water.

McBee well: A well drilled around 1910 on the McBee farm southwest of the Liberty School in the NW¼ sec. 7, T. 8 S., R. 5 W., is reported by the late C.B.S. Henry (unpublished report, 1939, in department file) to have reached a depth of 1,450 feet. No well log is known to have been preserved. The well no doubt encountered the basal limestone of the Yamhill Formation and then passed on into the Siletz River basalt at a relatively shallow depth

Washburne (1914, p. 89) refers to a well which seems to be in the same general position as the McBee well. He reports the following:

> "A small flow of gas is reported to have been struck between 1,400 and 1,500 feet in a well drilled by the Oregon Oil & Pipe Line Co., 3 miles southwest of Dallas, Oregon. An accurate log is not available, but the drill is said to have passed through dark-colored shale with thin-bedded sandstone near the bottom, in which the gas was encountered. The flow is said to have been sufficient to maintain a flame 2 feet high out of a 10-inch casing for several days. No gas was escaping at the time the well was

visited in 1910, but residents of the vicinity corroborate the report. The Dallas Oil Co. is preparing to drill in the same vicinity."

When visited by the writer, the well was an open hole without casing, emitting no gas. Salt springs occur in the small valley to the west of the McBee well.

Newman well: The Newman well is a short distance northeast of the Dallas quadrangle in the W½ sec. 7, T. 6 S., R. 4 W. It was drilled in 1917 to a depth of 2,600 feet. Some gas was reportedly encountered.

Riggs gas well: Gas encountered when drilling a shallow well for water supply at the Riggs farm in SE¼ sec. 6, T. 7 S., R. 4 W., north of Rickreall near Holmes Gap was utilized domestically for several years around 1917. Smith (1925, p. 174) mentions the gas used at the Cass Riggs farm near Rickreall. He gives the following analysis of the gas:

Carbon dioxide	None
Oxygen	Trace
Carbon monoxide	0.2%
Hydrogen	None
Methane	67.0%
Ethane	6.4%
Nitrogen (by difference)	26.4%
	100.0%

Alexander well: The Alexander well, located in sec. 14, T. 7 S., R. 5 W., near Smithfield, was drilled in 1931 to a depth of 1,440 feet. Gas encountered had the following analysis:

Methane	99.80%
Ethane	0.17%
Propane	0.03%
B.t.u.	1,012 per cu. ft.
Specific gravity	0.555

Bliven No. 1 well (Miriam): This well, located in sec. 11, T. 8 S., R. 5 W., and the succeeding wells were drilled in 1957 by the Miriam Oil Co. This well reached a depth of 1,300 feet. Salt water was encountered between 402 and 419 feet.

Bliven No. 2 and 3 wells (Miriam): These wells were driven by the Miriam Oil Co. in 1957. They are located near the southeast corner of sec. 10, T. 8 S., R. 5 W. Well No. 2 caved. Well No. 3 was started 70 feet south and drilled to a depth of 1,801 feet. Lithologic change shows on the electric log at 550 feet where there is a change from siltstone to firmer shale. The well was started in the Spencer Formation. This change may indicate penetration of the Yamhill Formation.

Elliot No. 1 well: This well, drilled in 1955 and deepened in 1959 by the Miriam Oil Co., reached a depth of 1,835 feet. Gas was reported between 490 and 630 feet. Salt water was also encountered.

Bliven No. 1 well (Mitchell): This well was drilled in 1959 by Ross Mitchell & Associates in the northwest part of sec. 15, T. 8 S., R. 5 W., to a depth of 1,347 feet. A small amount of gas was encountered. Its sample analyzed by the State of Oregon Department of Geology and Mineral Industries gave the following results: methane, 63.80%; nitrogen, 36.10%; and oxygen, 0.10%.

Paige No. 1 well: This well was drilled by Ross Mitchell & Associates in 1959 in sec. 11, T. 8 S., R. 5 W., to a depth of 600 feet, with little information shown.

Bliven No. 2 and 3 wells (Mitchell): These two wells were drilled in sec. 10, T. 8 S., R. 5 W., in

1960 by Ross Mitchell & Associates to depths of 430 and 580 feet, with little information derived from the wells.

Adams-Bliven No. 4 well (Mitchell): This well was drilled by Ross Mitchell & Associates in 1960 in the northwest part of sec. 15, T. 8 S., R. 5 W., to a depth of 340 feet with little showing.

Sullenger No. 1 well: This well was drilled by John T. Miller in 1960 in the northeast part of sec. 18, T. 8 S., R. 5 W., to a depth of 710 feet. A little gas was encountered between 329 and 340 feet.

Roy-L.& G.-Bruer No. 1 well: This well, drilled to a depth of 5,549 feet in 1960 by the Reserve Oil & Gas Co., was one of the major tests of recent years in the area. It is located 2,334 feet south and 1,855 feet west from the northeast corner of sec. 31, T. 6 S., R. 4 N., a short distance north of Rickreall and very close to the northeast corner of the Dallas quadrangle. The top of the Siletz River Volcanics was encountered at 3,500± feet and approximately 5 miles northeast of outcrops of this formation in the Dallas quadrangle. Siltstone overlying the volcanics is presumably a part of the Yamhill Formation.

Ray Adams No. 1 well: This well was drilled by J. T. Miller in 1962 in the SW¼ sec. 11, T. 8 S., R. 5 W., to a depth of 410 feet. No shows were encountered.

Bliven No. 1 well (Miller): This well was drilled by J. T. Miller in 1962 in the SW¼ sec. 11, T. 8 S., R. 5 W., about 100 feet northwest of Ray Adams No. 1. Total depth was 389 feet. No shows were encountered.

Conclusions

The sedimentary rock in general dips eastward off the older Eocene basalt. Although minor folds in the Yamhill Formation do not conform with this trend, the overlying Spencer sedimentary rock dips generally eastward. The Siletz River Volcanics probably underlie the sedimentary rock at a relatively shallow depth for a few miles east of the contact.

Natural gas has been encountered on numerous occasions in the Dallas-Valsetz area but as yet not in any significant quantity. Many of the occurrences would have been of sufficient quality for commercial use had the amounts been great enough.

Many wells and springs in the area yield salt water, indicating that porous sediments exist. Accumulations of oil and gas might be possible if structural elements were present to cause entrapment.

The Willamette Valley is largely covered by alluvium which obscures the geologic structure. Further exploration should include geophysical prospecting.

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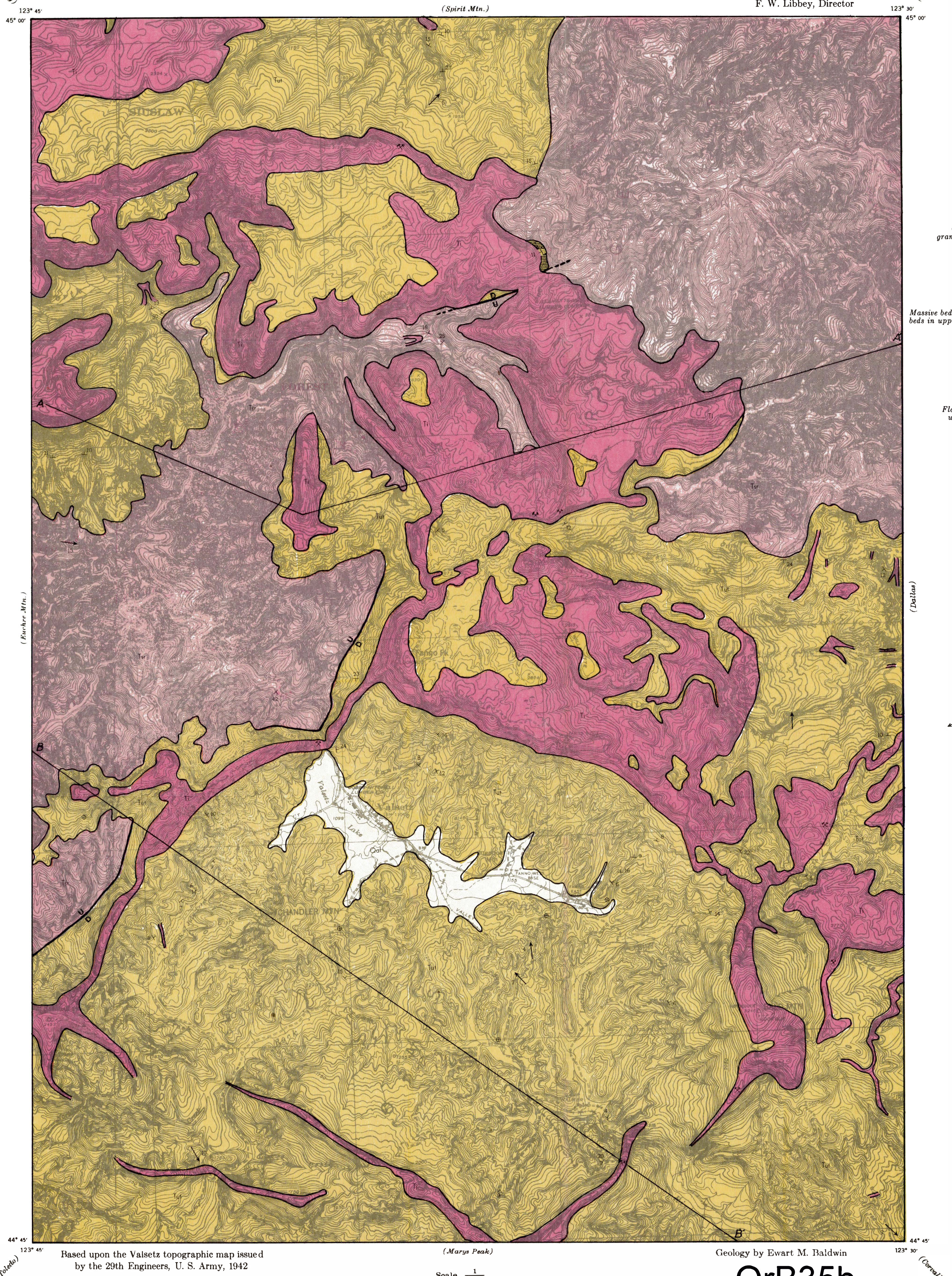
Reconnaissance Geologic Map
of the
VALSETZ QUADRANGLE
Oregon

Issued by
State of Oregon
Department of Geology and Mineral Industries
Portland, Oregon
F. W. Libbey, Director



EXPLANATION

RECENT

Qal — Alluvium
Recent stream deposits.

UNCONFORMITY

UPPER OLIGOCENE

Ti — Sills and dikes
Granophyric gabbro sills and granophyric diorite and gabbro dikes.

MIDDLE EOCENE

Tut — Umpqua-Tyee series
Massive bedded sandstone in basal part; more argillaceous beds in upper part. Limestone lenses in basal part of the series are shaded.

UNCONFORMITY (?)

Tsr — Siletz River volcanic series
Flows, flow breccia, pillow lavas, and tuff with interbedded tuffaceous sediments, much of it of submarine origin.

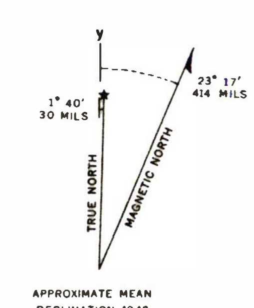
Attitude of the bedded rocks

- 31 Dip and strike
- ⊕ Horizontal beds
- ↙ General trend of dip

Formational contacts

Contacts are approximate, especially those bordering the intrusive rock.

- ⚒ Rock quarry
- + Megafossil localities



APPROXIMATE MEAN DECLINATION 1942
ANNUAL MAGNETIC CHANGE 2′ DECREASE

Based upon the Valsetz topographic map issued by the 29th Engineers, U. S. Army, 1942

Geology by Ewart M. Baldwin

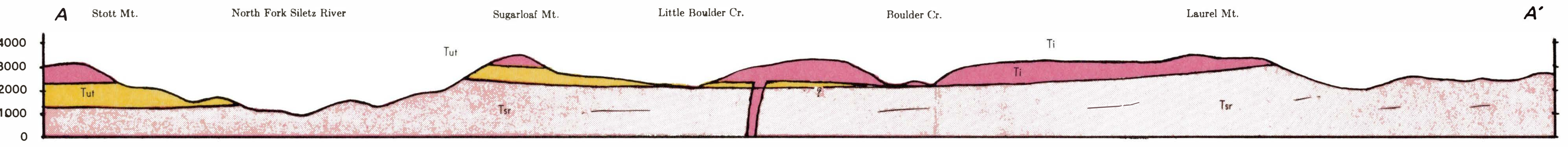
OrB35b

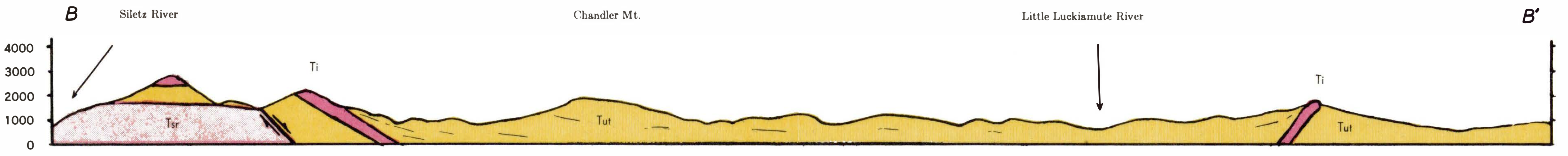
First edition

Scale $\frac{1}{62500}$

Contour interval 50 feet
Datum is mean sea level (1929 Adj.)

1947

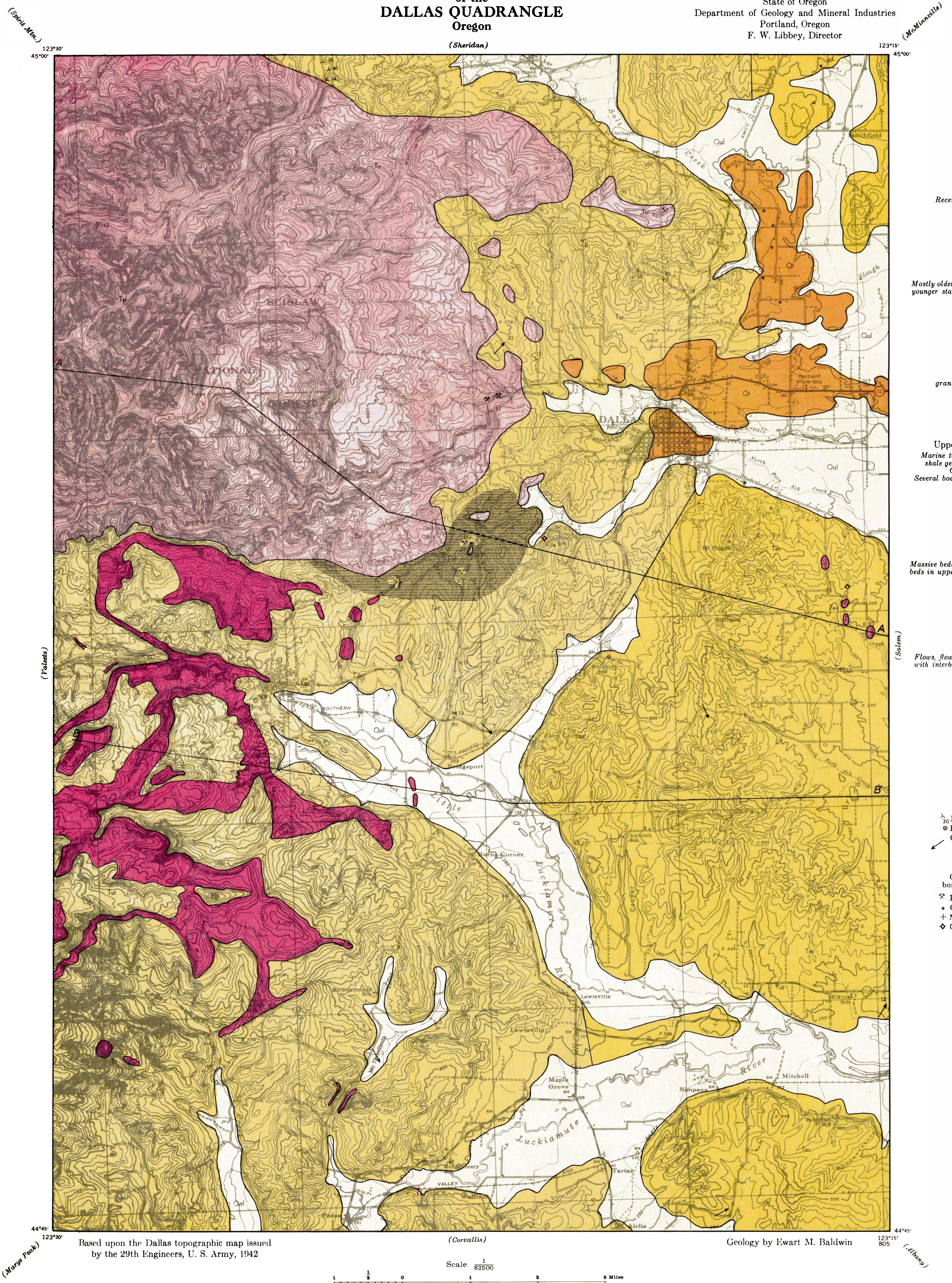




Generalized Structural Sections

Reconnaissance Geologic Map
of the
DALLAS QUADRANGLE
Oregon

Issued by
State of Oregon
Department of Geology and Mineral Industries
Portland, Oregon
F. W. Libbey, Director



EXPLANATION

Alluvium (Qal) — RECENT
Recent stream deposits, including some Willamette silts.

UNCONFORMITY

Terrace gravels (Qt) — PLEISTOCENE
Mostly older weathered gravels, may also include some younger stained gravels of intermediate age in lower terraces bordering alluvium.

UNCONFORMITY

Sills and dikes (Ti) — UPPER OLIGOCENE
Granophyric gabbro sills and granophyric diorite and gabbro dikes.

Upper Eocene sediments and basalt (Tes, Tev) — UPPER EOCENE
Marine tuffaceous sandstone, sandy siltstone, and shale generally equivalent in age to the Cowlitz, Coaledo, and Spencer formations. Several bodies of basalt which appear to be flows are included.

UNCONFORMITY

Umpqua-Tyee series (Tut) — MIDDLE EOCENE
Massive bedded sandstone in basal part; more argillaceous beds in upper part. Limestone lenses in basal part of the series are shaded.

UNCONFORMITY (?)

Siletz River volcanic series (Tsr) — MIDDLE EOCENE
Flows, flow breccia, pillow lava, agglomerate, and tuff with interbedded tuffaceous sediments, much of it of submarine origin.

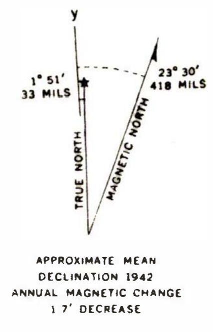
Attitude of the bedded rocks

- 30 Dip and strike
- ⊕ Horizontal beds
- General trend of dip

Formational contacts

Contacts are approximate, especially those bordering the intrusive rock.

- Rock quarry
- Glacial erratics
- Megafossil localities
- Oil tests



Based upon the Dallas topographic map issued by the 29th Engineers, U. S. Army, 1942

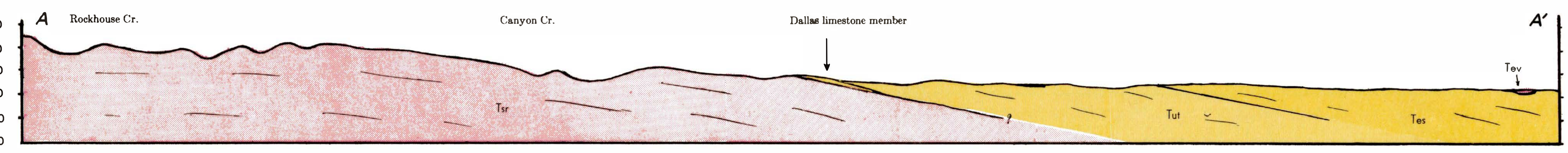
Geology by Ewart M. Baldwin

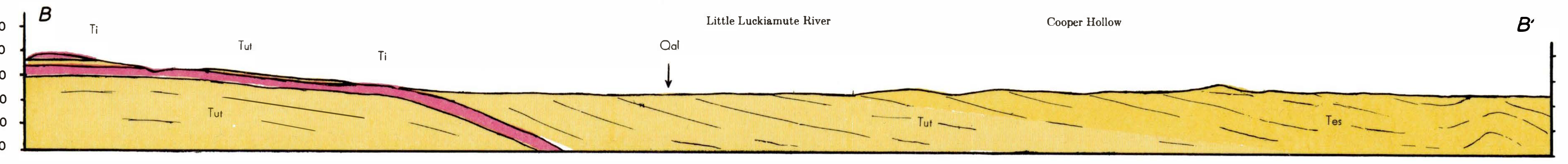
Scale $\frac{1}{62500}$

1 ½ 0 1 2 3 Miles

Contour interval 50 feet
Datum is mean sea level (1929 Adj.)

1947

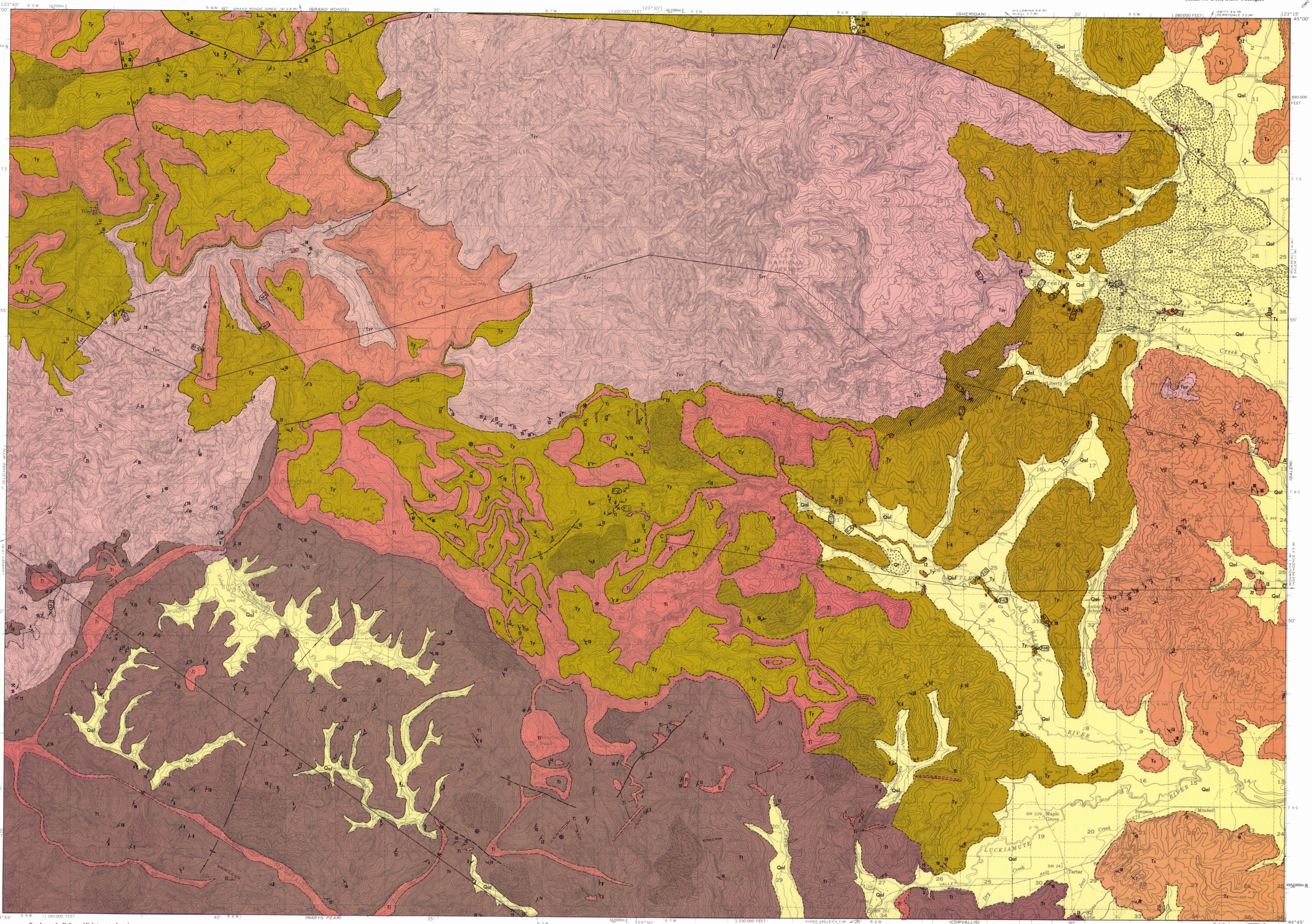




Generalized Structural Sections

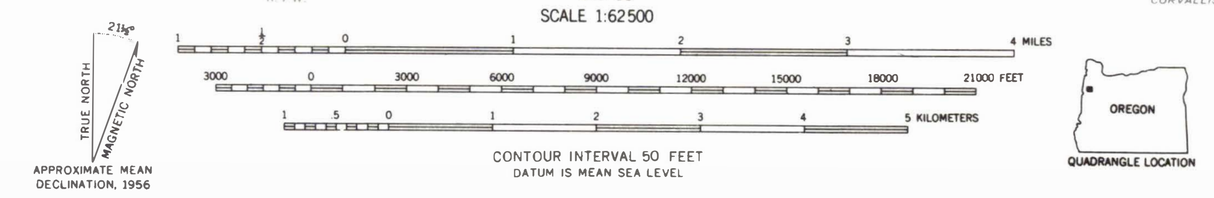
GEOLOGIC MAP
of the
DALLAS-VALSETZ QUADRANGLES
OREGON

Issued by
State of Oregon
Department of Geology and Mineral Industries
Portland, Oregon
Hollis M. Dole, State Geologist



Based upon the Dallas and Valsetz maps, Issued by the U. S. Geological Survey, 1957.

Geology by Ewart M. Baldwin, 1964



EXPLANATION

PLEISTOCENE — RECENT

Qal — **Alluvium**
Recent stream deposits including some silts.

PLEISTOCENE — MIDDLE PLEISTOCENE AND RECENT

Qt — **Terrace gravels**
Mostly older weathered gravels; may also include some younger stained gravels of intermediate age in lower terraces bordering alluvium.

OLIGOCENE-MIOCENE

Ti — **Gabbro and diorite intrusives**
Granophyric gabbro sills and granophyric diorite and gabbro dikes.

EOCENE — LATE

Ts — **Spencer Formation**
Marine tuffaceous sandstone and silty sandstone. Several bodies of basalt which appear to be flows included.

EOCENE — MIDDLE AND LATE

Ty (Rickreall Limestone) — **Yamhill Formation**
Medium-gray marine siltstone with intercalated sandstone. Rickreall Limestone Member in basal part of the formation.

EOCENE — MIDDLE

Tt — **Tyee Formation**
Rhythmically bedded micaceous arkosic sandstone and sandy siltstone.

EOCENE — EARLY TO MIDDLE

Tsv (sedimentary rock) — **Siletz River Volcanics**
Thick sequence of basalt flows, pillow lavas, flow breccias and pyroclastic rocks with a minor amount of marine tuffaceous sedimentary rock in uppermost part of the formation.

Landslide

Limestone

Contact
Contacts are approximate, especially those bordering the intrusive rock.

Dip and Strike

Horizontal beds

Dam

Well

Glacial erratic

FOSSIL LOCALITIES

F-2 *Micro*

M-6 *Mega*

GENERALIZED GEOLOGIC SECTIONS