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DESCRIPTION OF MAP UNITS

Qs — SEDIMENTARY DEPOSITS--Alluvium, morainal and glacial outwash material, and gravel, sand and silt deposited by Missoula floods. Locally includes loess of Palouse Formation. More extensive than shown; generally mapped only where important bedrock relations are obscured

Qls — LANDSLIDE DEPOSITS--Poorly sorted chaotic deposits, generally with hummocky topography. Mostly along contact of poorly lithified or clay-rich sediments and overlying flows of Grande Ronde or Wanapum Basalt. Includes deposits of block slides

Qba — ANDESITE AND BASALT--Flows of olivine basalt and andesite erupted in the Cascade Range, chiefly from Mount Adams and the King Mountain and Indian Heaven fissure zones (Hammond and others, 1976). Includes Tieton Andesite and overlying flows of olivine basalt in the Tieton and lower Naches River drainages (Becraft, 1950; Swanson, 1978). Mostly younger than about 700,000 yrs (Hammond and others, 1976), but Tieton Andesite has K-Ar age of about 1 m.y. (Kienle and others, 1979)

QTs — LOESS AND RINGOLD FORMATION--Mostly loess of Palouse Formation, but locally includes fine sand, silt, and stream gravel possibly correlative to Ringold Formation. More extensive than shown; mapped only where important bedrock relations are obscured. Subdivided in places in Pasco Basin into two units:

Qlo — Loess--Mostly of late Pleistocene and Holocene age

QTr — Ringold Formation--Fluvial and lacustrine deposits. Mostly Pliocene on basis of vertebrate fossils (Fry and Gustafson, 1974; Gustafson, 1978)

QTg GRAVEL AND CONGLOMERATE--Unconsolidated to weakly consolidated gravel. Composed mostly of clasts derived from Columbia River Basalt Group, but locally contains rocks derived from older units. Includes Thorp Gravel (Waitt, 1979) in Kittitas Valley, Cowiche gravel of Smith (1903) in Cowiche and Ahtanum Creek drainages, and fan, pediment, and high-level terrace gravel elsewhere. Probably mostly Pliocene. Fission-track dates from Thorp Gravel are about 3.7 m.y. (Waitt, 1979)

QTb OLIVINE BASALT--Principally olivine basalt flows and cinder of the Simcoe Mountains volcanic area (Sheppard, 1967) in the southwest part of the Yakima Indian Reservation and in the Goldendale area (Sylvester, 1978). Includes olivine basalt flow and cinder on Bethel Ridge north of Rimrock Lake (Swanson, 1978) and flows erupted from numerous vents in the Cascade Range north of the Columbia River (Hammond, 1980). Probably mostly Pliocene. Potassium-argon dates for flows in Goldendale area range from about 0.9 to 4.5 m.y. (Kienle and others, 1979). Locally includes flows, tuffs, and small intrusive bodies of andesitic, dacitic, and rhyolitic compositions (Sheppard, 1967)

YAKIMA BASALT SUBGROUP OF COLUMBIA RIVER BASALT GROUP--See Swanson and others (1979a) for more complete descriptions of most units

SADDLE MOUNTAINS BASALT--Includes:

Tl Lower Monumental Member--Nearly aphyric basalt flow or flows partly filling ancestral Snake and Clearwater River valleys near Lewiston, Idaho. Olivine visible with hand lens. Lower Monumental chemical type (Wright and others, 1979; Swanson and others, 1979a). Normal magnetic polarity (Choiniere and Swanson, 1979). Potassium-argon age about 6 m.y. (McKee and others, 1977)

Ice Harbor Member--Porphyritic basalt flows erupted from fissures just east of Pasco Basin (Swanson and Helz, 1979). Potassium-argon age about 8.5 m.y. (McKee and others, 1977). Occurs only in Pasco Basin. Subdivided into two map units:

Tim — Basalt of Martindale--Contains single phenocrysts and clots of plagioclase, clinopyroxene, and olivine. Martindale chemical type (Helz, 1978). Reversed magnetic polarity (Choiniere and Swanson, 1979)

Tib — Basalt of Basin City--Contains single phenocrysts and clots of plagioclase and olivine but no clinopyroxene. Basin City chemical type (Helz, 1978). Normal magnetic polarity (Choiniere and Swanson, 1979)

Tem — Elephant Mountain Member--Nearly aphyric basalt flows of Elephant Mountain chemical type (Wright and others, 1973). Normal to transitional magnetic polarity (Rietman, 1966; Choiniere and Swanson, 1979). Potassium-argon age about 10.5 m.y. (McKee and others, 1977). Occurs extensively in southwest quarter of map area and as isolated remnants of an intracanyon flow south and southeast of Lewiston, Idaho

Tsc — Basalt of Swamp Creek--Medium- to coarse-grained basalt flow with abundant groundmass olivine, common olivine phenocrysts 10 mm across, and sparse plagioclase phenocrysts a few millimeters long. Chemically distinct from most other flows of Columbia River Basalt Group (V. E. Camp, unpub. data, 1979). Normal magnetic polarity. Occurs only north of Dworshak Reservoir in the Clearwater embayment of Idaho. Younger than basalt of Weippe, but upper age limit unknown

Tcg

Basalt of Craigmont--Fine- to medium-grained basalt flow with scattered plagioclase phenocrysts as long as 10 mm. Chemically distinct from most other flows in Columbia River Basalt Group (V. E. Camp, unpub. data, 1979). Normal magnetic polarity. Occurs only in southeast part of Clearwater embayment. Upper age limit unknown. Possible feeder dike occurs in mapped area in sec. 1, T. 31 N., R. 5 E., and other feeders occur south of mapped area

Tgv

Basalt of Grangeville--Medium- to coarse-grained basalt flow with sparse plagioclase phenocrysts less than 7 mm long and abundant, commonly altered, olivine phenocrysts and microphenocrysts. Bears some resemblance chemically to Pomona and Dodge chemical types (V. E. Camp, unpub. data, 1979). Reversed magnetic polarity. Occurs only in southeast part of Clearwater embayment. Feeder dike occurs in Rocky Canyon (T. 30 N., R. 1 E.), just south of mapped area (P. Hooper, C. Knowles, and J. Bond, oral commun., 1979). Equivalent to the Amphitheater flow of Bard (1978)

Tif

Basalt of Icicle Flat--Medium- to coarse-grained phyric basalt flow containing abundant plagioclase phenocrysts as long as 15 mm and scattered olivine phenocrysts. Abundant groundmass olivine. Major-element chemistry similar to Dodge chemical type (V. E. Camp, unpub. data, 1979). Normal magnetic polarity. Occurs only in southeast part of Clearwater embayment. Underlies basalt of Craigmont, overlies thick saprolite developed on Asotin Member

Tp — Pomona Member--Slightly phyric basalt flow of Pomona chemical type (Wright and others, 1973. Contains small phenocrysts of plagioclase, clinopyroxene, and olivine. Reversed magnetic polarity (Rietman, 1966; Choiniere and Swanson, 1979). Potassium-argon age about 12 m.y. (McKee and others, 1977). Occurs extensively in southwest quarter of mapped area. Locally occurs as intracanyon flow along Yakima Ridge and along the Snake River south of Lewiston, Idaho

Twe — Basalt of Weippe--Medium- to coarse-grained flow of Pomona chemical type. Petrographically similar to Pomona Member. Reversed magnetic polarity. Feeder dikes form a linear system east and northeast of Orofino, Idaho, in the drainage of the North Fork of the Clearwater River. Probably equivalent to Pomona Member, but mapped separately because the easternmost outcrops of the Pomona, in the Lewiston basin, are 35 km west of the westernmost outcrops of the basalt of Weippe

Te — Esquatzel Member--Phyric basalt flow of Esquatzel chemical type (Swanson and others, 1979a; Wright and others, 1979). Plagioclase and clinopyroxene phenocrysts and glomerocrysts less than 5 mm across are irregularly distributed in flow. Normal magnetic polarity (Choiniere and Swanson, 1979). More than one flow may be present in places. In mapped area occurs only in Pasco Basin and as remnants of a valley-filling flow west of the basin

Tic — Intracanyon basalt--Plagioclase-phyric flow partly filling canyon of ancestral Snake River in Lewiston basin near Asotin, Washington. Some phenocrysts as long as 10 mm. Similar to Frenchman Springs chemical type in major elements but different in trace elements (Wright and others, 1979). Reversed magnetic polarity (Choiniere and Swanson, 1979). Potassium-argon age about 12.5 m.y. (E. H. McKee, written commun., 1978)

Twl — Weissenfels Ridge Member--In mapped area, consists of relatively coarse-grained, sparsely plagioclase-phyric basalt flow termed the basalt of Lewiston Orchards (Camp, 1976; Swanson and others, 1979a). Olivine visible in hand specimen. Normal magnetic polarity. Found only southeast of Lewiston, Idaho. Lewiston Orchards chemical type (Swanson and others, 1979a; Wright and others, 1979)

Tslk — Basalt of Sprague Lake--Sparsely plagioclase-phyric flow or flows occupying shallow ancient valley eroded into Priest Rapids Member in the Lamont-Sprague area southwest of Spokane. Chemically distinct from most other flows of Columbia River Basalt Group (T. L. Wright and D. A. Swanson, unpub. data, 1978). Normal magnetic polarity. Age uncertain, but possibly equivalent to Weissenfels Ridge Member on basis of some chemical resemblance

Ta — Asotin Member--Sparsely plagioclase- and olivine-phyric, commonly ophitic basalt flow of Asotin chemical type (Camp, 1976; Swanson and others, 1979a; Wright and others, 1979). Normal magnetic polarity. Occurs extensively in the Clearwater embayment east of Lewiston, Idaho. Includes the Huntzinger flow of Mackin (1961) in the Saddle Mountains, Pasco Basin, and along Yakima Ridge

Tawg — Asotin Member and basalts of Weippe and Grangeville, undivided--Shown only where map scale and steep topography prohibit separation

Tw — Wilbur Creek Member--Fine-grained, sparsely plagioclase-phyric basalt flows of Wilbur Creek chemical type (Swanson and others, 1979a; Wright and others, 1979). Normal magnetic polarity. Mapped in the Clearwater embayment, in the Pasco Basin, and as a valley-filling flow west of the Pasco Basin. In the Clearwater embayment, uppermost flow of member mapped separately as:

Tla — Basalt of Lapwai--Fine- to medium-grained flow with higher MgO and lower SiO_2 than rest of member. Chemically intermediate between Wilbur Creek and Asotin chemical types. Contains rare small plagioclase and olivine phenocrysts. Field relations suggests source northeast of Orofino, Idaho

Tu — Umatilla Member--Fine-grained basalt flow or flows of Umatilla chemical type (Wright and others, 1973) and its variant, the Sopher Ridge chemical type (P. R. Hooper, unpub. data, 1979). Typified by very even grain size and near lack of phenocrysts. Normal magnetic polarity (Rietman, 1966). Occurs extensively in and west of Pasco Basin. Fills ancient canyon along south side of Yakima Ridge

WANAPUM BASALT--Includes:

Tpr — Priest Rapids Member--Fine- to coarse-grained basalt flows with reversed magnetic polarity (Rietman, 1966). Flows in northern part of mapped area are of Rosalia chemical type (Swanson and others, 1979a; Wright and others, 1979); such flows are nearly aphyric and contain groundmass olivine visible with hand lens in fine-grained samples. Flows east of the Saddle Mountains and south of a line between Othello and Sprague are of Lolo chemical type (Wright and others, 1973); such flows generally contain phenocrysts of olivine and commonly plagioclase. Flows of Lolo chemical type consistently overlie flows of Rosalia chemical type in the south-

west part of the mapped area (Horse Heaven Plateau and lower Yakima Valley), in the Saddle Mountains (Reidel, 1978b), and at Sprague Lake. Flows of Lolo chemical type are dominant in the Clearwater embayment, but flows of Rosalia type also occur. Feeder dikes for both chemical types occupy a north-northwest trending zone passing through Orofino, Idaho. A vent area for flows of Rosalia type occurs near Emida, Idaho; pyroclastic material from this vent was recognized by Bishop (1969) but interpreted as laharic debris. Commonly overlies and invades weakly lithified subarkosic sandstone, siltstone, and claystone near border of Columbia Plateau; these sedimentary rocks are generally unmapped because of scale. Dikes reported in Spokane area (Pardee and Bryan, 1926) are invasive flows (Byerly and Swanson, 1978) of Priest Rapids Member in Latah Formation. Whiskey Creek sills of Bond (1963) are likewise invasive flows of member. Interbedded with volcaniclastic rocks of Ellensburg Formation near Yakima

Tr

Roza Member--Basalt flows of Roza chemical type (Wright and others, 1973) that consistently contain several percent single, in places clotted, plagioclase phenocrysts averaging nearly 10 mm across and evenly distributed throughout most flows. In places, particularly northeast of Moses Lake, upper vesicular zone of a flow is very sparsely phyric or aphyric. Transitional magnetic polarity (Rietman, 1966) within mapped area, but this is unreliable criterion for field identification because of common overprint of present magnetic field. Consists of one or two flows throughout most of mapped area; three flows may occur in Wilson Creek-lower Grand Coulee area (Lefebvre, 1970). Difficult to distinguish from some porphyritic flows in Frenchman Springs Member in places, especially

near Soap Lake. Invasive into diatomite south of Quincy and in Frenchman Hills. Vent areas near Macall and Revere form northernmost known segment of linear vent system more than 150 km long (Swanson and others, 1975). Member observed to pinch out between Rock and Bonnie Lakes southwest of Spokane, at several places near Columbia River north of Wilbur, and in places in the west part of the mapped area between Yakima and Lyle .

Tprz Priest Rapids and Roza Members, undivided--Shown only where map scale and steep topography prohibit separation

Tf Frenchman Springs Member--Basalt flows of Frenchman Springs chemical type (Wright and others, 1973). Many flows contain irregularly distributed plagioclase glomerocrysts as much as 50 mm across, but some flows, particularly the younger ones, are virtually aphyric. Generally fine- to medium-grained. Normal magnetic polarity (Rietman, 1966). Overlies subarkosic sandstone and siltstone of Vantage Member of Ellensburg Formation (unmapped im most places) along Columbia River; the Vantage thins away from the Columbia and is absent or generally less than 0.5 m thick near the crest of the Wenatchee Mountains, in Moses Coulee and lower Grand Coulee, and along Crab and Wilson Creeks. South of Quincy, Frenchman Springs Member underlies unmapped diatomite (Squaw Creek Member of Ellensburg Formation). Occurs widely in southwest part of mapped area, where member overlies thin volcaniclastic interbed (Vantage Member) or rests directly on weathered surface of Grande Ronde Basalt. Isolated outcrops of member occur north of Surveyors Creek (Klickitat River drainage) and in Columbia Gorge northeast of Cape Horn

Tprf — Priest Rapids, Roza, and Frenchman Springs Members, undivided--Shown only where map scale and steep or complex topography prohibit separation

Trf — Roza and Frenchman Springs Members, undivided--Shown only where map scale and steep topography prohibit separation

Tfc — Basalt of Feary Creek--Two or more fine- to medium-grained basalt flows containing scattered plagioclase phenocrysts as long as 10 mm and common groundmass olivine. Invasive into subarkosic sandstone and siltstone. Similar chemically to Frenchman Springs chemical type except for lower P_2O_5 (V. E. Camp, unpub. data, 1979). Normal magnetic polarity. Occurs only west of Headquarters, Idaho, in drainage of North Fork of Clearwater River. Underlies Wilbur Creek Member of Saddle Mountains Basalt and probably overlies Grande Ronde Basalt. Possibly correlative with Frenchman Springs Member but could be younger. Feeder dike occurs along Snake Creek in sec. 26, T. 38 N., R. 4 E.

To — Basalt of Onaway--Several thin, sparsely to highly plagioclase-phyric, basalt flows with chemical compositions generally higher in TiO_2 than most other flows in the Columbia River Basalt Group (V. E. Camp, unpub. data, 1979). Occurs in west part of Clearwater embayment. Several vents occur within area of outcrop; in addition, large blocks of highly plagioclase-phyric basalt at high elevations east of Garfield, Washington and on Basalt Hill in the Moscow Mountains may represent eroded remnants of dikes. Both reversed and normal magnetic polarity, although all flows in mapped area are normal. Stratigraphic position of unit poorly known, as field relations are ambiguous. Chemical analyses of chips from boreholes in the Pullman-Moscow basin suggest that the unit interfingers with Priest Rapids Member (J. C. Brown and V. E. Camp, unpub, data, 1979). Unit includes at least three

thin flows above Priest Rapids Member about 8 km northeast of Culdesac, Idaho; these flows are chemically different from most other flows in the unit but occur along the projected trend of the vent system for the unit. Includes:

Tpl — Basalt of Potlach--Medium- to coarse-grained basalt flow with numerous plagioclase phenocrysts as long as 10 mm. Normal magnetic polarity. Prominent flow along Palouse River south and east of Potlach, Idaho

Ted — Eckler Mountain Member--In mapped area, consists of one or more coarse-grained, sparsely plagioclase-phyric basalt flows of Dodge chemical type (Swanson and others, 1979a; Wright and others, 1979) first recognized by Griggs (1976; his low-Fe Picture Gorge type flows) in St. Maries River drainage of northern Idaho. Probable vent area occurs in T. 43 N., R. 2 W. north of Clarkia. Less porphyritic than most flows in the basalt of Dodge (Swanson and others, 1979a) in southeast Washington and northeast Oregon. Overlies subarkosic sandstone in places

GRANDE RONDE BASALT--Basalt flows, aphyric to very sparsely plagioclase-phyric, comprising tnickest and most voluminous formation in Columbia River Basalt Group. Generally fine-grained and petrographically non-distinctive. A few flows in lower reversely magnetized part of section (R_1 of Swanson and others, 1979a) in Clearwater embayment contain numerous plagioclase phenocrysts. Chemical composition varies within a broad field now termed Grande Ronde chemical type (Yakima chemical type of Wright and others, 1973). In western part of mapped area, flows of high-Mg Grande Ronde chemical type generally overlie somewhat finer-grained flows of low-Mg type in upper normally magnetized (N_2) part of section. Flows range in

thickness from less than 1 m to more than 50 m but are generally between 15 and 25 m. Many flows near margin of Columbia Plateau are invasive into interbedded subarkosic sediments, forming sill-like bodies such as the Hammond sill of Hoyt (1961; Byerly and Swanson, 1978; Swanson and Wright, 1978); such invasive flows are as much as 120 m thick. Covers and laps out on rugged topography developed on older rocks around margins of Columbia Plateau, where flows are commonly pillowed. Divided into magnetostratigraphic units on basis of dominant magnetic polarity:

Tgn_2	Upper flows of normal magnetic polarity-- Magnetostratigraphic unit N_2
Tgr_2	Upper flows of reversed magnetic polarity-- Magnetostratigraphic unit R_2
Tgn_1	Lower flows of normal magnetic polarity-- Magnetostratigraphic unit N_1
Tgr_1	Lower flows of reversed magnetic polarity-- Magnetostratigraphic unit R_1

Ti IMNAHA BASALT--Basalt flows conformably underlying Grande Ronde Basalt in Clearwater embayment. Generally coarse-grained, grusy-weathering, and plagioclase-phyric with phenocrysts between 5 and 25 cm in length. Normal magnetic polarity in mapped area. Generally equivalent to lower basalt of Bond (1963). Chemically distinct from Grande Ronde Basalt, as shown by average analyses obtained by P. R. Hooper in Swanson and others (1979a)

ELLENSBURG AND DALLES FORMATIONS--Weakly lithified sedimentary rocks interbedded with and overlying Columbia River Basalt Group in western part of Columbia Plateau. Mapped only where thickness or exposed area is large. Subdivided into three units:

Tse Subarkosic deposits--Fluvial and lacustrine sandstone, siltstone, and lesser claystone and conglomerate, consisting chiefly of detritus eroded from rocks older than Columbia River Basalt Group. Mainly found

along present or inferred ancestral course of Columbia River northeast of Kittitas Valley and east of the Hog Ranch axis of Mackin (1961). Commonly host to invasive flows of Grande Ronde Basalt and Priest Rapids Member of Wanapum Basalt. In Goldendale area, unit contains significant component of volcanic detritus, as in unit Tsev. Interbedded with flows as old as those in unit Tgn_1 in Tieton River area and along Naneum Creek north of Ellensburg, but too thin to show on map in those areas

Tsev — Volcaniclastic deposits--Well to poorly sorted, weakly lithified andesitic to rhyolitic detritus erupted from volcanoes in Cascade Range and transported into area by water, mudflows, air, and locally pyroclastic flows. In mapped area north of lat $46^{\circ}30'$, generally confined to area west of Hog Ranch axis of Mackin (1961); a major exception is the volcaniclastic deposit in the Beverly Member of Ellensburg Formation in the Sentinel Gap area, possibly derived from eruptions associated with emplacement of andesite plugs of unit Tia up the Columbia River near Wenatchee. Unit is thickest between Naches River and Wenas Creek, type locality of Ellensburg Formation, where most of unit is younger than Pomona Member of Saddle Mountains Basalt. Also occurs as thin, generally unmapped interbeds between flows of Columbia River Basalt Group as old as those of unit Tgr_2

Tss — Conglomerate of Snipes Mountain--Weakly consolidated river gravel and sand containing abundant quartzite and metavolcanic clasts. Interpreted as channel deposit of ancestral Columbia River in post-Elephant Mountain Member time. Occurs on Snipes Mountain near Sunnyside, across Horse Heaven Hills and Plateau, and into the Goldendale area. Locally includes volcaniclastic detritus, and may grade laterally into units Tse and Tsev

Tsg STREAM GRAVEL--Moderately lithified stream gravel associated with valley-filling flows of Saddle Mountains Basalt in Clearwater embayment of Idaho. Gravel is composed dominantly of clasts derived from Columbia River Basalt Group. Generally stained with iron oxides and friable. Includes Clarkston gravels of Lupher (1945) near Lewiston, Idaho

Tsl LATAH FORMATION--Weakly lithified, fluvial and lacustrine subarkosic sandstone, siltstone, and claystone in Spokane area. Interbedded throughout section of Columbia River Basalt Group (Griggs, 1976, fig. 6); thickest deposit occurs between Grande Ronde Basalt and Priest Rapids Member of Wanapum Basalt. Host to numerous invasive flows

Ts SANDSTONE AND SILTSTONE--Moderately well lithified arkosic to subarkosic deposits underlying locally oldest flow of Grande Ronde Basalt along Columbia River north of Wilbur. Sandstone is commonly crossbedded; siltstone is leaf bearing. At least 20 m thick where mapped, but thinner unmapped deposits occur in many places along northern margin of Columbia Plateau. Apparently conformable with overlying basalt. May be coeval with lower part of Ellensburg and Latah Formations

Tia ANDESITE--Hornblende andesite plugs on and north of Burch Mountain north of Wenatchee. Petrographically similar to volcanic rocks in Ellensburg Formation. Potassium-argon age about 11 m.y. (R. W. Tabor, oral commun., 1978). May be source of volcanic debris in Beverly Member of Ellensburg Formation between Elephant Mountain and Pomona Members at Sentinel Gap along Columbia River (Grolier and Bingham, 1978)

Tmv MIOCENE VOLCANIC ROCKS--Basaltic andesite, andesite, and lesser dacite and rhyolite flows and breccias in Cascade Range. Underlies Grande Ronde Basalt with erosional and in places angular unconformity. Mainly the Fifes Peak Formation, but includes the Eagle Creek Formation, lava flows of Council Bluff (Hammond and others, 1976; Hammond, 1980) and the flows of Three Corner Peak (Hammond, 1980). Potassium-argon and

fission track ages indicate middle and early Miocene age (Hartman, 1973; Vance and Naeser, 1977; Hammond and others, 1977). May include some volcanic rocks of Oligocene age

Tov OLIGOCENE VOLCANIC ROCKS--Includes flows, tuffs, and breccias, mostly andesitic and dacitic, in Ohanapecosh and Stevens Ridge Formations as well as unnamed andesitic to rhyolitic breccia and tuff. Generally zeolitized. Fission track ages are early to late Oligocene (Vance and Naeser, 1977)

Tos OLIGOCENE SEDIMENTARY ROCKS--Chiefly epiclastic sandstone, shale, and conglomerate of Wenatchee formation of Gresens (1976) in Wenatchee area (Gresens and others, 1977)

Tev EOCENE VOLCANIC ROCKS--In western part of mapped area, includes Teanaway Basalt, Taneum Andesite, basalt of Frost Mountain (Tabor and others, in press), rhyolite flows and tuff, and Naches formation of Stout (1964). In northeast part of mapped area, includes the Sanpoil Volcanics (Pearson and Obradovich, 1977) in a north-northwest trending zone along and north of the lower part of the Spokane River. In western Idaho, includes the Kamiah Volcanics of Anderson (1930), volcanic rocks at Potato Hill north of Deary, and a dacite(?) south of Princeton

Tes EOCENE SEDIMENTARY ROCKS--Includes Roslyn and partly correlative Chumstick Formations (Tabor and others, in press; Gresens and others, 1977), Swauk Formation, and, southwest of Kittitas Valley, Manastash Formation. Chiefly subsrkosic sandstone

Tdu BASALT DIKES, UNDIVIDED--Fresh to slightly altered, medium- to coarse-grained basalt in dikes cutting rocks older than Columbia River Basalt Group and chemically unlike flows in the group. May be older than the group, or may have been intruded during Columbia River basalt time without feeding lava flows. Mapped only in east part of Clearwater embayment

Td DIABASE DIKES--Mapped only in two dikes north of Clarkia, Idaho (Hietanen, 1963). Amphibole-bearing. Probably early Tertiary and unrelated to the Columbia River Basalt Group

Tiu INTRUSIVE ROCKS, UNDIVIDED--Fine- to medium-grained, commonly porphyritic, generally mafic plugs, dikes, and irregular intrusive bodies. May in part be equivalent to the large batholithic complexes in unit TMzg. In Cascade Range, probably form subvolcanic bodies associated with lower and middle Tertiary volcanism

TMzg PLUTONIC ROCKS--Coarse-grained granitoids, chiefly granodiorite and quartz monzonite, associated with large batholithic complexes in the crystalline terrain along the northern and eastern margins of the Columbia Plateau. Includes outliers of the Idaho Batholith. Probably mostly of Cretaceous and Eocene age

MzPzg PLAGIOGRANITE--Highly sheared tonalite and trondhjemite near Rimrock Lake west of Yakima (Swanson, 1978). In fault contact with surrounding rocks

MzPzm METAMORPHIC ROCKS--Chiefly high-grade gneiss, schist, amphibolite, and foliated quartzite. Includes the Swakane Biotite Gneiss between Wenatchee and Entiat and the Methow Gneiss near Pateros north of Lake Chelan. Also includes relatively low-grade metamorphic rocks, particularly greenstone, of the Paleozoic Corvada Group north of mouth of Spokane River (Campbell and Raup, 1964) and metasedimentary rocks of probable Paleozoic age northwest and south of Rearden, Washington (Griggs, 1973; Becraft and Weis, 1963)

MzPzmc CHELAN BATHOLITHIC COMPLEX--Granodiorite and quartz monzonite plutons, migmatite, and gneiss near Chelan, Washington

Ps RUSSELL RANCH FORMATION--Graywacke and lesser greenstone near Rimrock Lake west of Yakima. Age based on fossils found in limestone in float and thus questionable (Ellingson, 1972)

MDs LIMESTONE AND DOLOMITE--Mapped only in small areas near Valley north of Spokane River (Miller and Clark, 1975)

Os LIMESTONE AND SLATE--Mapped in small area east of Columbia River near north edge of mapped area (Campbell and Raup, 1964)

Cs MARINE SEDIMENTARY ROCKS--Includes Metaline Formation (limestone and dolomite), Maitlen Phyllite, Gypsy Quartzite, Addy Quartzite, Lakeview Limestone, Rennie Shale, and Gold Creek Quartzite. Crops out mainly in northeast-trending belts north of Spokane River and in fault-bounded flocks along Lake Pend Oreille

pCw WINDERMERE GROUP--Greenstone and conglomerate of the Huckleberry Formation northwest of Valley (Miller and Yates, 1976)

pCb BELT SUPERGROUP, UNDIVIDED--Chiefly argillite and quartzite. Metamorphosed to schist and gneiss in places, such as east of Spokane (Griggs, 1973) and in border zone of Idaho Batholith (Hietanen, 1963). Includes mafic sills of Precambrian age, locally metamorphosed to amphibolite

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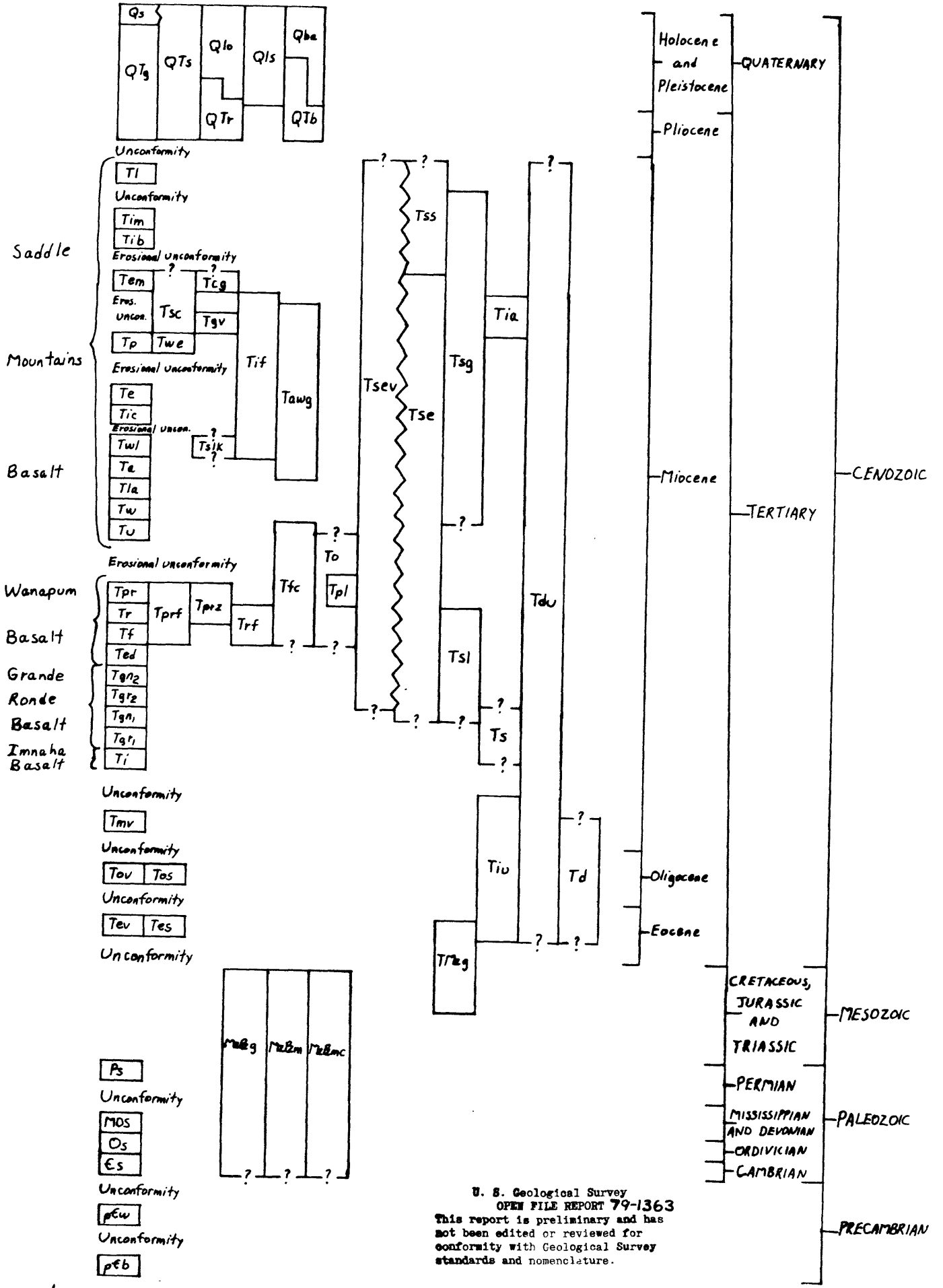
CORRELATION OF MAP UNITS



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EXPLANATION

Contact, approximately located; dotted where concealed

Fault, dashed where approximately located; dotted where concealed

High-angle fault; bar and ball on downthrown side where known

Thrust fault; sawteeth on upper plate

Strike-slip fault, showing relative horizontal movement

Oblique-slip fault, showing relative horizontal and vertical movement

Fold, showing direction of plunge if any; dashed where approximately located; dotted where concealed

Crestline of upright anticline

Crestline of overturned anticline

Troughline of syncline

Monocline, dashed where approximately located; dotted where concealed

Abrupt decrease in dip in direction of arrows

Abrupt increase in dip in direction of arrows

Prominent regional joints visible on air photos near Cheney, Washington

Prominent photo or topographic lineament, possibly a strike-slip fault

Attitude

25 Strike and dip

Horizontal

80 Overturned

Tr Vent area with map symbol of unit in vent

Twe Dike with map symbol of unit fed by dike