WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland - Commissioner of Public Lands

DGER NEWS

DIVISION OF GEOLOGY AND EARTH RESOURCES
"Washington State's Geological Survey since 1890"

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CHANGES AT THE WASHINGTON GEOLOGY LIBRARY

by Lee Walkling

A little over a year ago, we didn't know if we would be able to keep the Geology Library open. The good news is the Library still exists. The bad news is that we have lost one librarian and the Library is open fewer hours. The legislative budget cuts that resulted in these changes also dictated a reduction in journal subscriptions and discontinuation of some labor-intensive services, such as copying material on behalf of clients, but the Library continues to serve the geoscience community and the general public.

The Library's clientele is as diverse as Washington's geology—DGER and other Department of Natural Resources geologists, geotechnical firms, geoscience teachers, students, real estate agents, legislators, mining historians, rockhounds and gold prospectors, museums, engineers, state and local governments, other state agencies, and Washington citizens interested in the state's geology. Many of these users drive from Seattle, Portland, and other distant locations to use the Library.

The Library was established in 1935 by an act of the Legislature. During its first years, the library was run by geologist W. A. G. Bennett. In 1960, librarian William Reichert took over and began the invaluable bibliography of Washington geology series*. In 1978, Connie J. Manson started 25 years' work shaping the library into the respected and unique collection it is today. She put the bibliography online in 2001. In 2003, Lee Walkling became the sole librarian.

The Library has more than 34,000 items about Washington's geology—DGER publications, USGS reports and maps, Bureau of Mines publications, journals, theses and dissertations, books, reports, topographic maps (current and historic), geologic maps, the Washington Coastal Zone Atlas, and symposium proceedings and abstracts.

Unique to the collection are historic coal and metal mine maps, the Capitol Campus series of geologic reports, and the State's watershed analyses. The Library's catalog is online and searchable at http://www.dnr.wa.gov/geology/washbib.htm. There is also an index to the geologic and geophysical mapping of Washington (http://www.dnr.wa.gov/geology/mapindex.htm).

If you have geology magazines, general geology books, or publications of any kind on the geology of Washington that you no longer need, the Library is always willing to accept donations. For further information, contact Lee Walkling at (360) 902-1473 or lee.walkling@wadnr.gov.

The Library is located in the Natural Resources Building, 1111 Washington Street SE, Room 173, Olympia, Wash. Current hours are 9:00 am to 4:30 pm, Monday, Tuesday, Thursday, and Friday. The Library is not open on Wednesday. It is always a good idea to check our website (http://www.dnr.wa.gov/geology/library.htm#hours) or call ahead for any other closures before making the trip. ■

* Although there were several bibliographies on Washington geology published in the first half of the last century, Reichert was the first trained librarian to do one.

MESSAGE FROM THE STATE GEOLOGIST

Ron Teissere
State Geologist

The Association of American State Geologists 96th annual meeting was hosted by DGER at Skamania Lodge, Stevenson, Wash., June 13–16. Representatives from 41 states and nine federal agencies and congressional committees were treated to exceptional Washington weather and scenery on field trips to the Bonneville and Kelso landslides, Mount St. Helens, and Yakima Valley wine country.

A wide range of topics was discussed, including:

1. Pending reauthorization of the National Cooperative Geologic Mapping Act and the implementation of various programs under the Act,
2. The pending move of the National Earthquake Hazard Reduction Program to the National Institute of Standards and Technology and the implications of this move,
3. Progress by the U.S. Geological Survey on the National Map Project to replace paper topographic maps with digital products,
4. The status of state surveys, many of which continue to face severe budget problems,
5. Water-related issues around the nation,
6. Improving geological survey publications and public education on geological issues, and
7. The need for national energy and minerals policies.

The overall impression many of us gained from the meeting was the increasing quality of the work being done by the various state

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State geologists assemble on the lawn of Skamania Lodge for a group photo. The Columbia River Gorge is in the background. Photo by Blue Ackerman.

LANDSLIDE INVENTORY AND SLOPE STABILITY MAPPING OF URBAN GROWTH AREAS IN COWLITZ COUNTY

by Karl Wegmann

The need for mapping potential geologic hazards is increasing in step with regional population growth and expansion of the urban fringe into once sparsely populated rural forest and agricultural lands. Nationwide, ground failures account for approximately $1.5 billion in economic losses and 25 to 50 deaths annually, placing them high on the list of most costly natural disasters. Western Washington, with its underlying geologic conditions, high annual precipitation, and areas of considerable topographic relief, is one of the more landslide-prone areas of the country.

With the passage of the Washington Growth Management Act in 1990, counties and cities were directed to delineate critical areas (including those subject to geologic hazards) to aid in formulating regulations governing development in such areas. Although Cowlitz County did not meet the population threshold for inclusion in the Growth Management Act, the county was required to establish a critical areas protection ordinance. Identification of potential slope-stability hazard areas within the rapidly urbanizing areas of Cowlitz County was an important first step in meeting this goal.

DGER's Geologic Hazards Section began a three-phase landslide inventory and slope stability mapping project for Cowlitz County in 2000, primarily in response to the 1998 Aldercrest-Banyon landslide (Fig. 1). We have mapped the areas shown in Figure 2 for all landslides, regardless of age.

Using aerial photos, we identified 604 deep-seated and 235 shallow landslides, 80 percent of which were not previously mapped. In total, 7 percent of the sloping lands within the study area were classified as landslide terrain. Of the deep-seated slides identified on aerial photos, 70 percent were field checked, and of these, 20 percent exhibited evidence of movement within the past 10 years. Deep-seated slides ranged in size from 0.03 to 410 acres. Deep-seated slide movement occurred on slopes with gradients as low as 10 percent (6 degrees).

The study area is characterized by moderate to steep slopes that tend to fail via slow to moderate, rotational to translational rock/earth slides (Fig. 3). It is underlain by high-plasticity clay-rich soils and deeply weathered Tertiary bedrock. Slides occur within all rock units regardless of age, but have the highest rate of occurrence on steep to moderate slopes underlain by deeply weathered volcanic tuffs and volcaniclastic sedimentary rocks (Goble Formation), Cowlitz Formation, Toutle Formation, Sandy River Mudstone, and Troutdale Formation, all of Tertiary age.

The majority of slides appear to have moved in response to natural causes, such as above-average annual precipitation. Some of the now-dormant deep-seated slides may have been seismically triggered, and others may have initiated in response to rapid drawdown of late Pleistocene glacial outburst floodwaters along the Columbia River and its tributaries. Human actions, such as the alteration of slope hydrology by development and forestry practices, surface mining operations, and improper placement and design of fill material on slopes, have contributed to the initiation of new and reactivation of dormant deep-seated slides.

The end product of Phase I of this study was the *Digital Landslide Inventory for the Cowlitz County Urban Corridor—Kelso to Woodland (Coweeman River to Lewis River), Cowlitz County, Washington* (Report of Investigations 34). The report contains a digital, map-based geographic information system (GIS) inventory of landslides in the south half of the Cowlitz County urban corridor. The inventory consists of ArcView shapefiles, a database and spreadsheet, digital photos of individual landslides, associated metadata, 1:24,000-scale landslide inventory maps for 7.5-minute quadrangles in the inventory area, and a 20-page text.

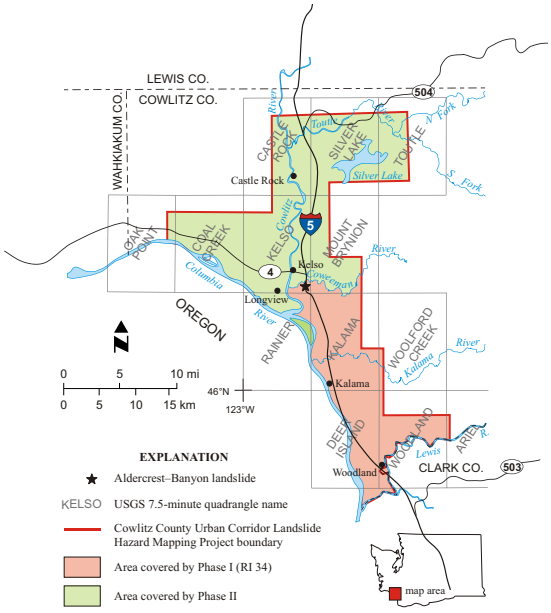

Figure 2. Location of the Cowlitz County Urban Corridor Landslide Hazard Mapping Project study area and the portions covered by Phases I and II of the study.

Figure 1. View northwest along the main scarp of the Aldercrest–Banyon landslide (1998) as it appeared in August of 2000. Note the destroyed houses and tilting trees at the base of the scarp. Prior to the landslide, these houses were slightly above the elevation of the top of the scarp. This photo was taken in the former basement (light gray area on the left) of a house now at the bottom of the hill outside the photo area. The scarp exposes Neogene fluvial gravels and sands of the Troutdale Formation.

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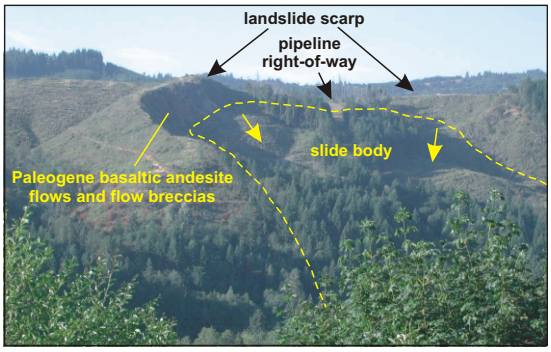

Figure 3. Large slow-moving, deep-seated rockslide along the north side of the Kalama River illustrating failure in bedrock. This 90-acre landslide is failing in interbedded Paleogene volcanic and volcaniclastic rocks. In 1996, renewed movement of the upper portion of this landslide complex ruptured and ignited a natural gas pipeline that is routed across the landslide. View to the north across the Kalama River valley.

CURRENT DGER PROJECTS

GEOLOGIC MAPPING PROGRAM

DGER continues to improve its ability to create and make available high-quality geologic maps. Mapping by Josh Logan, Tim Walsh, Joe Dragovich, Hank Schasse, Michael Polenz, and Bob Derkey finds widespread use in such applications as growth management planning, geologic hazards mitigation, and earth resources management.

Through innovative use of state-of-the-art remote sensing methods such as lidar, the latest GIS and computer drafting techniques, and Internet notification and distribution systems, geologic mapping in Washington has never before been so widely available. Washington is one of the few states in the nation with statewide digital geologic mapping at 1:100,000 scale.

With funding from the National Cooperative Geologic Mapping Program, DGER produces geologic maps of five to six 7.5-minute quadrangles per year. In 2002, we started producing this 1:24,000-scale mapping as full-color maps (PDFs) that can be downloaded from our website (http://www.dnr.wa.gov/geology/pubs/pubs_ol.htm) or purchased as a printout or CD. So far most mapping has been in heavily populated areas of the Puget Lowland and Spokane County. On June 30, DGER released geologic maps covering the lower Elwha River basin, part of the Darrington–Devils Mountain fault zone, part of the Olympia structure, and tributaries to Spokane's sole-source aquifer.

A cooperative effort with the National Park Service and U.S. Geological Survey to map on Whidbey Island is now in progress. Mapping also continues near Olympia, Port Townsend, and Spokane.

YAKIMA RIVER FLOODPLAIN MINING RESEARCH PROJECT

River floodplains offer an easily available source of gravel for our roads and buildings. Associated with floodplain gravel mining are loss of streamside vegetation and suitable spawning substrate for salmon and steelhead, as well as reduction of active floodplain area and channel complexity by dikes, levees, and avulsion, which happens when the river breaches a pit and fills it with water. Additional effects of mining are lowered water tables, altered ground-water/surface-water interactions, and changes in water quality, such as

Figure 1. DGER geologists Dave Norman and Karl Wegmann measure bathymetry in a gravel pit lake.

elevated temperature and pH. All of these impacts are detrimental to coldwater fishes and the native ecology of a river basin. Little has been done to study the extent, scale, and duration of these effects.

The Yakima River floodplain is the most heavily mined area of its kind in the state. Because the river supports important native fisheries, it was deemed prudent to improve our understanding of the impacts of gravel mining on floodplain habitat. Yakima County, in partnership with the Yakama Nation and the Washington State Departments of Ecology, Fish and Wildlife, and Natural Resources, obtained grants to study floodplain mine sites on the basis of characteristics that could be quantified, such as amount of connection to the river, depth, distance from river, location in river reach, fish species, grain size, gravel pit substrates, benthic macroinvertebrates, and temperature.

DGER participated in the study by defining and comparing physical characteristics of mine sites, such as whether the pits were connected to the river, deep or shallow, or close to or far from the river. Staff

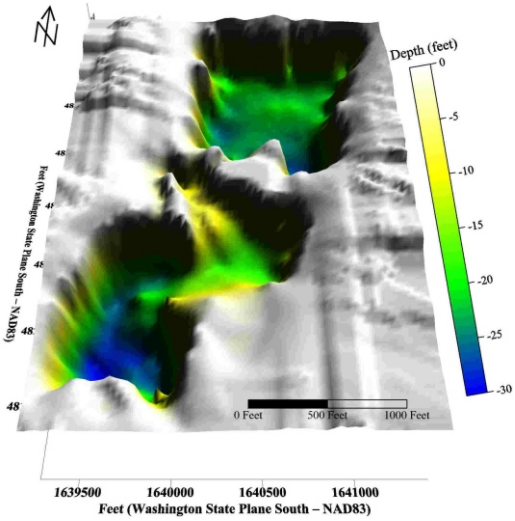

Figure 2. A three-dimensional perspective bathymetric map of Selah Ponds 2 and 3 made on July 17, 2002; bathymetry in feet below the water level.

Figure 3. DGER geologist Chris Johnson dives for pond-bottom sediment samples. Diving to collect samples is more work, but provides a better quality sample.

geologists used global-positioning system (GPS) software and depth-finder techniques to produce accurate maps of the current bathymetry and morphology of selected flooded mine pits along the Yakima River (Figs. 1 and 2). Particle-size measurements were made of bottom samples from each pond and adjacent river reaches to define substrate character (Fig. 3).

DGER has released the results of this study as Open File Report 2004-8, which identifies mitigation actions for use in existing and future mines and incorporation into government policy as "best available science". The 270-page main text is available at http://www.dnr.wa.gov/geology/pdf/ofr04-8_text.pdf. The complete report, with appendices, is available on CD only. ■

COWLITZ COUNTY *Continued from p. 2*

The inventory includes information about each landslide, such as the level of certainty that the mapped feature is a slide, the inferred state of activity, slide dimensions, landslide type, geologic unit(s) involved, affected infrastructure, and whether or not the slide was previously identified.

Phase II of this project is nearly finished. It will consist of a detailed digital map-based GIS inventory and database of identified deep-seated and shallow landslides in that part of the study area north and west of the Coweeman River. The final product will be similar to Report of Investigations 34.

Phase III of the study will consist of a combined database covering the entire study area to be released as an open file report. ■

NOMINATIONS FOR SURFACE MINE RECLAMATION AWARDS

DGER is accepting nominations for this year's Surface Mine Reclamation Awards until October 1. The awards honor mine operators and reclamation plan designers who contribute to surface mine reclamation in an exemplary manner. More information and the nomination form may be found at http://www.dnr.wa.gov/geology/smraward.htm. ■

STATE GEOLOGIST *Continued from p. 1*

surveys despite continuing budget pressures at both the state and federal levels. Many state surveys continue to face measures designed to save their state governments money. These measures may not always take the form of direct program cuts. Many surveys face restrictions on travel, conference attendance, printing publications, and filling vacant positions. States with significant energy or mineral production generally fare better than the states that lack such financial incentives.

All of the discussion topics mentioned above have relevance to the situation in Washington State. The continuing reorganization and budget difficulties at the federal level mean that grants to support geological hazard and mapping activities are harder to come by. Competition for these funds is intense. Washington's population growth, economic development pressures, and growing awareness of the severity of the state's geological hazards all contribute to the need for additional geological work.

As part of the 05-07 biennial budget package, our parent agency, the Department of Natural Resources, will submit a number of proposals to the Office of Financial Management for inclusion in the Governor's budget request to the Legislature. These packages include requests for funds to provide information to local, state, and federal government as well as industry:

- Subsurface mapping to guide water-resources and water-rights decision makers,
- Resource mapping of sand and gravel and quarry stone to assist local governments in designating areas for future production and protecting those areas from conflicting uses as required by the Growth Management Act,
- A database of landslide-prone areas to allow local governments to properly zone these hazardous areas, and
- Detailed soil liquefaction and soil condition maps to help local governments identify areas that become hazardous during earthquakes. This last package is needed for the proper implementation of new statewide building codes that went into effect July 1.

We're hopeful that the Legislature will recognize the importance of this critical information in protecting life and property and in the continued orderly economic growth of the state. ■

WESLEY WEHR—AN APPRECIATION

by Kitty Reed

Wes Wehr died on April 12th, a few days short of his 75th birthday. The party he had planned was sure to have rivaled the two simultaneous parties he hosted in November of 2003, the evening before he received the Strimple Award* recognizing his contributions as a paleontologist who does not make his living in that science.

Wes was born in Stanwood in 1929. His grandfather encouraged him to go to college to study his current love, music, and he started at the University of Washington in 1947. He met numerous artists during his college years and took up art (and poetry, drama, and philosophy) while sharing music with his friends.

Wes soon began to produce the small mixed-media works and pen and ink 'monsters' that have delighted many. His art has been shown worldwide. Wes was the person called on to authenticate Northwest abstract expressionist Mark Tobey's paintings (http://bahai-library.com/reviews/tobey.html). Wes knew the recent history of the Pacific Northwest art world better than anyone else.

He was first drawn to fossils more for their aesthetic side than for the science. By the 1970s, his passion led him to volunteer at the University of Washington's Burke Museum. He enjoyed field work and, of course, the people he met in his travels. He discovered the world-class deposit of Eocene fossils at Republic, Wash., and convinced the city to make it available to the public (http://www.stonerosefossil.org/). Wes and his coworkers have identified about 250 plants or other fossils from this area. Our understanding of climate change/plant evolution during the Eocene relies heavily on this rich upland deposit.

Wes made sure that Republic genus and species names honored people who helped him. (In turn, he has been honored: *Wehrwolfea* and *Wessiea*.) Wes's early publications included articles in *Washington Geology* that introduced this remarkable flora to the world.

His work radiated to other sites in Washington and British Columbia. He collaborated with most of the current experts in paleobotany and paleoentomology. In the early 1980s, the Burke named him affiliate curator, a position he filled as a volunteer. Recently an endowment was set up to assist him in this work.

While he was amassing an impressive collection of fossil plants and wood, he found time to write two semi-autobiographical books: *The Eighth Lively Art: Conversations With Painters, Poets, Musicians, and the Wicked Witch of the West* and also *The Accidental Collector: Art, Fossils, Friendships*. These are quintessential Wes—vignettes with a twist that capture the subject. Letters from Wes's many friends fill boxes in his archive at the University of Washington. He was known for his postcards sent from tiny obscure towns, signed by him and whoever was traveling with him—a who's who of paleontology. He reluctantly switched from handwritten notes and phone calls to e-mail, although he admitted that it increased his productivity.

Wes lived very frugally but was unfailingly generous. All the art (his own and that of his friends) he had at his death has gone to museums or libraries. But the most important Wes legacy was the myriad connections he made and caused to happen among his friends in the worlds of art, music, literature, and science.

Memorials may be made to the Wes Wehr Endowment for Paleobotany, the Burke Museum, Development Office, University of Washington, Box 353010, Seattle, WA 98195. ■

*Johnson, Kirk, 2004, Presentation of the Harrell L. Strimple Award of the Paleontological Society to Wesley

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