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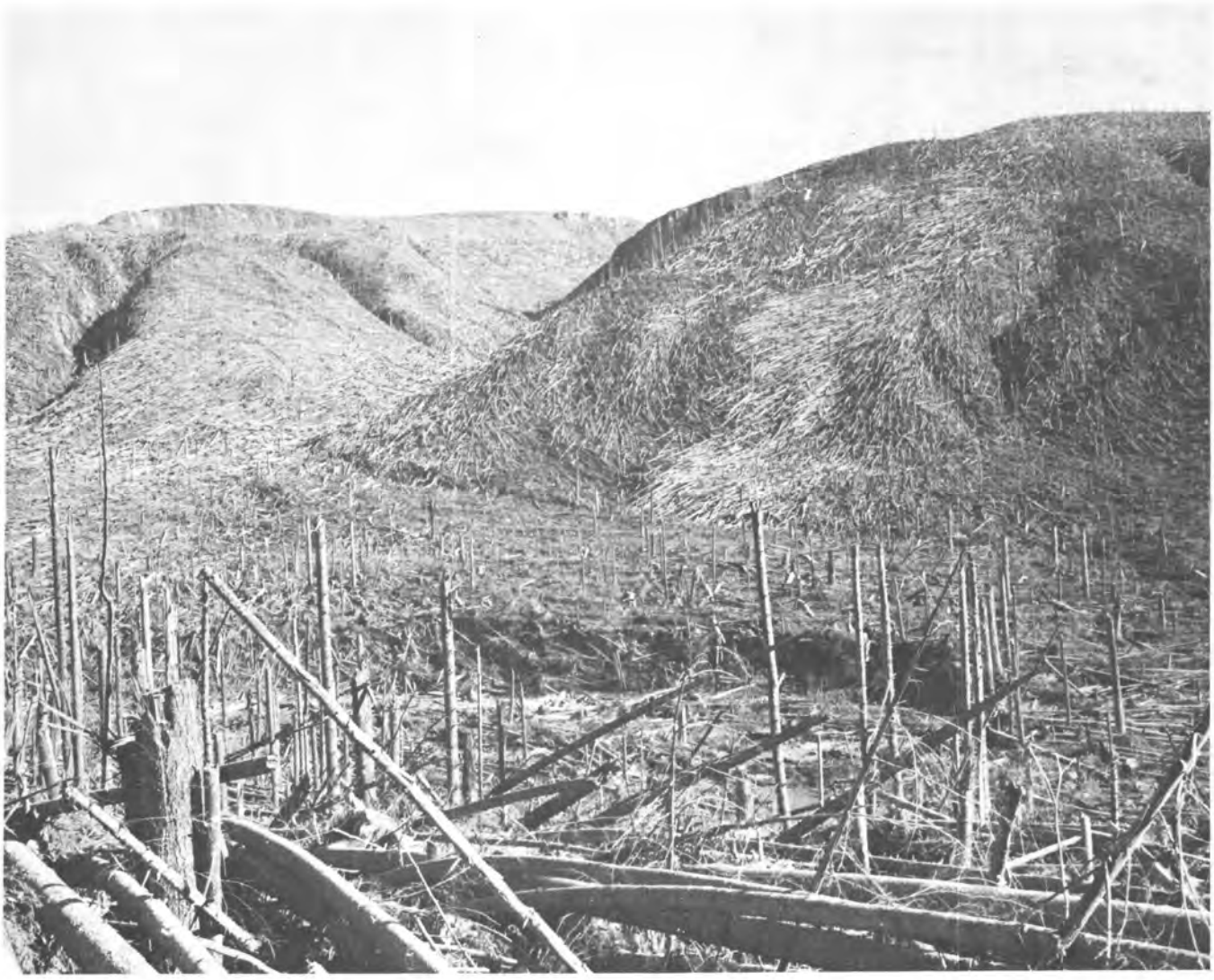

Large area of timber blowdown in Green River drainage
14 miles north of Mount St. Helens

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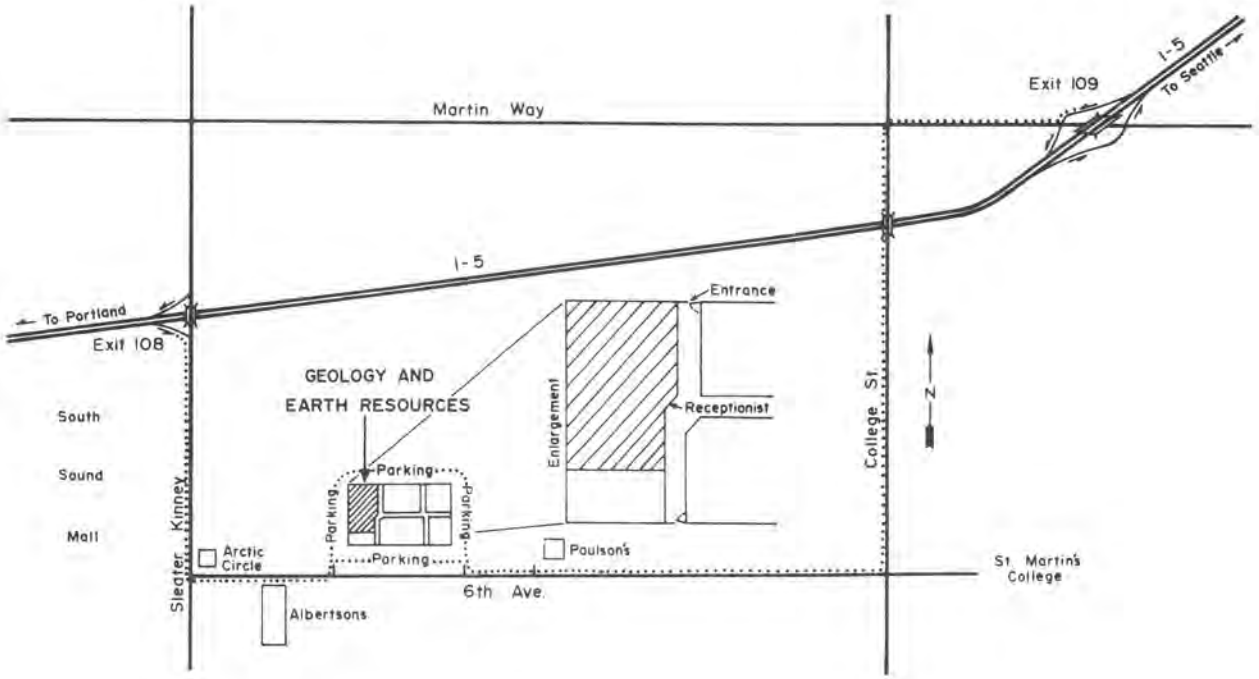

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DIVISION WILL HAVE NEW PHONE NUMBER IN SEPTEMBER

The Olympia office of the Division of Geology and Earth Resources phone number will be changed in September to:

(206) 459-6372

The Washington Geologic Newsletter, a quarterly report of geologic articles, is published by the Division of Geology and Earth Resources, Department of Natural Resources. The newsletter is free upon request.

The division also publishes bulletins, information circulars, and geologic maps. A list of these publications will be sent upon request.

INFILTRATION RATES OF UNDISTURBED AND DISTURBED MOUNT ST HELENS TEPHRA DEPOSITS[1/]

by

Allen J. Fiksdal

The May 18, 1980 eruption of Mount St. Helens wreaked havoc on the forested terrain north and west of the mountain. The tephra deposits resulting from the blast and eruption covered the area's forested slopes with up to a meter of ash in some places. The ash restricted infiltration of rainfall into the slopes, causing rapid runoff and erosion problems throughout the area.

In the Shultz Creek drainage, 20 km from the mountain's center, ash deposits ranged in depth from 3 cm to 30 cm, and often the ash depths change over a few meters distance. The stratigraphy of the tephra deposits in the Shultz Creek area is basically two distinct layers: coarse sand to sand-sized rock fragments from the initial lateral blast underlie a silty airfall ash.

Ash covered clearcut in Shultz Creek drainage. Photo taken June 1980.

Erosion of clearcut after one winter; extensive rill network has developed.

Average thicknesses of these deposits are approximately 14 cm of blast material and 6 cm of airfall ash.

Through late Spring of 1980, saturation by rainfall and subsequent drying throughout the summer resulted in the compacting of the silt layer of ash. This compaction led to very low infiltration rates. Some early tests of infiltration rates by the U.S. Geological Survey and the Washington Department of Natural Resources, Division of Geology and Earth Resources, found infiltration to average less than about 5 mm per hour.

In the summer of 1980, programs were set up to measure erosion in the blast area of Mount St. Helens by using erosion pins placed on a variety of slopes. Of interest was the

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[1/] From a paper presented at the Mount St. Helens-One Year Later Symposium, Eastern Washington University, May 19, 1981.

differences in erosion in areas that had, previous to the eruption, been clearcut and now covered with a blanket of ash, and those areas where forests had been blown down and ash deposited on them. In the late summer, salvage of some of the downed timber prompted interest in measuring erosion on the sites where timber had been removed and the layers of ash disturbed.

Preliminary results this spring revealed erosion rates were highest in areas of clearcuts, lower in areas of timber blowdown, and lowest in areas where the blowdown timber had been removed. These results indicated that timber removal reduced erosion on the sites measured.

Ash covered timber in Shultz Creek area.

Ash loss by erosion*

Clearcut	Down timber	Timber removed
420 meters^3/hectar (230 yards^3/acre)	260 meters^3/hectar (140 yards^3/acre)	90 meters^3/hectar (50 yards^3/acre)

*Preliminary data summarized from University of Washington and Department of Natural Resources studies.

Same area after timber was removed. Note large amount of organic debris left after timber removal.

Of interest still was what the actual infiltration capacity of these timber removal sites were. Interest in infiltration rates increased with the decision by the Washington State Department of Natural Resources to scarify (disrupt the stratigraphy by mixing the tephra layers with a bulldozer) some of their clearcut land to decrease erosion.

Experimentation using one square meter plots were devised to measure infiltration rates on different areas in the Shultz Creek drainage. Sites on undisturbed ash in clearcuts, on areas where timber had been removed, and on areas that had been scarified were selected. The tests entailed putting a controlled simulated rainfall on a plot and measuring runoff over time. The difference between the rate of rainfall and runoff indicated the infiltration rate.

These experiments were designed to be simple and inexpensive. Therefore, the findings are to be used only in general terms and are not to be considered specific. Infiltration on undisturbed ash varied between 2 mm to 11 mm per hour after saturation was attained. The large range in results was due to the fact that on one plot almost all of the silt-sized airfall ash had been removed allowing rapid infiltration of 11 mm/hr, while on another site 3 cm of silt overlay 12 cm of sand-sized blast deposits with an infiltration rate of 2 mm/hr. On the sites where timber had been removed infiltration increased significantly to approximately 28 mm/hr. This increase is judged to be due to basically three factors: (1) Mixture of the two tephra layers when the timber was removed; (2) heavy residual of organic debris inhibiting runoff by creating microponding and entrapment of the runoff; and (3) disruption of the surface texture and creation of many large and small depressions and ridges that acted with the organic matter to pond and inhibit runoff. Similar results were also found on slopes that had been scarified. Infiltration rates there varied from 10 mm/hr to 29 mm/hr. This large figure is again attributed to the mixing of the two tephra layers. Particularly the breakup of the surface silt ash that inhibited water movement.

Average infiltration rates

Undisturbed	Yarded	Scarified
6.5 mm/hr (.25 in/hr)	28 mm/hr (1.10 in/hr)	20 mm/hr (.79 in/hr)

In summary, general rates of approximately 2-10 mm/hr infiltration indicate a wide variability in the undisturbed areas of ash cover. The low rates of less than 5 mm/hr also explain the greater erosion rate found on these areas. Rates of 28 mm/hr on areas where timber has been removed indicate the ability of disturbed areas to handle a significant rainfall. The measured erosion rates bear out this finding. And infiltration rates averaging about 24 mm/hr for scarified slopes would indicate that these areas should not undergo significant erosion unless high rainfalls occur.

Maximum rainfall intensities in the Shultz Creek area over the 1980-81 winter were in the order of 6.6 to 9.4 mm/hr[1/]. These intensities (although very light) indicate the yarded timber's infiltration capacity was much higher than the rainfall over last winter and the clearcut areas marginal ability to infiltrate rainfall. Erosion results mirror the inability of the clearcut area to handle the heavy rainfall thus producing heavy runoff.

Maximum estimated rainfall intensities for the Shultz Creek area*

Yearly return					
2	5	10	25	50	100
14 mm	18 mm	20 mm	24 mm	28 mm	30 mm
.55 in	.70 in	.80 in	.95 in	1.10 in	1.18 in

* Miller and others (1973).

The above indicates that average infiltration capacities of ash in undisturbed areas is only 46 percent of the 2 year rainfall intensities and 22 percent of the 100 year intensities. However, disturbed ash could possibly be capable of handling up to a 50 year storm, and scarified areas up to a 10 year storm.

Reference

Miller, J. F.; Frederick, R. H.; Tracey, R. J., 1973, Precipitation-frequency atlas of the western United States, v. IX, Washington: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Atlas 2.

1/ Weyerhaeuser Corporation data.

GEOLOGIC RESEARCH PROJECTS

Geologic research activities conducted by colleges and universities on the geology of Washington State during 1980-1981 are listed below:

Centralia College

Faculty Research Project

Completion of a self-instructional module for a travel-oriented field trip in the Puget Lowland, north Cascades, and the Columbia Plateau (Bert Woodland).

Eastern Washington University

Faculty Research Projects

Geochemistry of granitic rocks of northeastern Washington (Mohammed Ikramuddin).

Geochemistry of the Sanpoil Volcanics and its relationship to gold-silver mineralization (Mohammed Ikramuddin).

Hydrogeochemical methods of exploration for gold and silver (Mohammed Ikramuddin).

Permian bryozoans of the carbonate units of the Mission Argillite, northeastern Washington (Ernest H. Gilmour).

Fumarole and geothermal ice cave monitoring, Mounts Rainier and Baker (Eugene P. Kiver).

Quaternary geology of the northeastern Columbia Plateau and terraces along the Spokane and Columbia Rivers upstream from Grand Coulee (Eugene P. Kiver and Dale F. Stradling).

Quaternary map of northeastern Washington east of the Okanogan River (Eugene P. Kiver and Dale F. Stradling).

Compilation of computer data base of whole-rock chemical analyses of igneous rocks from Washington (Felix E. Mutschler).

Major and trace element chemistry of "porphyry" molybdenum, tin-tungsten systems (Felix E. Mutschler).

Geologic map of the Inchelium quadrangle, Washington (James R. Snook).

Paleomagnetism of intrusive igneous rocks of northeastern Washington (William K. Steele).

Remanent magnetization of May 18, 1980 Mount St. Helens ash (William K. Steele).

Magnetic stratigraphy of Fargher Lake, Clark County, Washington (William K. Steele).

Student Research Projects

Geochemistry of alaskite and quartz monzonite of Mount Spokane, northeastern Washington, and its relation to uranium mineralization (Roy Bongiovanni).

Geochemistry of metapelites and calc-silicate hornfelses associated with uranium mineralization at the Midnite mine, northeastern Washington (Gin Chou).

Geomorphology and hydrology of the Latah Creek drainage, Spokane County (Robert Chiang).

Economic geology of the Sherman molybdenum prospect, Okanogan County, Washington (Grant Newport).

Geology of the Heidegger Hill and Monumental Mountain area, northeastern Washington (John Janzen).

Geology of the Orient Project uranium deposits, Washington (Mark Wicklund).

Geologic hazards in the Spokane quadrangle (Tom Davis).

Stratigraphy and structural analysis of the Gold Hill area, Inchelium quadrangle, Stevens County, Washington (Howard Orlean).

Geology of the southeastern portion of the Inchelium quadrangle, Washington (Bruce Smith).

Geology of part of the Inchelium quadrangle, Washington (Dick Winters).

Emplacement analysis of the Starvation Flat quartz monzonite pluton, Colville, northeastern Washington, using the anisotropy of magnetic susceptibility method (Kong Wang).

Gravity survey of the Reardan area, Washington (Kuan-Chou Pan).

Geochemistry and petrography of veins and wall rocks associated with gold-silver mineralization in the Republic district, Ferry County, Washington (Walter M. Martin).

Geochemistry and petrology of the Sanpoil Volcanics and associated granitic rocks of a part of the Colville Indian Reservation, Washington (Sharon J. M. Digby).

Geochemistry of biotite from part of the Loon Lake batholith and its relationship to uranium mineralization at the Midnite mine, Stevens County, Washington (Yemane Asmerom).

Reconnaissance trace element geochemistry of the Loon Lake batholith, northeastern Washington (Adolphus A. Afemari).

Vertical geochemical variations in granodiorites associated with porphyry molybdenum-copper deposits at Mount Tolman, Ferry County, Washington (Danelle D. Elder).

Grays Harbor College

Faculty Research Projects

Research concerning water quality and currents in Grays Harbor (James B. Phipps).

University of Arizona

Geology and radiometric dating of metamorphic core complexes of northeastern Washington (S. J. Reynolds).

University of Kansas

U-Pb dating of the Gabriel Peak Orthogneiss and some orthogneisses in the adjacent Skagit Gneiss (Wendel Hoppe; Bob Miller and Peter Misch).

University of Washington

Faculty Research Projects

Origin of the Lopez tectonic complex, San Juan Islands (Darrel Cowan).

Mesozoic structural evolution of the southern San Juan Islands (Darrel Cowan).

Origin of chaotic rocks in the San Juan Islands (Darrel S. Cowan).

Stratigraphy, metamorphism, and tectonic evolution of the San Juan Islands (Joseph A. Vance).

Tertiary stratigraphy and structure of the area between Darrington and Skykomish (Joseph A. Vance).

Fission track geochronology of the Tertiary volcanic rocks of the Washington Cascades and Oregon (Joseph A. Vance).

Chronology of neoglacial moraines at Mount Rainier (Stephen C. Porter).

Regional Cenozoic tectonic patterns and geologic hazards of the northern Puget Lowland (Eric S. Cheney).

Stratigraphy and structure and ore deposits of the Okanogan Highlands (Eric S. Cheney).

Structure and origin of the Twin Sisters Dunite (Nikolas I. Christensen).

Structure and composition of the crust in the vicinity of Mount St. Helens, Washington (Nickolas I. Christensen and Robert S. Crosson).

Petrology of ultramafic hornfelses, Icicle Creek, central Cascades (B. R. Frost).

Stratigraphy, structural geology, and regional interpretation of the Wenatchee Formation (Randall L. Gresens).

Mounts Baker and Shuksan 15-minute quadrangles (Peter Misch).

Metamorphic facies and petrogenesis of Shuksan Greenschist and associated rocks (Peter Misch).

Petrology of Cascade River schist (Peter Misch).

Petrology and geochemistry of metaplutonic rocks associated with Cascade River schist (Peter Misch with R. S. Babcock).

Metasomatic progressive metamorphism of ultramafic rocks in Skagit metamorphic suite (Peter Misch).

Geology, geochemistry and origin of the Golden Horn batholith (Peter Misch, with R. T. Stull).

Petrology and geochemistry of the Yellow Aster Complex (Peter Misch, with R. S. Babcock).

Age of northwest Cascades blueschists and associated rocks (Peter Misch, with R. L. Armstrong).

Rock units and structure of imbricate zone beneath sole of Shuksan thrust plate (Peter Misch).

Stratigraphy and structure of rocks in the Hoh River, Clearwater River area, western Olympic Peninsula (Richard J. Stewart).

Enrichment carbon-14 dating of late Quaternary glacial events, Olympic Peninsula, Washington (Minze Stuiver).

Carbon-14 and carbon-13 analysis of Douglas fir trees from western Washington as an indicator of carbon reservoir changes (Minze Stuiver).

Sunspot activity as monitored by C-14 changes in Pacific Northwest trees (Minze Stuiver).

Minor and trace element geochemistry of Mesozoic oceanic volcanic and plutonic rocks in northwestern Washington (Joseph A. Vance).

Geochemistry of the Easton blueschists and greenschists (Joseph A. Vance).

Quaternary evolution of the Willapa Bay estuary (Barbara L. Whitney, V. Standish Mallory, and Sandra Leo).

Correlation of stratigraphic units of Washington and western Oregon (V. Standish Mallory).

Stratigraphy and paleontology of Lower Cretaceous sediments of the northern Methow Valley (Julian D. Barksdale and V. Standish Mallory).

Petrology and metamorphic history of the Chiwaukum schist in the Stevens Pass area (Bernard W. Evans).

Sources and fate of sediment from Olympic Mountains (Thomas Dunne and Leslie Reid).

Graduate Program

Paleoecology and biostratigraphy of the Kulshan glaciomarine drift, northwestern Washington (Maria A. Balzarini).

Late Quaternary volcanic stratigraphy and concomitant volcanic hazards at Glacier Peak, Washington (James Beget).

Volcanic and glacial stratigraphy of the Goat Rocks area, central Cascade Mountains (Geoffrey Clayton).

Mechanics of river meanders, Sinlahekin River (William Dietrich).

Hydrothermal clay and thermal activity in source areas of debris avalanches at Mount Rainier and Mount Baker (David Frank).

Late Quaternary evolution of western Washington coast (A. Dan Horn).

Geology and ore controls of the Republic gold district, Ferry County, Washington (Linda A. Oliver).

Stratalogic analysis of the intra-Miocene Ochoco unconformity in Washington-Oregon (Sandra Leo).

Fossil vertebrates from the Clarendonian and Hemphillian of northern Oregon and Washington (James Martin).

Factors affecting the oxygen-18 composition of Douglas Fir tree rings from western Washington (Robert L. Burk).

Tertiary volcanic rocks of the Mount Daniel [area], central Washington Cascades (Eric Simonson).

Metamorphism of the Chiwaukum Schist at Stevens Pass, Cascade Range, Washington (John Berti).

Tertiary evolution of northwestern Washington and southwestern British Columbia (Lee Fairchild).

Washington State University

Faculty Research Projects

Geophysical studies of the Ringold Formation on the Hanford Reservation (James W. Crosby, III).

Geohydrologic studies of the basalts of eastern Washington (James W. Crosby, III).

Applications of borehole geophysics to hydrogeology and engineering (James W. Crosby, III).

Petrology and geochemistry of Colville batholith (Peter R. Hooper).

Detailed geologic mapping of the Colton, Uniontown, Ewartsville, Almota, Kirby, and Bishop quadrangles (Peter R. Hooper and Gary D. Webster)

Black shale belts and associate sulfides in northeast Washington (Joseph W. Mills).

Geology of the Kettle Falls and Marcus quadrangles (Joseph W. Mills).

Cretaceous stratigraphy, San Juan Islands, San Juan County, Washington (W. Frank Scott).

Beach erosion, San Juan Islands, San Juan County, Washington (W. Frank Scott).

Refolded rocks in Cedar Lake area, large-scale mapping and analysis of outcrop patterns near Northport, Washington (Richard L. Thiessen).

Structural synthesis and stratigraphy of the Kootenay Arc and Kettle dome, northeast Washington (A. John Watkinson).

Subsurface stratigraphic studies of the Ringold Formation in the vicinity of Gable Mountain, Washington (Gary D. Webster).

Bonneville flood gravels in the Snake River canyon (Gary D. Webster).

Student Research Projects

Petrology of the Upper Cretaceous strata of Waldron Island, San Juan County, Washington (James Baichtal).

Low temperature geothermal resources of south-central Washington (John Biggane).

Textures and genesis of the lead-zinc ore in the Yellowhead horizon, Pend Oreille mine, Metaline district, northeast Washington (Michael Bemski).

Geology of the Copper Glance prospect, Winthrop, Washington (Thomas Bush).

Cambrian stratigraphy and structural geology of an area in Stevens County, Washington (Bonnie Conklin).

Upper Cretaceous stratigraphy of Patos Island, San Juan County, Washington (Norman Dainty).

Magnetic susceptibilities of eastern Washington basalts (Gerald J. Djuth).

Mineral deposits of the Gold Hill area, Kettle Falls, Washington (Gregory Duncan).

Stratigraphy and petrology of Matia, Clark, and Barnes Islands, San Juan County, Washington (Robert Egemeier).

Structural morphology and associated strain in Kootenay Arc, northeast Washington (Michael Ellis).

Mineral deposits of the Gold Hill area, Kettle Falls, Washington (Patrick Ellison).

Geophysical studies of an area northwest of Spokane, Washington (Linda M. Finn).

Digital simulation of geothermal reservoirs (Vernon T. Ichimura).

Sulfide mineralogy of the Midnite mine, Spokane Indian Reservation, Washington (Donald Lance).

Geophysical techniques applied to a small groundwater basin near Omak, Washington (Katherine J. Laudon).

Structural analysis of Paleozoic metasediments, Flagstaff Mountain area, Northport, Washington (Shawn McKenna).

Structural analysis and detailed mapping of the China Bend region, Washington (Donald Minkel).

Geology of the steptoes in southeast Washington (Luis Nunez).

Chemical variations in parts of the Colville batholith and its relation to mineralization at Squaw Mountain, Colville Indian Reservation, Washington (Don Orazulike).

Geophysics and geohydrology of Hillyard trough area (David J. Steffy).

Sedimentary analysis of gravel deposits in the vicinity of Clarkston, Washington (Gail Waggoner).

Geology of the Schminsky molybdenum prospect, Colville Indian Reservation, Washington (Randy White).

Geologic mapping of Boyds and Bangs Mountain quadrangles, Ferry and Stevens Counties, Washington (Joseph Wilson).

Western Washington University

Faculty Research Projects

Geochemistry of magmatic rocks in the north Cascades (R. S. Babcock).

Paleomagnetism and tectonics of the Washington coast range (M. E. Beck, Jr.).

Tectonics of the Washington Cascades (M. E. Beck, Jr.).

Shape analysis of paleomagnetic secular variation data (M. E. Beck, Jr.).

Structure and petrology of metamorphic/tectonic units in the north Cascades (E. H. Brown).

Cascades project; a study of significant geologic sites in the Washington, Oregon, and California Cascades (D. J. Easterbrook).

Glacial history of Puget Lowland and Columbia Plateau (D. J. Easterbrook).

Volcanic and glacial geology of Mount Baker (D. J. Easterbrook).

Paleomagnetism of glacial sediments in Washington (D. J. Easterbrook).

Clay mineral distribution in rocks of the Olympic Peninsula (D. R. Pevear).

Mixed layer illite/smectites in Tertiary bentonites of western Washington and British Columbia (D. R. Pevear).

Mineralogy (especially clays) of Chuckanut and Huntingdon Formations, northwestern Washington and British Columbia (D. R. Pevear).

Mineral transformation in Pleistocene paleosols, northern Puget Sound (D. R. Pevear).

Geochemical criteria for determining paleosalinity applied to tills and glaciomarine drift (D. R. Pevear).

Formation of calcareous cements in Pleistocene and Recent sediments with ultramafic clasts (D. R. Pevear).

Marine biogeographic realms during late Paleozoic time (C. A. Ross).

The fit of South and North America during the late Paleozoic (C. A. Ross).

Recent foraminiferal populations, Samish Bay, Washington (C. A. Ross).

Cobb Seamount; sea level changes during the Cenozoic (M. L. Schwartz).

Coast sea level changes, sediment drift studies, coastal archaeology, coastal morphology, and beach preservation in Puget Sound and on the Pacific coast (M. L. Schwartz).

Stratigraphic relationships of the Chuckanut Formation, northwest Washington (C. A. Suczek).

Plate tectonics and sandstone compositions (C. A. Suczek).

Graduate Program

Hydrology of Whatcom Creek, Bellingham, Washington (Stan Carrick).

Geology, mineralogy, and diagenetic history of bentonites and associated rocks of the Chuckanut Formation, Mount Higgins, north Cascades, Washington (Sue Cruver).

Coal petrology of the Big Seam, Centralia, Washington (David Hadley).

The Chilliwack Group of Black Mountain, Washington (Jerry Lizak).

The depositional framework and regional extent of the West Beach silt and its significance in pre-late Wisconsin stratigraphy of the Puget Lowland, Washington (Jeffrey Sprague).

Petrology of the pre-Tertiary rocks in the Cultus Mountain area, Washington (Jack Cruver).

Mineralogy and origin of bentonite clays in Centralia coal mine (Linda Reinik-Smith).

The geochemistry, petrology and structure of the Yellow Aster Complex in the Park Butte-Loomis Mountain area, Washington (David Blackwell).

Coastal processes at Dungeness Spit, Strait of Juan de Fuca, Washington (Michael Chrzastowski).

Anomalous paleomagnetic directions in Eocene dikes in central Washington (Lynne Stauss).

A study of the hydrothermal alteration and stratigraphy of the Gamma Ridge volcanics and their possibility of geothermal potential in the area of Glacier Peak, Washington (Rick Waldron).

Petrology and geochemistry of xenoliths in the 1980-81 Mount St. Helens pumice (Christina Heliker).

The mechanics of creep and its relationship to slope stability (north slope of Manastash Ridge (Ellensburg Formation) near Ellensburg, Washington) (Chuck Eccleston).

Whitman College

Department of Geology

Quaternary, environmental, and economic geology of the eastern Olympic Peninsula (R. J. Carson).

Yakima Valley College

Department of Geology

Stratigraphic relationship between the Thorp Gravel and Ellensburg Formation (Newell Campbell).

Evaluation of late Cenozoic structures in the southwest Columbia Basin (Newell Campbell).

MINERALOGICAL SYMPOSIUM TO BE HELD IN BELLEVUE

Silicates will be the theme of the 7th Annual Mineralogical Symposium, sponsored by the Pacific Northwest Chapter of the Friends of Mineralogy. It will be held on September 25-27, 1981, at the Holiday Inn, Bellevue, Washington.

For more information on the program and registration contact Bob Smith, c/o Friends of Mineralogy, Box 197, Mailroom, Seattle University, Seattle, WA 98122.

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Bartells, J. H., 1981, An analysis of reservoir storage contents for the proposed enlargement of Bumping Lake in Washington: U.S. Geological Survey Open-File Report 80-440, 10 p.

Burkhardt, H. E.; Brook, C. A.; Smith, F. W., 1980, Selected administrative, land, and resource data for known geothermal resources areas in Arizona, California, Idaho, Nevada, Oregon, and Washington: U.S. Geological Survey Open-File Report 80-1290, 27 p.

Dethier, D. P.; Saffoles, S. A.; Pevear, D. R., 1981, Composition of till from the Clear Lake quadrangle, Skagit and Snohomish Counties, Washington: U.S. Geological Survey Open-File Report 81-517, 56 p.

Gower, H. D., 1980, Bedrock geologic and Quaternary tectonic map of the Port Townsend area, Washington: U.S. Geological Survey Open-File Report 80-1174, 19 p., 1 plate, scale 1:100,000.

Hansen, A. J., Jr.; Bolke, E. L., 1980, Groundwater availability on the Kitsap Peninsula, Washington: U.S. Geological Survey Open-File Report 80-1186, 65 p. (prepared in cooperation with the Kitsap County Department of Community Development and the Washington Department of Ecology).

Offield, T. W., 1980, Uranium and thorium resource assessment and exploration research program, fiscal year 1981: U.S. Geological Survey Open-File Report 80-1175, 13 p.

Packard, F. A., 1981, Reconnaissance of water availability and quality in abandoned coal mines near Roslyn, Kittitas County, Washington: U.S. Geological Survey Open-File Report 80-955, 20 p. (prepared in cooperation with the Washington Department of Ecology).

Reeves, J. F.; Rodriguez, T. R.; Seiders, W. H., 1981, Summaries of technical reports, volume XI—Prepared by participants in National Earthquake Hazards Reduction Program: U.S. Geological Survey Open-File Report 81-167, 477 p.

Zielinski, R. A.; Sawyer, M. B., 1980, Size and shape measurements of ash particles from the May 18, 1980 eruption of Mount St. Helens: U.S. Geological Survey Open-File Report 81-114, 18 p.

DIVISION OPEN-FILE REPORTS FOR SALE IN OLYMPIA OFFICE

The Division of Geology and Earth Resources open-file reports that are reproducible can now be purchased from us. In this edition of our newsletter we are printing a complete list of them; the new ones will be listed as they become available. The nonreproducible reports are available only as references here in our Olympia library.

Unnumbered Reports

Artim, E. R., 1976, Differential settlement hazards of the Kirkland area, Washington: Washington Division of Geology and Earth Resources Open-File Report, 1 map, scale 1:24,000. Nonreproducible.

Gresens, R. L.; Naeser, C. W.; Whetten, J. T., 1978, The Chumstick and Wenatchee Formations—Fluvial and lacustrine rocks of Eocene and Oligocene age in the Chiwaukum graben, Washington: Washington Division of Geology and Earth Resources Open-File Report, 42 p. Price $5.

Jenkins, O. P.; Cooper H. H., 1921, Geological investigation of the proposed Grand Coulee Reservoir: Washington Geological Survey Open-File Report, 21 p., 1 plate (plate nonreproducible). Price (text) $3.50.

Moen, W. S., 1979, Placer gold mining in Washington: Washington Division of Geology and Earth Resources Open-File Report, 21 p. Price $3.

Reichert. W. H., 1969, Compilation of geologic mapping in Washington through 1968—A continuation of Leona Boardman's Index to geologic mapping; also, geologic maps from theses on Washington geology: Washington Division of Mines and Geology Open-File Report, 43 p., 11 maps, scale 1:1,000,000. Nonreproducible.

Reichert, W. H., 1976, Selected geologic reports of Washington for the period 1969 through 1976: Washington Division of Geology and Earth Resources Open-File Report, 20 p. Price $2.50.

Shedd, Solon, 1925, Geology and resources of the Pasco and Prosser quadrangles: Washington Division of Geology and Earth Resources Open-File Report, 125 p., 1 plate. Nonreproducible.

Stoffel, K. L., 1980, Stratigraphy of pre-Vashon Quaternary sediments applied to the evaluation of a proposed major tectonic structure in Island County, Washington—Final technical report: Washington Division of Geology and Earth Resources Open-File Report, 161 p. Price $17.

1968

Rau, W. W., 1968, Correlation chart of coastal wells (in Washington): Washington Division of Mines and Geology Open-File Report 68-1, 1 chart. Price $3.

1969

Campbell, N. P.; Sorem, R. K., 1969, Sketch map showing geology and mineral deposits in Stevens County: Washington Division of Mines and Geology Open-File Report 69-1, 7 p., 7 plates. Price $9.50.

Moen, W. S., 1969, Analyses of stream sediment samples in Washington for copper, molybdenum, lead, and zinc: Washington Division of Mines and Geology Open-File Report 69-2, 86 p., 38 plates. Nonreproducible.

1972

Crosson, R. S.; Mayer, I. R., 1972, Report on geothermal ground noise measurements in Washington State: Washington Division of Mines and Geology Open-File Report 72-1, 52 p. Free.

1973

Capps, Gerald; Simmons, J. D., Videgar, F. D., 1973, Preliminary report on the geology of southern Snohomish County: Washington Division of Geology and Earth Resources Open-File Report 73-1, 11 p., 3 plates. Nonreproducible.

Fiksdal, A. J., 1973, Slope stability of the Longview-Kelso urban area, Cowlitz County: Washington Division of Geology and Earth Resources Open-File Report 73-2, 4 p., 1 plate. Price $2.50.

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Artim, E. R., 1973, East Wenatchee and vicinity geologic hazard maps: Washington Division of Geology and Earth Resources Open-File Report 73-5, 7 maps, scale 1:24,000. Nonreproducible.

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Birdseye, R. U.; Carson, R. J., 1974, Tephra of Salmon Springs age from the southeastern Olympic Peninsula, Washington: Washington Division of Geology and Earth Resources Open-File Report 74-1, 35 p. Price $4.50.

Milne, Scott; Cross, Randy, 1974, Sand and gravel deposits of Klickitat County, Washington: Washington Division of Geology and Earth Resources Open-File Report 74-2, 1 map. Nonreproducible.

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Artim, E. R., 1975, Ground water in the Methow Valley, Mazama to Winthrop: Washington Division of Geology and Earth Resources Open-File Report 75-1, 9 p., 4 plates. Nonreproducible.

Battie, John; Johnston, Donella; Searls, Craig, 1975, Environmental geology of the Parkland-Spanaway area, Washington: Washington Division of Geology and Earth Resources Open-File Report 75-2, 7 maps, scale 1:24,000. Nonreproducible.

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Carson, R. J., 1975, Slope stability map of the southern Hood Canal area, Mason County: Washington Division of Geology and Earth Resources Open-File Report 75-4, 1 map, scale 1:62,500. Nonreproducible.

Danes, Z. F., 1974, Bouguer gravity map of Mount Rainier National Park, Washington: Washington Division of Geology and Earth Resources Open-File Report 75-5, 10 p. 1 plate. Nonreproducible.

Gresens, Randall, 1975, Geologic mapping of the Wenatchee area: Washington Division of Geology and Earth Resources Open-File Report 75-6, 2 maps, scale 1:24,000. Price $1.50.

Othberg, K. L., 1975, Geologic interpretive map showing areas of unstable slopes, Kitsap County, Washington: Washington Division of Geology and Earth Resources Open-File Report 75-7, 11 maps, scale 1:24,000. Nonreproducible.

Othberg, K. L., 1975, Geomorphology of the Colockum Pass area, Kittitas County, Washington: Washington Division of Geology and Earth Resources Open-File Report 75-8, 3 p. Price $1.

Vonheeder, E. R., 1975, Coal reserves of Whatcom County, Washington: Washington Division of Geology and Earth Resources Open-File Report 75-9, 90 p., 2 plates. Free.

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Smith, Mackey, 1975, Earthquake hazards of Clark County, Washington: Washington Division of Geology and Earth Resources Open-File Report 75-12, 2 p., 1 plate. Price $2.50.

Hammond, P. E., 1975, Preliminary geologic map and cross-sections with emphasis on Quaternary volcanic rocks, southern Cascade Mountains, Washington: Washington Division of Geology and Earth Resources Open-File Report 75-13, 1 map. Price $3.50.

Lucas, J. M., 1975, The availability of nickel, chromium, and silver in Washington: Washington Division of Geology and Earth Resources Open-File Report 75-14, 140 p. Price $2.

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Erikson, E. H., Jr., 1976, Petrogenesis of the Mount Stuart batholith plutonic equivalent of the high-alumina basalt association: Washington Division of Geology and Earth Resources Open-File Report 76-6, 38 p., 2 plates. Price $5.

Hanson, K. L., 1976, Waste-disposal map of the Uncas-Port Ludlow area, Jefferson County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-7, 1 map, scale 1:24,000. Price $2.50.

Schuster, J. E., 1976, Geology of the Clugston Creek area, Stevens County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-8, 26 p. Price $3.50.

Smith, Mackey, 1976, Surficial geology of northeast Tacoma, Pierce County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-9, 1 map, scale 1:24,000. Price $1.50.

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Othberg, K. L.; Hall, J. B., 1976, Monitoring of an active fault near Lilliwaup, Mason County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-12, 7 p. Price $1.

Hurley, B. W., 1976, The Ledbetter Slate-Metaline Limestone contact; 1976 field study report: Washington Division of Geology and Earth Resources Open-File Report 76-13, 23 p. Price $3.

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Carson, R. J., 1976, Mineral resources map of the Brinnon area, Jefferson County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-16, 1 map, scale 1:24,000. Price $1.50.

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Hanson, K. J., 1976, Geologic map of the Uncas-Port Ludlow area, Jefferson County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-20, 1 map, scale 1:24,000. Price $2.

Gayer, M. J., 1976, Geologic map of northeastern Jefferson County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-21, 1 map, scale 1:24,000. Price $3.

Gayer, M. J., 1976, Slope stability map of northeastern Jefferson County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-22, 1 map, scale 1:24,000. Price $3.

Gayer, M. J., 1976, Nonmetallic mineral resources of northeastern Jefferson County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-23, 1 map, scale 1:24,000. Price $3.

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Gayer, M. J., 1976, Waste-disposal map of northeastern Jefferson County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-25, 1 map, scale 1:24,000. Price $3.

Birdseye, R. U., 1976, Geologic map of east-central Jefferson County, Washington: Washington Division of Geology and Earth Resources Open-File Report 76-26, 1 map, scale 1:24,000. Price $2.50.

Birdseye, R. U. 1976, Relative slope stability in east-central Jefferson County: Washington Division of Geology and Earth Resources Open-File Report 76-27, 1 map, scale 1:24,000. Price $2.50.

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Lucas, J. M., 1976, The availability of lead and zinc in Washington: Washington Division of Geology and Earth Resources Open-File Report 76-31, 81 p. Price $9.

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Terich, T. A., 1977, Coastal processes of the Whatcom County mainland: Washington Division of Geology and Earth Resources Open-File Report 77-1, 36 p. Price $4.50.

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Vonheeder, E. R., 1977, Strippable and underground coal resources on Washington Department of Natural Resources administered land, Whatcom County, Washington: Washington Division of Geology and Earth Resources Open-File Report 77-3, 1 p., 3 plates. Free.

Vonheeder. E. R., 1977, Strippable and underground coal resources on Washington Department of Natural Resources administered land, Lewis County, Washington: Washington Division of Geology and Earth Resources Open-File Report 77-4, 7 maps. Free.

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Palmer, Pamela, 1977, Investigation of tectonic deformation in the Puget Lowland, Washington: Washington Division of Geology and Earth Resources Open-File Report 77-6, 36 p., 3 plates. Price $6.

Campbell. N. P., 1977, Geology of the Selah area, Yakima County, Washington: Washington Division of Geology and Earth Resources Open-File Report 77-7, 3 plates. Price $2.

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Smith, Mackey, 1977, Geologic map of the city of Tacoma, Pierce County, Washington: Washington Division of Geology and Earth Resources Open-File Report 77-9, 1 map, scale 1:24,000. Price $1.50.

Fischer, H. J., 1977, Report on 1977 field investigations on lithology and Metaline Limestone in Stevens and Pend Oreille Counties, Washington; field report, summer 1977: Washington Division of Geology and Earth Resources Open-File Report 77-12, 12 p. Price $1.50.

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Vonheeder, E. R., 1978, Strippable and underground coal resources on Washington Department of Natural Resources administered land, Kittitas County, Washington: Washington Division of Geology and Earth Resources Open-File Report 78-1, 1 p., 6 maps. Free.

Fiksdal, A. J., 1978, Slope stability of the Centralia-Chehalis area, Lewis County, Washington: Washington Division of Geology and Earth Resources Open-File Report 78-2, 4 p., 1 plate. Price $1.50.

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Daniels, Joseph, 1979, Mining history of Pierce County, Washington coal fields, 1860-1962: Washington Division of Geology and Earth Resources Open-File Report 79-1, 162 p. Price $17.

Milne, P. C., 1979, An assessment of the uranium potential in the Ellensburg Formation, south-central Washington: Washington Division of Geology and Earth Resources Open-File Report 79-2, 32 p., 4 plates. Free.

Rigby, J. G.; Othberg, K. L.; Campbell, N. P., Hanson, Larry; Kiver, Eugene; Stradling, Dale; Webster, Gary, 1979, Reconnaissance surficial geologic mapping of late Cenozoic sediments of the Columbia Basin, Washington: Washington Division of Geology and Earth Resources Open-File Report 79-3, 97 p., 7 plates (note: Mapping of Toppenish Ridge and Saddle Mountains-Smyrna Bench, by Newell Campbell). Price $22.

Vonheeder, E. R., 1979, Strippable and underground coal resources on Washington Department of Natural Resources administered land, Pierce County, Washington: Washington Division of Geology and Earth Resources Open-File Report 79-4, 5 maps. Free.

Tucker, G. B.; Rigby, J. G., 1979, Bibliography of the geology of the Columbia Basin and surrounding areas of Washington: Washington Division of Geology and Earth Resources Open-File Report 79-5, 499 p., 20 plates. Free.

Danes, Z. F., 1979, Bouguer gravity map, Camas area, Washington and Oregon: Washington Division of Geology and Earth Resources Open-File Report 79-6, 1 map, scale 1:62,500. Price $1.

Hanson, L. G., 1979, Surficial geologic map of the Okanogan quadrangle, Washington: Washington Division of Geology and Earth Resources Open-File Report 79-7, 1 map, scale 1:250,000. Price $1.50.

Campbell, N. P., 1979, Surficial geologic map of the Pendleton quadrangle, Washington: Washington Division of Geology and Earth Resources Open-File Report 79-8, 1 map, scale 1:250,000. Price $1.50.

Webster, G. D., 1979, Surficial geologic map of the Pullman quadrangle, Washington: Washington Division of Geology and Earth Resources Open-File Report 79-9, 1 map, scale 1:250,000. Price $1.50.

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Hanson, L. G., 1979, Surficial geologic map of the Wenatchee quadrangle: Washington Division of Geology and Earth Resources Open-File Report 79-14, 1 map, scale 1:250,000. Price $1.50.

Campbell, N. P., 1979, Surficial geologic map of the Yakima quadrangle Washington: Washington Division of Geology and Earth Resources Open-File Report 79-15, 1 map, scale 1:250,000. Price $1.50.

Thorsen, G. W.; Othberg, K. L., 1978, Slope stability pilot project—Upper Deschutes River Basin: Washington Division of Geology and Earth Resources Open-File Report 79-16, 30 p., 4 plates. Price $6.

Othberg, K. L.; Palmer, Pamela, 1979, Preliminary surficial geologic map of the Dungeness quadrangle, Clallam County, Washington: Washington Division of Geology and Earth Resources Open-File Report 79-17, 3 p., 1 map, scale 1:24,000. Price $1.50.

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Othberg, K. L.; Palmer, Pamela, 1979, Preliminary surficial geologic map of part of the Gardiner quadrangle, Clallam County, Washington: Washington Division of Geology and Earth Resources Open-File Report 79-19, 3 p., 1 map, scale 1:24,000. Price $1.50.

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Walker, C. W., 1980, Geology and energy resources of the Roslyn-Cle Elum area, Washington: Washington Division of Geology and Earth Resources Open-File Report 80-1, 62 p., 25 plates. Price $25.

McLucas, G. B., 1980, Preliminary fault map of Washington: Washington Division of Geology and Earth Resources Open-File Report 80-2, 5 p., 2 plates, scales 1:1,000,000 and 1:500,000. Price $4.

McLucas, G. B., 1980, Surficial geology of the Springdale and Forest Center quadrangles, Stevens County, Washington: Washington Division of Geology and Earth Resources Open-File Report 80-3, 29 p., 2 maps, scale 1:24,000. Price $4.50.

Korosec, M. A., 1980, Bibliography of geothermal resource information for the State of Washington: Washington Division of Geology and Earth Resources Open-File Report 80-4, 17 p. Price $2.50.

Rau, W. W., 1980, Pacific Northwest Tertiary benthonic foraminiferal biostratigraphic framework—An overview: Washington Division of Geology and Earth Resources Open-File Report 80-5, 50 p. Free.

Korosec, M. A.; McLucas, G. B., [1980], Quaternary volcanics and volcanic centers in the State of Washington: Washington Division of Geology and Earth Resources Open-File Report 80-6, 2 p., 1 map, scale 1:500,000. Nonreproducible.

Korosec, M. A.; Kaler, K. L., 1980, Well temperature information and locations in the State of Washington: Washington Division of Geology and Earth Resources Open-File Report 80-7, 89 p., 2 maps. Price $9.50.

Clayton, Geoff, 1980, Geology of White Pass-Tumac Mountain area, Washington: Washington Division of Geology and Earth Resources Open-File Report 80-8, 1 map, scale 1:24,000. Price $2.50.

Blackwell, D. D., 1980, Heat flow and geothermal gradient measurements in Washington to 1979, and temperature-depth data collected during 1979: Washington Division of Geology and Earth Resources Open-File Report 80-9, 524 p. Price $55.

Bloomquist, R. G., 1981, Washington State geothermal leasing status, January 1981: Washington Division of Geology and Earth Resources Open-File Report 80-10, 5 sheets. (Sheets are overlays to U.S. Forest Service maps.) Price $12.

Korosec, M. A., 1980, Table of thermal and mineral spring locations in Washington: Washington Division of Geology and Earth Resources Open-File Report 80-11, 6 p. Price $1.25.

Folsom, M. M.; Quinn, R. R., 1980, Ash from the May 18, 1980 eruption of Mount St. Helens: Washington Division of Geology and Earth Resources Open-File Report 80-12, 6 sheets. Price $3.

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McLucas, G. B., 1981, Detailed fault map of the Hoquiam, Vancouver, Yakima, and The Dalles quadrangles: Washington Division of Geology and Earth Resources Open-File Report 81-1, 5 maps, scale 1:250,000. Price $3.

McLucas, G. B., 1981, Lineament and fault maps of the south Cascades—The Dalles, Mount St. Helens, Mount Adams, Mount Rainier, and Centralia: Washington Division of Geology and Earth Resources Open-File Report 81-2, 6 sheets, scale 1:100,000. Price $3.

Korosec, M. A.; Schuster, J. E., Blackwell, D. D.; Danes, Z. F.; Clayton, G. A., 1981, The 1979-1980 geothermal resources assessment program in Washington: Washington Division of Geology and Earth Resources Open-File Report 81-3, 155 p., plus 4 appendices. Price $6.50.

Danes, Z. F., 1981, Preliminary Bouguer gravity map, southern Cascade area, Washington: Washington Division of Geology and Earth Resources Open-File Report 81-4, 1 sheet, scale 1:250,000. Price $1.

NEW PUBLICATIONS RELEASED BY DIVISION

The following recently published reports are now for sale from the Division of Geology and Earth Resources in Olympia:

Information Circular 73

Index to geologic and geophysical mapping of Washington, compiled by Connie Manson, division librarian. 1981. 63 p. 10 plates. Price $4.

Report of Investigations 25

A cross section of a Nevada-style thrust in northeast Washington, by J. R. Snook, H. E. Lucas, and M. J. Abrams, Eastern Washington University in Cheney. 1981. 2 figs. 9 p. Price 50 cents.

RECENT U.S. GEOLOGICAL SURVEY PUBLISHED REPORTS ADDED TO OUR DIVISION LIBRARY

The following reports are now available for inspection in our division library. If you wish to purchase any of these published reports, please contact the U.S. Geological Survey, Public Inquiries Office, Room 678, U.S. Court House, 1020 Riverside, Spokane, WA 99201; (509) 456-2524.

Dion, N. P.; Embrey, S. S., 1981, Effects of Mount St. Helens eruption on selected lakes in Washington: U.S. Geological Survey Circular 850-G, 25 p.

Lombard, R. E.; Miles, M. B.; Nelson, L. M.; Kresch, D. L.; Carpenter, P. J., 1981, Channel conditions in the lower Toutle and Cowlitz Rivers resulting from the mudflows of May 18, 1980: U.S. Geological Survey Circular 850-C, 16 p.

PUBLICATION WINS FIRST PLACE IN INTERNATIONAL COMPETITION

The Division of Geology and Earth Resources is proud to announce that one of our publications (GM-24) recently took first place for technical reports in international competition sponsored by the Society for Technical Communication. The report, *Geologic map in the vicinity of the Lower Bogachiel and Hoh River valleys and the Washington coast*, was authored and designed by Weldon Rau. Laura Bray provided the editorial support, and Gibb Johnson was the cartographer.

Award of Distinguished Technical Communication

Presented to

Weldon Rau, author-designer
Gibb Johnson, cartographer
Laura Bray, editor
Washington Department of Natural Resources, Geologic Division

for the Technical Report

Geologic Map in the Vicinity of the Lower Bogachiel and Hoh River Valleys and the Washington Coast

SOCIETY FOR TECHNICAL COMMUNICATION

Entries for the competition came from all facets of technical writing, both private industry and governmental agencies, and was not necessarily restricted to members of the Society. In order to qualify for international competition, entries were required to place either first or second in a local contest held last Fall by the Puget Sound chapter. According to Society members, it is a particularly outstanding achievement to receive the award of "Distinguished Technical Communication" for technical reports because of the highly competitive nature of this category. Many of the entries were from large corporations and other organizations with considerably more budget and staff than our division. It is therefore gratifying to know, that among the nation's technical writing community, we are recognized as having outstanding capabilities in this field. We intend to continue to serve our public with reports of such quality.

THESES ADDED TO DIVISION LIBRARY

The theses listed below were recently added to our division library and are available for reference work.

Calcacal, Elias L., 1980, Sintering characteristics of diatomites: University of Washington Doctor of Philosophy thesis, 218 p.

Globerman, Brian R., 1981, Geology, petrology, and paleomagnetism of Eocene basalts from the Black Hills, Washington coast range: Western Washington University Master of Science thesis, 373 p.

Grant, Philip Robert, 1980, Limestone units within the Triassic Wild Sheep Creek Formation of the Snake River Canyon: Washington State University Master of Science, 103 p.

Kaneda, Ben Keith, 1980, Contact metamorphism of the Chiwaukum Schist near Lake Edna, Chiwaukum Mountains, Washington: University of Washington Master of Science thesis, 149 p., 2 plates.

Larson, Arthur Gene, 1979, Origin of the chemical composition of undisturbed forested streams, western Olympic Peninsula, Washington State: University of Washington Doctor of Philosophy thesis, 216 p.

McCarthy, Conrad Joseph, 1980, Sediment transport by rainsplash: University of Washington Doctor of Philosophy thesis, 215 p.

May, Dann Joseph, 1980, The paleoecology and depositional environment of the late Eocene-early Oligocene Toutle Formation, southwestern Washington: University of Washington Master of Science, 110 p.

Peatfield, Giles Russum, 1978, Geologic history and metallogeny of the "Boundary district," southern British Columbia and northern Washington: Queen's University (Ontario) Doctor of Philosophy thesis, 300 p.

Reid, Leslie Margaret, 1981, Sediment production from gravel-surfaced forest roads, Clearwater basin, Washington: University of Washington Fisheries Research Institute FRI-UW-8108, 247 p. (NOTE: also accepted as a Master of Science thesis, Geology Department, UW).

Smith, Roger Norman, 1980, Heat flow of the western Snake River plain: Washington State University Master of Science, 111 p.

Swank, Wayne Thomas, 1972, Water balance, interception and transpiration studies on a watershed in the Puget Lowland region of western Washington: University of Washington Doctor of Philosophy thesis, 178 p.

Wadekamper, Donald, 1968, Electrical porcelains formulated from Pacific Northwest raw materials with special effects of quartz grain size: University of Washington Master of Science, 42 p.

Wald, Alan R., 1975, The impact of truck traffic and road maintenance on suspended-sediment yield from a 14' standard forest road: University of Washington Master of Science thesis, 38 p.

Zamoras, Robert L., 1979, The geology and hydrothermal mineralization at the Molly property and vicinity, Snohomish County, Washington: Western Washington University Master of Science, 88 p.

DIVISION OF GEOLOGY AND EARTH RESOURCES MOUNT ST. HELENS PROJECTS

Michael A. Korosec; J. Eric Schuster—Continued geothermal resource investigations in the Mount St. Helens area [ongoing].

Allen J. Fiksdal—Erosion and infiltration rates of Mount St. Helens blast and ash deposits, Green River valley area [ongoing].

Robert L. Logan—Trace element composition and petrography of Mount St. Helens pyroclastic and dome materials [ongoing].

Allen J. Fiksdal; Michael A. Korosec; Robert L. Logan; James G. Rigby—Photographic documentation of the continuing volcanic events in the Mount St. Helens area [ongoing].

Michael A. Korosec; Robert L. Logan; William M. Phillips; Timothy J. Walsh—The geochemistry and mineralogy of Mount St. Helens fumarole sublimates (high temperature vs. low temperature) [ongoing].

Allen J. Fiksdal; Robert L. Logan; James G. Rigby—Volcanic hazards associated with the Cascade stratovolcanoes of Washington [ongoing].

J. Eric Schuster; Michael A. Korosec; Robert L. Logan—Updating of volcanic hazards maps for Mount St. Helens vicinity [ongoing].

Robert L. Logan—Compilation of video tape documentation of the 1980 eruption of the Mount St. Helens volcano [ongoing].

Michael A. Korosec—Geochemical investigations of known and suspected structures in the Mount St. Helens area (spring chemistry and soil mercury surveys) [summer 1981].

Z. F. Danes, University of Puget Sound; J. Eric Schuster; Michael A. Korosec—Refinement of Bouguer gravity maps for the Mount St. Helens area [summer 1981].

Note: A correction needs to be made on the table "Mount St. Helens Dome Statistics" that appeared in the April issue of our Washington Geologic Newsletter (v. 9, no. 2, p. 17). The heading on the last column of the table reads Volume ($X10^3m^3$); this should be changed to ($X10^6m^3$).

U.S. GEOLOGICAL SURVEY 7½-MINUTE TOPOGRAPHIC QUADRANGLES
(Maps received in the division library April 30, 1981)

Name	New edition	Photo revised	Latitude (indicates southeast corner)	Longitude	County
Addy Mountain	1965	1980	48°22'30"	117°45'00"	Stevens
Aeneas Lake	1980		48°37'30"	119°30'00"	Okanogan
Amber	1981		47°15'00"	117°37'30"	Spokane; Whitman
Barker Mountain	1981		48°37'30"	119°15'00"	Okanogan
Boyer Mountain	1968	1980	48°37'30"	117°22'30"	Pend Oreille; Stevens
Bridgeport	1980		48°00'00"	119°37'30"	Okanogan; Douglas
Bridgeport Point	1980		48°00'00"	119°30'00"	Okanogan; Douglas
Browns Lake	1968	1980	48°22'30"	117°07'30"	Pend Oreille
Camden	1968	1980	48°00'00"	117°07'30"	Pend Oreille; Spokane
Cheney	1980		47°22'30"	117°30'00"	Spokane
Chewelah	1964	1980	48°15'00"	117°37'30"	Stevens
Cliff Ridge	1964	1980	48°22'30"	117°37'30"	Stevens
Cusick	1968	1980	48°15'00"	117°15'00"	Pend Oreille
Deer Lake	1965	1980	48°00'00"	117°30'00"	Stevens; Spokane
Diamond Lake	1968	1980	48°07'30"	117°07'30"	Pend Oreille
Elk	1968	1980	48°00'00"	117°15'00"	Pend Oreille; Spokane
Fan Lake	1968	1980	48°00'00"	117°22'30"	Spokane; Stevens; Pend Oreille
Fishtrap Lake	1981		47°15'00"	117°45'00"	Spokane; Lincoln; Whitman
Forest Center	1965	1980	48°00'00"	117°45'00"	Stevens
Goddards Peak	1964	1980	48°15'00"	117°30'00"	Stevens
Jared	1968	1980	48°22'30"	117°45'30"	Pend Oreille
Monse	1980		48°07'30"	119°37'30"	Okanogan
Nelson Peak	1965	1980	48°07'30"	117°30'00"	Stevens; Pend Oreille
Riverside	1981		48°30'00"	119°30'00"	Okanogan
Sacheen Lake	1968	1980	48°07'30"	117°15'00"	Pend Oreille
Spangle East	1981		47°22'30"	117°15'00"	Spokane
Spring Valley	1980		47°15'00"	117°15'00"	Spokane; Whitman
Springdale	1965	1980	48°00'00"	117°37'30"	Stevens
Sprague	1981		47°15'00"	117°52'30"	Lincoln; Adams; Whitman
Stubblefield Point	1981		48°00'00"	119°22'30"	Okanogan; Douglas
Tacoma Peak	1968	1980	48°22'30"	117°22'30"	Pend Oreille
The Pothole	1980		48°22'30"	119°22'30"	Okanogan
Tweedie, Wash.-Idaho	1968	1980	48°00'00"	117°00'00"	Pend Oreille; Spokane
Waitts Lake	1965	1980	48°07'30"	117°45'00"	Stevens
Winchester Peak	1968	1980	48°15'00"	117°22'30"	Pend Oreille

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Division of Geology and Earth Resources
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