USGS RETIREES

NEWSLETTER No. 187
May 2020

An organization of retirees of the U.S. Geological Survey, whose purpose is to keep its members in touch with each other and their former agency.

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PRESIDENT'S MESSAGE

Hello Members:

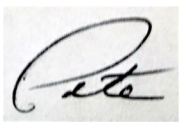
On behalf of the Retirees' officers, I send our best wishes for your health and your loved ones' health. We are experiencing a unique and challenging time that we have never had to witness or endure during our lifetime. Hopefully, our families and acquaintances will survive the COVID-19 pandemic with limited hardships, and the pandemic ends sometime this year, well before current projections.

When I wrote this message my wife Joyce and I recently returned to our home in Fairfield Glade, TN after spending 4 wonderful months at a beach condo in Indian Shores, FL, just west of Tampa. Ten days before we left Florida, the beaches, pubs, bars, and restaurant dining were closed due to the COVID-19 pandemic. However, we made the most of the situation by fixing our meals and eating out on the balcony of the condo with a panoramic view of the Gulf beach and water under fabulous weather conditions. Arriving home, we encountered no surprise problems, thanks to neighbors and Fairfield Glade Police who checked our house and property. However, we are now faced with a lot of yard work, but can't complain because it's refreshing, keeps us busy, provides exercise, and, of course, easily adheres to social distancing. Oh, I almost forgot to mention our 5 golf courses are temporarily closed along with all other Community Club activities.

The Tucson Local Arrangement Committee members continue their planning efforts for the next Reunion, scheduled on March 18-20, 2021. On pages 2-3, Mark Anderson provides the latest information on what should be an exciting, informative, and interesting Reunion. So, keep those dates on your calendar with plans to attend. A USGS Reunion with its activities and the camaraderie with former colleagues and friends in a warm and sunny climate at the end of winter will be a welcomed change for what we are experiencing this year.

On pages 4-11, Tom Pierson provides an article on this month's 40th anniversary of one of the most significant geologic events that occurred in the United States. "Vancouver! Vancouver! This Is It!" Those are the last words spoken by USGS Volcanologist David Johnston moments before he perished from the eruption of Mount St. Helens on the morning of May 18, 1980 at an observation post 5 miles north of the volcano. We are extremely fortunate to have Tom volunteer to write this excellent and informative article on early WRD response to the eruption. Tom spent his entire USGS career at the Cascades Volcano Observatory (CVO) in Vancouver, WA from 1981 to his retirement in 2018. Four of his years at CVO he served concurrently as Vancouver Project Office Chief (WRD) and Associate Scientist in Charge at CVO. Tom's field-based research at CVO focused primarily on volcano hazards involving the mobilization and rapid movement of rock debris, ice, and water mixtures down the flanks of volcanoes (lahars, debris avalanches, and floods). He continues to be particularly interested in using hazard assessment information gleaned from volcanic deposits to inform and educate emergency managers, public officials, and vulnerable communities about volcanic hazards.

I hope you enjoy reading this edition of the Newsletter. We need to give a big THANK YOU to all who contributed. Please consider contributing to the August edition. We want to hear from you. Also, see "Note from Editor" preceding Tom Pierson's article.



Editor's Notes:
We on the Newsletter Team are wishing you all good health and safety through this pandemic. One impact of the COVID-19 virus is the difficulty in gathering and mailing out the printed versions of the May2020 newsletter and the 2020 Directory from the USGS National Center. We hope to mail the printed May newsletter and the 2020 Directory sometime between June and August. As usual, a copy of the May Newsletter will be posted on the Web site http://wrdretirees.org/newsletters.htm. Those retirees receiving an electronic copy of the newsletter will still receive it in May. We regret any inconvenience.

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What is your Mount St. Helens story? As you read above, this anniversary article suggested by President Pete Anttila was prepared by his colleague, Thomas Pierson. For reasons of space, science references were not listed and not all people involved could be named. I take this opportunity to ask readers to reach out to anyone you know who was involved or if you were involved and submit your 'brief account of Mt. St. Helen's eruption stories for consideration in the "News of Retirees" section for future newsletters. Thank you, Tom for this fine article.

Jeff Stoner
USGS Retirees' Newsletter Editor

USGS Retirees' 2021 Reunion -- Hold the Date March 18-20
Second Announcement

Please plan to join your fellow retirees for fun, reflection, and education in Tucson. For the nature enthusiasts among us, the Sonoran Desert comes alive this time of year.

Photo 1-- Cardinal in Cholla cactus. Southern AZ is a bird watchers paradise. Photo by Mark Anderson

Photo 2—The desert begins to bloom in March. Here is a native Pincushion cactus. Photo by Stan Leake.

Where: Tucson, Arizona
When: March 18-20, 2021
Facility: University Marriott (on U of A campus); Walking distance to USGS Center (See web site for a few photos) https://www.marriott.com/hotels/hotel-photos/tusmp-tucson-marriott-university-park/

Room rate: $135 per night; your choice of King bed or 2 queens; rate honored 3 days before and after the event for those who wish to extend your stay.

Special Administrative Message:
While we are in the grips of this Covid-19 pandemic, it might occur to you, what if this plague persists or reoccurs next winter. Here is our plan:

1. We continue to plan and remain optimistic that the reunion will occur as scheduled.
2. A registration form and all related information will be in the August Newsletter.
3. Registration for the Reunion and hotel begins on September 1, 2020
4. If the current pandemic persists or re-emerges, a decision to cancel will be made by the Retirees Association Leadership, in early January 2021.
5. ***In order to meet the requests for special break-out sessions (i.e., IT, Hydro Tech., Admin), the LAC will need to have a point of contact for each group meeting by February 19, 2021. And, a follow-up by March 5, 2021 of the number of people in the corresponding group so that the LAC can make the appropriate arrangements for available meeting space.***

Potential Activities: In addition to icebreaker events and dinners together, the organizing committee is considering a number of offerings 1) Sonoran Desert exploration, 2) Tucson Water Avra Valley recharge facilities, 3) Seminars by current and former USGS scientists and technicians; 4) presentation on U of A—USGS collaboration on first academic hydrology program in US (do you know about the napkin?), 5) Special session and invite to HydroTechs and support personnel; more detail in subsequent Retirees' Newsletters. If you want to wander on your own or extend your stay, Tucson offers a wide variety of activities, and March is the perfect time to enjoy them. There are National Parks nearby to add to your life list (Saguaro, Organ Pipe, Chiricahua) with many more up north. A few examples: take in a major league ball game during spring training, visit the Arizona-Sonora Desert Museum, Kartchner Caverns, the Pima Air Museum, the Tucson Botanical Gardens, or one of the many museums. Tucson has become a foodie mecca and is home to world-class restaurants – everything from food trucks featuring Sonoran hot dogs to 4-star elegant dining. An alternate lodging option is to rent an RV to take in the sites.

Weather: Average high temperature mid-March is 75 F. Precipitation unlikely.

Watch for more details in subsequent Newsletters. For more information contact local committee members, Mark Anderson (markandersonwater@gmail.com), Pat Tucci (ptucci@sprintmail.com), Stan Leake (azstan@gmail.com), or Sandy Williamson (sandeb2@gmail.com)

Forty Years Ago—The Early Water Resources Division Response to the 1980 Eruption of Mount St. Helens

Back in early 1980, the Water Resources Division (WRD) of the U.S. Geological Survey didn't study or deal with volcanoes. It had its hands full assessing, evaluating, and monitoring the Nation's water resources[1]. *Volcano hydrologic hazards* was not recognized as a topic of study by WRD hydrologists at this point, but it was soon recognized to become an urgent water-resources issue. This article covers WRD efforts during calendar year 1980 to address the catastrophic impacts of the May 18 eruption and its hydrologic hazards on populated valleys downstream of the volcano. The USGS legacy of that early work continues today with the USGS Volcano Science Center.

In the early months of 1980, the U.S. news media were reporting on efforts to free the American hostages in Iran, the decision to boycott the Summer Olympics in Moscow, effects of inflation on the economy, and Ronald Reagan running for President. Then on the first day of spring, a snow-and-ice-clad volcano in southwest Washington State became front-page news. Mount St. Helens began to wake up from 123 years of slumber.

The iconic stratovolcano rumbled abruptly back to life with a shallow Magnitude 4.2 earthquake directly beneath the volcano at 3:48 PM on March 20, 1980, followed within minutes by smaller aftershocks. This was the largest quake in the Cascades in at least 16 years, and its location raised eyebrows. Mark Meier, head of the Project Office for Glaciology (POG) in Tacoma under WRD's National Research Program (NRP), was informed of the earthquake that same afternoon by Steve Malone, a geophysicist attached to the University of Washington (UW) seismology laboratory and the three-month-old Pacific Northwest Seismic Network (a UW/USGS joint venture). Mark and Steve were concerned, because in 1975, when a column of hot magma rose beneath Mount Baker[2] (but didn't erupt), the two had worked together and tried to imagine the threats that a warming or erupting glacier-clad volcano might unleash on downstream populated areas. Eyebrows rose higher when more earthquakes rattled the volcano in the following days and weeks, increasing in magnitude and frequency. Then, a steam explosion blasted a small crater in the summit on March 27, upping the ante.

WRD staff began swinging into action. The Tacoma-based POG held staff meetings to determine how they might aid the effort. POG's Austin Post and Bob Krimmel immediately began taking high-resolution aerial photos of the volcano and its glaciers. Photo specialists David Hirst and Robert Crist worked overtime in the photography darkroom to develop the aerial photos, so that the prints could be made and distributed to USGS colleagues and to the news media. WRD water-quality specialists began sampling the rivers to see what effect ash from early steam explosions was having on water chemistry (brief increases in acidity, as it turned out). A former USGS field assistant and then CalTech graduate student, Mindy Brugman, quickly established survey transects on Shoestring Glacier (on the southeast flank of St. Helens) to measure glacier velocity variations that might herald potentially damaging increases in river discharge downstream. Mindy asked for USGS assistance, and on May 17, she and Carolyn Driedger, a twenty-something WRD glaciologist working under Meier, headed to Mount St. Helens with the POG's highest quality distance measuring device—a Laser Ranger 2 EDM (electronic distance meter), to be loaned to geologists monitoring the volcano.

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[1] In 1980 there was a strict division of labor within the USGS, reflected in the three major semiautonomous and separately funded Divisions within the Agency. The Water Resources Division dealt with inland surface water and groundwater, including the full range of physical and chemical hydrologic processes. The Geologic Division handled the rocks and geologic processes (including volcanoes and their processes), plus coastal, oceanographic, and astrogeological studies. The National Mapping Division (NMD) focused on geography and cartography, and it produced the Nation's maps, principally topographic maps. The skills and resources of experts in all three of these Divisions were critical to the effective USGS response to the reawakening of Mount St. Helens—personnel from all three worked together and were housed at the Cascades Volcano Observatory (CVO) in Vancouver, Washington, which was effectively established in 1980 but officially dedicated in 1982. WRD staff at CVO (District and NRP) were reassigned to the Volcano Hazards Team (GD) in 2005, and soon thereafter separate Divisions in the USGS were abolished.

[2] Mount Baker is another active Cascade stratovolcano in Washington State.

Geologists, geophysicists, and geochemists from the Geologic Division (GD) and other agencies and institutions from around the country began arriving in Vancouver, Washington[3] in April and early May, following the volcano's reawakening. Some of these scientists had studied volcanic processes at Kilauea Volcano in Hawaii at the Hawaiian Volcano Observatory and knew a lot about gas-depleted basalt eruptions at mid-ocean shield volcanoes, but none had any direct experience with gas-rich (explosive) magma eruptions from stratovolcanoes in the Cascades. The last such eruption, which ended in 1915, was at California's Lassen Peak. Many of these scientists had studied the rocks and deposits on and around dormant or extinct stratovolcanoes at many places around the world, however, and they knew the hazardous capability of such volcanoes. Their expertise was mainly in the emplacement of lava flows, pyroclastic flows (rapid dry avalanches of hot rock and ash), and ashfall that can blanket landscapes downwind of explosive eruptions. Only two of these scientists had carried out in-depth studies of deposits emplaced by an important hydrologic hazard at Cascade volcanoes—*lahars* (an Indonesian term that describes a slurry of water, mud, and rock fragments that flows down the slopes of a volcano and typically enters a river valley). In fact, they had studied these and a variety of other deposits at Mount St. Helens during the 1970s. Dwight "Rocky" Crandell and Don Mullineaux (from the USGS Denver office), quickly became the "go to" geologists for trying to forecast what Mount St. Helens might do[4].

Rocky and Don truly understood the hydrologic hazard implications of a potential eruption from Mount St. Helens. Years earlier, Rocky had correctly identified and mapped deposits from a massive lahar from Mount Rainier—a deposit that had been previously described as glacial till, and he encountered other lahar deposits there as well. At St. Helens he also found a rich history of past lahars, and careful dating of those deposits and interbedded ash layers showed them that this volcano had been erupting not just thousands of years ago but frequently in recent centuries. They published their findings in 1978[5] and predicted[6] that this highly active volcano might erupt again before the end of the 20th century, sending more highly destructive flows of mud, rock, and water surging down river valleys.

Rocky and Don's prediction came true just two years later, on May 18th, 1980. At 8:32 a.m. the volcano was shaken by yet another earthquake—a M5.2 tremor that coincided with the structural collapse of the entire oversteepened north flank of the volcano. About 3 billion cubic yards of rock accelerated downslope, averaging a speed of 112 mph in the first 26 seconds, then split into three tongues of churning rock debris. One surged into Spirit Lake, raising the lake 200 ft and producing a new jumbled blockage of debris capable of impounding much more water. Another flowed more than 800 feet up and over Coldwater Ridge (now Johnston Ridge). The main tongue turned westward and crashed another 14 miles down the North Fork Toutle River. This debris avalanche—a hazard previously unknown to the Cascades—filled the upper North Fork Toutle River valley with two thirds of a cubic mile of debris to an average depth of 150 feet in just 10 minutes.

The almost instantaneous removal of hundreds of millions of cubic yards of rock uncorked a highly pressurized, gas-rich magma system inside the volcano, and an explosion, heard in Canada (but not locally), sent out a shock wave and an explosive lateral blast (another hazard unknown to the Cascades) that devastated nearly 200 square miles of terrain, mostly old growth forest. Then, with its vent finally cleared, the volcano directed a column of volcanic ash vertically to 80,000 feet within 15 minutes. The ash cloud drifted to the northeast, raining fine rock fragments over a broad swath of the Northwest, turning day into night. About half a billion tons of volcanic rock (ash and pumice) and several tens of thousands of tons of gas (carbon dioxide and sulfur dioxide) were pumped into the atmosphere on that day. In addition to the pumice and ash lofted upward, coarse hot rock debris also cascaded down the remaining snow-covered upper flanks of the

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[3] Vancouver was a large enough town to provide needed services, close enough to the volcano for field work access (but not too close), and close enough to Portland International Airport for the frequent comings and goings of researchers on temporary duty rotations.

[4] Rocky and Don were funded by a project to study volcanic hazards, but there was no official USGS volcano hazards program at the time.

[5] Crandell, D.R., and Mullineaux, D.R., 1978, Potential Hazards from Future Eruptions of Mount St. Helens Volcano, Washington: U.S. Geological Survey Bulletin 1383.

[6] Their findings in support of the likelihood of another eruption in the relatively near future first appeared in a short scientific paper in *Science* in 1975, and then in a USGS press release in 1976.

cone, triggering three large lahars in Muddy River, Pine Creek, and South Fork Toutle River. Another enormous lahar was triggered by liquefaction of the avalanche debris in the upper North Fork Toutle valley later the same day. This flow of liquefied mud and rock flowed more than 60 miles to the Columbia River, where it dumped enough sediment to block commercial shipping and to nearly plug the cooling-water intakes of a nuclear power plant. It was the biggest eruption in the Cascades in 500 years, and it prompted the birth of the USGS Volcano Hazards Program.

In its opening seconds, the eruption snuffed out the life of USGS geologist David Johnston, who was on duty at an observation post 5 miles north of the volcano and directly in front of the steadily bulging and oversteepened north flank of the volcano. The eruption also killed 56 other people who were in the wrong place at the wrong time, most of them outside the State-designated "red zone". Carolyn Driedger and Mindy Brugman visited Dave on May 17 at that "Coldwater 2" observation post. They delivered the POG-owned EDM to Dave and taught him how to use it. They had hoped to spend the night there, so that they could get a helicopter pickup from there to make glacier measurements in the morning, but Dave told them that the site was too dangerous and that they should limit their exposure and return to Vancouver. Dave used that EDM the next morning, May 18, to measure the distance from his location to the tiny mirror (reflector) on the "bulge". In what became his final communication with the USGS office[7], David Johnston reported his measurement of overnight growth. Carolyn and Mindy were driving back up to the mountain the next morning when they saw, from their car on I-5, an ominous dark cloud rising from the sunlit snow-covered cone. It was moving north, and they realized then that Dave had been right.

WRD involvement at Mount St. Helens ballooned after that Sunday morning in May. After turning their car around in Woodland, Carolyn and Mindy drove straight to the makeshift volcano operations center at the Forest Service HQ in Vancouver and began four straight days of work fielding questions from the news media[8]. Shortly thereafter, Dick Janda and Mike Nolan, two WRD/NRP geomorphologists studying erosion and sediment production in Redwoods National Park, California, headed to Vancouver. They were also immediately swept up in the whirlwind of emergency management issues and media interviews, but they soon started to devise a plan to study impacts of the eruption on stream systems around the volcano. They first set up a network of stream channel cross-sections that could be repeatedly resurveyed to document changes in channel morphology, then they began mapping lahar deposits in the Toutle River drainage. Dick was tapped by Western Regional Hydrologist John Bredehoeft to head up a new WRD Project Office associated with the nascent Cascades Volcano Observatory, which would soon be operating out of a rented office suite on McLoughlin Boulevard in Vancouver, and Mike joined him periodically from Menlo Park to assist. Dick had the opportunity to choose whether to align the new project office with the Washington District or keep it an NRP enterprise. Dick chose the District in Tacoma because of the potential for strong collaboration with experienced hydrologists and technicians, and probably, for the promise of more stable funding—in early 1980, WRD was coping with an 8% funding cut. Soon thereafter Dick asked sedimentologist Kevin Scott, who was working out of a subdistrict office in southern California, to join the new project office in Vancouver. Together they continued studying and mapping fresh lahar deposits, while at the same time Dick enlisted a UC Santa Barbara PhD student, Harry Glicken, to tackle mapping and studying the huge debris avalanche deposit, under the supervision of Richard Fisher and Penn State landslide expert Barry Voight. Over the remainder of 1980, Dick assembled a team of hydrologic technicians to monitor and sample the rivers draining St. Helens, which were overloaded with sediment and floating woody debris. The 1980 Surveillance Section of the Vancouver office included Dallas Childers (chief), Steve Cox, Jeanette Dodge, Steve Gustafson, Tom Hale, Dick Jesser, Al Onions, Len Reed, and Wayne Steuben. Dick also added hydrologists to analyze the results and initiate new research: Randy Dinehart, Holly Martinson, Dave Meyer, and (briefly) Jim Culbertson.

Beyond the activity based out of Vancouver, WRD personnel from the Washington District Office in Tacoma (Chuck Collier, District Chief) and other centers around the country also began documenting what had

[7] The widely reported last words heard from David Johnston, "Vancouver, Vancouver, this is it!" never got through to the Vancouver office. They were picked up by others listening on that radio frequency.

[8] Carolyn's boss in Tacoma, Mark Meier, knew that Carolyn and Mindy were supposed to be making measurements on the volcano on May 18. Only when he heard Carolyn's voice reporting volcano news on the radio did he know that they were safe.

happened to streams and lakes affected by this immense volcanic disturbance to the landscape. They saw two crucial needs: to try to predict what might happen in the future, and to set up monitoring for any future hazards. The first order of business was to help the Vancouver crew construct or reactivate 14 stream gaging stations on rivers draining the volcano and 2 lake-level stations on the new Spirit Lake, now dammed by a debris blockage of unknown stability. Five pre-eruption gaging stations had been destroyed by the eruption or its aftermath, but by the end of the year, gages were operational on North Fork Toutle River (2), South Fork Toutle River (4), Green River (1), main stem Toutle River, (2), Cowlitz River (2), Kalama River (1), Muddy River (1), and Pine Ck (1); three of these remain in operation today. The 1980 contingent of managers, hydrologists, hydrologic technicians, and field assistants from the Tacoma office who were working or helping on volcano projects included Bob Adsit, Phil Carpenter, John Cummans, Gary Deeter, Norm Dion, Jack Doyle, Brian Drost, Sandy Embrey, Walker Frederick, Luis Fusté, Tom Kane, Dennis Kent, John Klein, Dave Kresch, Ron Lombard, Bill Lum, Ed McGavock, Mory Miles, Leonard Nelson, Bryan Peck, Jim Poole, Ralph Quisdorf, Don Reynolds, Martha Sabol, Bill Sikonia, Chuck Swift, Ken Tanner, Lyn Topinka, Gary Turney, Lloyd van Gorden, Bill Wiggins, and Rod Williams. They were later joined by Bill Meyer, Ed Prych, and Len Tunnel. NRP researchers from Denver, Diane McKnight and Dave Hubbell, monitored water quality in the lakes around the volcano and sediment in the affected rivers, respectively. Another team from the Oregon District Office headed by Julija Laenen and Stuart McKenzie analyzed the massive input of sediment to the Columbia River.

The other key task of the Tacoma group (working with the Vancouver office) was to devise a warning system for potential breakouts of debris-dammed lakes in the North Fork Toutle River drainage. Six lakes began to fill immediately after May 18. Having no natural outlets, they would fill until their unstable natural dams breached, sending floods of various volumes downstream toward Kelso and Longview in a channel already choked with sediment and debris. Three of the smaller lakes filled and spilled in 1980, but South Castle, Coldwater, and Spirit Lakes remained as potential hazards. The largest and most dangerous of these growing impoundments was Spirit Lake, threatening an outbreak flood potentially in excess of 500,000 ft^3/s that almost certainly would have transformed into a catastrophic lahar. Working with the Vancouver office and the National Weather Service (NWS), which had the mandated responsibility for giving flood warnings, a warning system was devised using trip wires, seismic signals, and river- and lake-stage heights at gages—all transmitted in real time (by GOES satellite). The system could send alarms to Tacoma hydrologists carrying beepers (Phil Carpenter, Chuck Swift, Ed Prych, and Dave Kresch). In the event of a validated alarm, the hydrologist on duty would alert the Cowlitz County Sheriff and the NWS, and a flood warning would be broadcast. But a flood warning was never sent, because within the next few years the lake level at Spirit Lake was safely stabilized by the U.S. Army Corps of Engineers (USACE)—first by pumping from barges in the lake, and later by a drainage tunnel bored several miles through a bedrock ridge. Spillways were also constructed at Coldwater and South Castle Lakes by the USACE to keep them from overtopping.

Stream gaging became the backbone of hydrologic monitoring at the volcano over time, and it needs to be emphasized that collecting streamflow data and sediment samples from a river system severely disturbed by a major volcanic eruption is not easy. Crews from Vancouver had responsibility for gaging stations on the Toutle River and others directly draining the volcano, while Tacoma crews initially collected data on the Cowlitz River downstream of the Toutle confluence. Data and samples from the smaller rivers were collected from cableways and bridges for virtually all high-water events, day or night. Floods at night were particularly risky. Floating logs commonly were large, mostly submerged, difficult to see, and numerous. A spotter using a powerful spotlight watched upstream for floating logs in the churning muddy water, while the person taking current-meter readings or sediment samples worked as fast as humanly possible while the meters or samplers were suspended in the water from cable reels, fervently praying the cables wouldn't snag a log. If they did, and if the floating debris did not come loose, there was no safety break-away mechanism other than heavy-duty cable cutters at the ready. Either the snagged cable would spool out rapidly, then tear loose from its connection, or if the reel drum was in locked position, the cable would be cut, or break, but not before taking a cable car (or a bridge crane) on a wild ride. As far as I know, no personnel were seriously injured during these operations. The Tacoma crews operating from boats on the Cowlitz faced similar challenges from floating logs and debris. They also had spotters in the bow of the boat, and it was reported that colorful language from a cable operator was heard from shore one night when he discovered that the spotter was a guy who was legally blind.

In the years since 1980, a broad range of hydrology-related research projects have been carried out by WRD scientists and engineers, often in collaboration with researchers from other agencies and institutions:

- Effects of volcanic ash on surface water chemistry and toxicity
- Eruption effects on benthic fauna in streams
- Effects on organic and inorganic water chemistry, physical limnology, ecology, and bathymetry of lakes profoundly altered or created by the eruption
- Geomorphic responses of river channels to extreme sediment loading
- Rates and durations of sediment production from impacted terrain
- Sediment deposition in rivers and lakes
- Changes is vertical velocity profiles in flows of high sediment concentration
- Gravel bedform development and movement
- Sediment transport effectiveness as a function of flood magnitude
- Improved sediment transport formulas
- Development of physics-based flow models for lahars and debris avalanches
- Advances in flood-routing models
- Stability of lake-impounding debris blockages
- Potential of lake outbreak floods to transform to lahars
- Infiltration rates and erosion of ash-mantled hillslopes
- Volume and distribution of ice on Cascade Range glaciers
- Long term effects of volcanic ash fall on snow and ice ablation
- Destruction and regrowth of glaciers during and after eruptions
- Effects of a growing lava dome beneath a glacier
- Origin, flow behavior, depositional mechanisms, and sedimentology of lahars
- Transformation from debris flow to hyperconcentrated flow in single lahars
- Threshold fines concentrations necessary to sustain hyperconcentrated flow
- Understanding how pyroclastic flows rapidly produce meltwater and lahars
- Differences in sediment yield as a function of type of volcanic impact
- Duration of high sediment yields following disturbance

In retrospect, the biggest explosive eruption of Mount St. Helens in 1980, plus the five smaller ones later in the year, were hugely important in providing new understanding of how explosive volcanic eruptions work, what hazardous processes they can trigger (immediately and years later), and how volcanically disturbed drainage basins deal with altered topography and massive inputs of runoff and sediment. Hard-won new insights came from USGS personnel in three administratively (and culturally) separate Divisions: Geologic, Water Resources, and National Mapping, all of which had contingents based at the Cascades Volcano Observatory. Although there were occasional turf battles and interdivisional squabbles over funding allocations, a huge amount of excellent science was accomplished by working together. Indeed, it seems likely that the interdisciplinary scientific cooperation and success achieved at Mount St. Helens in the decades following 1980 may have helped persuade the USGS leadership team that more ground-breaking research might be accomplished without Divisions than with them.

Finally, Mount St. Helens in 1980 was key in opening the eyes of the hazard-mitigation community to the multiple destructive processes that are possible at erupting stratovolcanoes—not only the dramatic geologic processes involving hot, exploding, gas-charged magma, but also the far-reaching hydrologic hazards that can occur both during eruptions and later during times of quiescence. It also began to open the eyes of the scientific community to the need for effective education and communication about hazard and risk for the public and for government officials and managers. Lahars, debris avalanches, breakouts of unstable lake impoundments, and post-eruption flooding and sediment inundation (all of which can occur without warning) had not been fully understood or appreciated before Mount St. Helens. It's a scientific legacy and a contribution to public safety for which all WRD St. Helens veterans can be proud.

-By Tom Pierson, USGS Scientist Emeritus

With thanks to many contributors to this article. For more details into the scientific findings and authors, consider searching the USGS publications warehouse or Google Scholar web sites. I Photos are from USGS archives and from personal collections of those who were there.

Mike Nolan surveying a channel cross-section on the Pine Creek–Muddy River fan, a surface on the lower SE flank of the volcano that was swept by a large, high-velocity (45 mph) lahar during the first few minutes of the May18 eruption. The Shoestring Glacier, visible below the notch in the crater rim, was scoured locally more than 30 feet by pyroclastic flows, which provided the meltwater for the lahar (Summer 1980).

Holly Martinson (L) and Martha Sabol (R) conducting channel cross-section survey on upper Pine Creek (October 9, 1980)

Sediment sampling on the Toutle River at Tower Road during a flood. Dick Jesser is second from the left. (December 12, 1982)

Dick Janda with Kevin Scott to study and map May 18 lahar deposits in the Toutle River valley. Photographing a cable spool, perhaps buried in place, first by the South Fork Toutle lahar and then hours later by North Fork Toutle lahar. (Winter 1980–1981).

Sandy Embrey and Norm Dion sampling Fawn Lake for impact study. (USGS archive photo, Lyn Topinka, October 28, 1980).

Brian Drost examining mudline on tree trunks by afternoon lahar (May 18) along Toutle River near Interstate 5 bridge, Castle Rock, Washington. (Photo by Lyn Topinka, September 30, 1980).

Washington District office chiefs examining a lahar-transported boulder in Muddy River. Best-guess people, left to right, John Cummans, Phil Carpenter, Chuck Collier, and Ed McGavock. Mudlines on trees in background suggest depth of flow was about half the vertical height of the boulder. (May 1980).

Rod Williams examining rootless fumarole (hot gases being emitted from buried chunk of hot volcanic rock). Site appears to be on the debris-avalanche deposit in the upper North Fork Toutle valley. (Photo by P.J Carpenter, June 5, 1980).

Ron Lane installing piezometers in Coldwater Lake blockage—unstable natural dam impounding the lake. (Photo by K. Tanner, July 1981).

In Memory of David A. Johnston (12/18/1949 – 05/18/1980)
David was a Geologic Division employee who was on the rim and lost his life on Mt. St Helens on May 18, 1980 – if you would like to know more about David and the Mt St Helens eruption – click on this webpage: https://en.wikipedia.org/wiki/David_A._Johnston

The dedication was held in September 1980 outside of Bldg. 1, on the USGS, Menlo Park, CA facility.

David's plaque on the memorial reads

NEWS OF RETIREES

Larry Bohman writes: Hi Kate! Hope all is well. Still getting paid on top of my pension, but the paid gig ends this August (thankfully). Ready to retire!

Tony Coffey writes: Lind and I just returned from Hawaii to see our son and family. Everything there was fine.

Judy Cornwell writes: Thanks for all you do to keep our WRD retiree organization up and running.

Steve Curtin writes: I was a Hydrologic Technician in the Annapolis and Baltimore office for 42 years and know the importance of good data collection and analysis for Hydrologic studies. *(check included dues and donation to the scholarship fund)*

Ernest Dension writes: First off, thanks to the staff for assembling information regarding USGS retirees. As time marches on I recognize more names in the Memorials section than in the news of Retirees. Could it be that I retired in 1984 (36 years ago). On 16 December 2019 I celebrated 93 years mortal life. During these years, and among other things, I spent 2+ years in the US Navy, graduated from Utah State University with a degree in Civil Engineering, spent 35 years working for the USGS in Utah, Alaska, Nebraska, Texas, New England, and Wyoming. After retiring I moved back to Texas where the climate was more agreeable for my wife's health. Since the beginning of this year (2020) I sold my home and my little (1989) Ford truck. Being homeless my daughter and son-in-law, Rozanne and Rick Clayson, took me in. My new address is 2917 Alta Vista Lane, San Angelo, TX76904. My telephone number is 315-374-0263 and my email address is ernest.dension@gmail.com. I am very comfortable here, but I miss the home I built back in 1986-90. I'm not sure where I stand in dues but have enclosed a check to be applied to my account Thanks again to the USGS Retirees staff for keeping us up to date.

Gale Fullerton writes: Last October, I had the honor of being inducted into the Eagle Rock High School (ERHS), Los Angeles, CA **Sports Hall of Fame**. This award was based on volunteering as a shot-put coach from 1963 through 1968. During this period there were two school record holders, an LA City Champion, and seven out of the top eight shot-putters in school history at that time. The most important factor in receiving this award is that I started the ER Sports Hall of Fame program in 2008. This program has grown over the last 12 years to honor over 40 of Eagle Rock's greatest sports heroes. This program is now the number one alumni activity in the Fall and has increased alumni membership and contributions for scholarships. I was also recognized as a Soaring Eagle for ERHS in 2007 for prior volunteer activities for the school.
NOTE: *Gale worked as an Employee/Labor Relations Specialist in the Western Region Personnel Office, Menlo Park, CA. for nearly 25 years (1971-1995). He says the best part of his job was assisting managers and employees of the WRD Division - especially the many trips to the field offices. For his service he received the Department's Meritorious Service Award and was the first USGS administrative employee to receive the Superior Service Award.*

Bill Harenberg writes: I seem to have run out of work of a professional nature. Didn't get to the field last year or the year before. I'm assuming I'm still in business as I have my measuring equipment and my truck still has the decals on the window. It's been a good year so far for me. I keep busy with Scouts BSA. Have a Pack, a girl's Troop, a boy's Troop, and a Venture Crew. Also involved in District meetings. Jean just had a total reverse shoulder replacement surgery so I'm currently chief cook and bottle washer. Also, clean cat boxes, help Jean with showers and dressing. With spring coming I'll have to get the yard work started. I did get some Nordic skiing in this year but not as much as normal. Weather just wouldn't cooperate.

Rich Hawkinson writes: Keep up the good, informative work on the newsletter. I enjoy reading it and keeping up on the 'continuing' change within the organization. Those of us in AZ look forward to the March 2021 retirees gathering here in Tucson and it sounds like Mark Anderson and his organizing group will have an interesting meeting put together.

Bill Herb writes: A big thank you to the officers and newsletter staff. Marian and I are still enjoying our place on Fairlee Creek in "The Land of Pleasant Living" here on Maryland's Eastern Shore. Every day we remind ourselves that we get to spend most of our time in a place that folks would like to visit for a getaway. The migratory waterfowl, plus our nesting pair of eagles across the creek continue to entertain us. We have the usual senior health challenges, but they do not get in our way very much. I am optimistic enough to be mailing dues payment through 2021. We try to stay active in our community in Chestertown and are involved in a local political club and the League of Women Voters. We remain on the Board of Directors for Emerge, Inc., an organization that provides support to developmentally disabled adults, and I still serve as Newsletter editor for my college fraternity, Tau Phi Delta. I also teach a hydrology course at the Washington College Academy of Lifelong Learning on a roughly a 3-year cycle. I am involved in some of the ongoing controversies and discussions regarding the impact of Conowingo Dam on water quality in the Chesapeake. We are still travelling when we get the chance, with a trip to Egypt in the rear-view mirror and an upcoming one to Greece and Turkey before the end of spring. We also get to Florida occasionally to visit with Marian's sisters. I hunt deer and turkey in northern Pennsylvania when I get the chance and keep my 22-foot fishing boat ready to go on the Bay, although we don't get out nearly as often as we should.

Scott Hoffman writes: It has now been a full year for me to be in retirement. First, I want to say hello to all you current retirees and I am proud to part of this group! My official retirement date was square in the middle of the 2018-2019 furlough, but I was able to return as a Scientist Emeritus and give back to the PA Water Science Center in order to tie project loose ends together and mentor my replacement. I finally said goodbye on November 1, 2019 to the Center. I am still doing geospatial research in and around PA and helping a few other folks with their mapping and analysis needs. I am working part time for Hershey Resorts & Entertainment…as a 'rink rat'. Part of my duties are to do ice maintenance at the Giant Center (home of the Hershey Bears) and the Hershey Park Arena (where Wilt Chamberlain scored his 100-point game). We do ice painting (white, to give the surface the traditional look) and paint the goal area (light blue). Lines are done with cray paper and the logos are printed on white nylon mesh. At some point, driving the Zamboni is on the list of things to do…part art, part science. My group also sets up for concerts in the Giant Center and outside, at the Hershey Park Stadium in the summer. Concert set-up is physically demanding, so of course, I love it.
My family is doing well, too. Yvonne Harhigh and I will celebrate 30 years of marriage later this year…honestly, I don't know how she puts up with me. Her plan is to retire in the next couple of years from Penn State Harrisburg from her position as the Marketing and Communications Director. Our daughter Danika is a 2016 Penn State alum living and working in Philly and her plan is to go to grad school (probably Drexel) for nutrition. Our son Dax is currently on the Penn State Men's Soccer team (#25) and is studying Materials Science and Engineering. Who knows what good things will happen in the next year, but I hope you all are enjoying your time in retirement!

John McLean writes: Hello fellow retirees: Since I am catching up on my dues, I might as well catch you up on my activities. I am still active in cave studies, running a long-term (20+ years now!) microclimate monitoring program at Glenwood Springs Cavern, an exploration project near Manitou Springs, and continuing earth resistivity geophysics at Ft. Stanton Cave, New Mexico (now 40+ miles long!). I contributed to the book about the history and exploration of the cave, '12 Miles From Daylight'. Needless to say, I no longer go on the 30-hour push trips but am content to look at the photos when the 30-year-olds come out. Often run into retiree Scott Christenson who is also active in the project. I have been continuing to canoe rivers in between cave trips and had a great nine-day trip down through Desolation Canyon on the Green River last fall. Headed for the Buffalo River this spring. The Tucson retiree get together sounds like it will be great fun -- look for me there.

Curtis Price writes: This winter, I am beginning my third year of teaching all things geospatial at the South Dakota School of Mines & Technology. My two-year NDAA appointment timed out on December 28 so packed up my USGS office finally for good. One last USGS pub just came out, co-author on the new NHDPlus High-Resolution Users Guide! At SD Mines I am a Lecturer, which means I teach four in the fall and three in the spring (GIS, Remote Sensing, and basic surveying). In the little time I have available after that, I am chipping at my PhD; I enjoyed learning more about how streams work in a grad class in fluvial geomorphology last fall. My dissertation topic is finally coming into focus, examining fluvial landforms using DEM data in the Black Hills.

Going to EsriUC again this summer. Still playing clarinet! Love the newsletter, it is great to see familiar faces, and some names that I fondly remember from collegial emails and (way back) sort-of collegial Continuum (remember that?) posts. Thank you, Randy Olsen, for the excellent Geography Matters posts!

Jon Scott writes: Greetings and thank you for your volunteer efforts. May I please suggest that you offer a lifetime (as opposed to annual) membership option? I dare to think you might approve and that I could guess (approximate) the appropriate fee?

John Terry writes: This is John Terry, former District Chief/Director for the Arkansas District/Water Science Center, retired October 1, 2010. I'm 72 years old now and deal with some health issues. Post-polio syndrome has significantly reduced my motor ability and spinal stenosis and nerve pain complicate things even more. With ablation of nerves in the sacroiliac area and steroid injections in my spine, I've been able to get significant relief. My youngest son, Dillion, lives with me and is a real blessing to me these days. I still have my farm and keep a few cows, ducks, chickens and geese. I'm still active in my church. I am still a Deacon and lead them. Like many these days I'm concerned with avoiding infection from the coronavirus. Apparently, those of us who are older and have under-lying health issues are most vulnerable. I'm sending a check for $100. Please apply part of it to my dues thru 2022 and use the remainder for whatever is most needed. Thanks to all who make publication of the newsletter possible.

Loyd Waite wires: Great job on the newsletter. Thank you for the work you all do!!!

Jack and Judy Weeks writes: 2019 was a year of change for Judy and me. We bought into a planned retirement community, the Village Cooperative, in Lakewood, CO, and sold our home of 30 years in Morrison, CO. The complication was that the Village won't be ready for occupancy until May 2020. Fortunately, we own a home in Mesa, AZ, so that is where we have been living for the past year. To get out of the Arizona heat last summer, we took a three-week European river cruise, something we have planned to do for a long time. The Viking cruise started in Amsterdam and ended in Budapest. After the cruise, we had a 3-day stay in Prague. Also, we did some house sitting for friends in Colorado as well as a trip to Grand Junction, CO in September for a golf tournament. Although we were gone for much of the summer, we did see our thermometer, which is in the shade on the north side of our house, reach 118 degrees. I actually played golf that day in the morning when the temp ranged from 100 to 110. We send our best wishes for a happy, healthy and prosperous 2020 to our USGS family.

Chuck Wood writes: It's probably time to tell you to remove my second wife's name from the directory as she died in 2013. I'm still in good health. I live on a small lake, and I'm still able to swim across the lake and back during the summer. My girlfriend Flora and I have gone to northern Spain during the summer for two or three weeks for the last five years. Also, we go to Cancun, Mexico a week at a time for four weeks every winter.

Dues Received since last February's Newsletter:

Jim Bennett
Tony Coffey
Judy Cornwell
Steve Curtin
Ernest Dennsion
Bill Harenberg
Rich Hawkinson
Scott Hoffman
Henry Ku
Vincent Lai
Pete Martin
John McLean
Ron Rathbun
Marge Shaira
Gary Tasker
John Terry
Chuck Wood

MEETINGS AND GATHERINGS

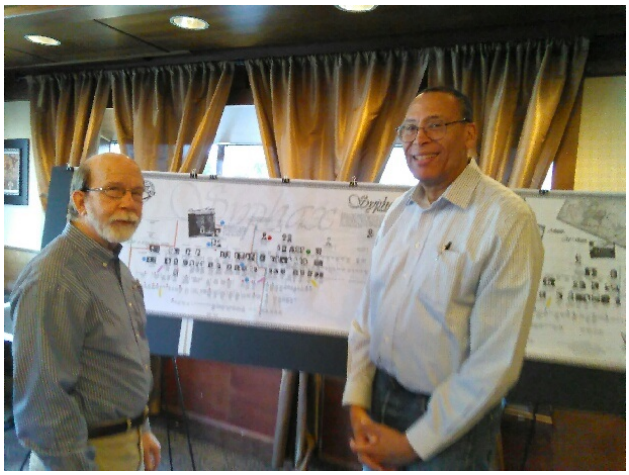
AZ RETIREES' LUNCHEON
Guadalajara Grill
Tucson, AZ
February 6, 2020

A group of USGS retirees (and one still employed) met at Guadalajara Grill in Tucson on Feb. 6 for an informal lunch, and an update on the upcoming Retirees Reunion by Mark Anderson (not pictured). Those in attendance (left – right) were Zelda Bailey, Pat Tucci, Ken Hollett, Rich Hawkinson, Bob McNish, Stan Leake, Sandra Owen-Joyce, and Frank Oliver.

ID RETIREES' LUNCHEON
Boise, ID
December 2019

FIRST ROW (SEATED--LtoR): Kay Lehmann, Dorene MacCoy, Steve Lipscomb, Steve Frenzel, Joe and Jean Spinazola.
SECOND ROW (STANDING LtoR): Mary and Bob Luscombe, Gene and Bill Harenburg, Bruce Parks, Mark Hardy, Annette Campbell, Frank Youngkin, Alvin Sablan, Muffy and Gerald Lindholm, Dick Whitehead, Luther Kjelstrom, and Taylor Dudunake (Scholarship recipient)

RESTON-HERNDON LUNCHEON
February 3, 2020



Piecing Together a Family History through Genetic Genealogy
by Steve Hammond

Have you taken a DNA test or ever thought about it? Our luncheon speaker has. Steve Hammond discussed how he traded in a successful 40-year career in earth science at USGS to pursue his passion to decipher his family history. Steve presented a black-history month program titled "Piecing Together a Family History through Genetic Genealogy". He shared a 10-foot family tree along with artifacts and documents that tell the story of how his enslaved northern Virginia ancestors were freed in the 19th century. In addition, Steve described a fascinating DNA project that is underway to document the genetic relationship between his family and Martha Washington. Yeah, that Martha Washington.

RESTON-HERNDON LUNCHEON
March 2, 2020

Featured a talk by Paul Hearn entitled “Ten Years of USGS Cooperative Activities with the USSR and Russia (1987-1996): “Science and some Good Stories”

RETIREMENTS

William S. 'Bill' Banks, Hydrologist / Southeast Colorado Office Chief, has decided to retire (in 2020). Bill began his career in 1987 working in the Trace Metals and Nutrients group in Reston, Virginia before moving to the MD-DE-DC Water Science Center in 1989. Bill's work in Maryland began on the Delmarva NAWQA pilot project. For the next 26 years, Bill worked on groundwater as well as sediment source-transport and accumulation projects all over Maryland and Delaware. In 2015, Bill left Baltimore and came to Pueblo, CO, where he served as the Southeast Office Chief for the Colorado Water Science Center. Bill believes that the most important thing he learned during his time in Colorado is that "Western water is complicated!" During his 33-year tenure, Bill authored or coauthored over 30 reports, articles, abstracts, and proceedings; and has had the privilege of working with some of the best people in the USGS. For this, he says he is very grateful, and considers himself to be very lucky. He believes that he learned something new nearly every day at the USGS; and had more fun than the Federal Government would have wanted him to have. Bill is not ready to fully retire, so he's leaving the USGS to pursue another career in the water community of eastern Colorado. Bill wants to continue to honor his belief that "We must continue to take care of the most important resource we have." We wish Bill the very best and will miss his charm, positive attitude and significant contributions to the success of the USGS.

-David P. Mau, Center Director, Colorado Water Science Center

Scott Beddingfield retired on August 31, 2019. He was an IT Specialist in the Lower Mississippi-Gulf Water Science Center.

Neil Dubrovsky retired on March 31, 2020 after 34 excellent hard-working years. Neil is going to enjoy more time with all his family and friends, learn to sleep in. Back in 1984, the story of selenium contamination in irrigation drainage (Kesterson) hit the press big time, to make a long story short, Congress mandated that USBR fund a multi-million dollar, multi-year USGS assessment and research project to understand the sources and distribution of selenium in the western San Joaquin Valley. Bob Gilliom was tasked with leading the team, hiring Steve Deverel, Roger Fujii, and by recommendation of the Regional Hydrologist (John Bredehoft), Ken Belitz. Bob then launched a search for a geochemist, and on the recommendation of Dr. John Cherry, University of Waterloo, hired his soon-to-finish PhD student, Neil Dubrovsky. Neil and Farla moved to Sacramento in 1986—the rest is history! In 1991, Neil began serving as the Study Unit Chief of the San Joaquin-Tulare Basins (SANJ) study of the NAWQA program. He led many fine scientists in his role, as he helped to design surface water, groundwater, and ecological monitoring and research studies in the San Joaquin Valley and adjacent watersheds. Later, serving as a Program Chief for the CA WSC and working with Ken Belitz, Neil was instrumental in developing the groundwater quality monitoring program with the California State Water Resources Control Board, which is now known as the GAMA program. There were many a meeting with high stakes and high emotions in working with the cooperators at the State. In 2001, Neil was selected as Chief of the Nutrient and Trace Element National Synthesis team of the Cycle 2 NAWQA program. Again, he led many excellent scientists in this role. Some of the large amount of work performed under this team culminated in publication of a well-cited USGS Circular 1350, "Nutrients in the Nation's Streams and Groundwater, 1992-2004." Since 2012, Neil has provided leadership for NAWQA's third decadal cycle. Neil provided sage guidance during the planning and standing-up of the new design. He served as the NAWQA Regional Program Officer for the West, and as the component lead for surface water, overseeing $26 million of surface water quality monitoring and research. Most recently, Neil has served as Chief of the Water Resources Assessment Branch where he helped to manage WAUSP and NWQP assessments, while overseeing the transition of NAWQA from a stand-alone program to a project crossing four Divisions. As Branch Chief he has strived to support the new WMA priorities while maintaining the world-class stature of the NAWQA products. Neil has always had excellent management insight and skills in working with others, was a master at

wordsmithing in writing and reviewing reports, and paid great attention to details of data, such that he could pick out a single dot or portion of a line in a data analysis graph and say, “Gee, is that correct?” - and he was almost always right that correction was needed. Most remarkably, he always (nearly always) was a kind soul.

Neil wants to extend his deepest gratitude to the exemplary scientists – both supervisors and supervisees – that he had the great fortune to work with; too numerous to list, they constituted a community with equally high measures of intelligence and integrity, which he will miss. Neil’s retirement represents a significant loss to the Water Mission Area, the California Water Science Center, and to the USGS, and we who have had the privilege of knowing and working with Neil will miss him greatly!

-William L. Cunningham | Senior Science Advisor for Groundwater Director, Earth System Processes Division, Reston, VA

Randy McFarland is retiring on March 13, 2020 after 34 years of service to the USGS. Randy originally hails from northern Virginia before the days of mass congestion associated with the suburbs of Washington DC. He ventured to the Great Valley of Virginia to receive a BS in geology from James Madison University in 1981 and later returned to the DC area to complete a MS in geochemistry at George Washington University in 1983. Following college, Randy worked for the Smithsonian Institution and the Virginia Water Control Board before joining the U.S. Geological Survey in 1986. During 1983-93 he conducted research on various aspects of contaminant transport in water in Virginia and Maryland. Since 1993 his career has been wholly directed to study of the major regional water supply of the Virginia Coastal Plain aquifer system. Randy’s publication of Professional Paper 1731 “The Virginia Coastal Plain Hydrogeologic Framework” incorporated the newly discovered Chesapeake Bay impact crater and is the standard resource for all working in the area. Randy followed that work with Professional Paper 1772 that characterized groundwater chemistry of the Virginia Coastal Plain, including delineation of the saltwater-transition zone which has a uniquely mounded configuration over the impact crater. His other Coastal Plain studies have dealt with the Fall Zone, the Potomac aquifer, saltwater-intrusion monitoring, the Piney Point aquifer, and most recently the Virginia Eastern Shore. Randy ends his career having authored or co-authored 50 scientific publications, many of which will continue to be cited well into the future.

-Mark R. Bennett, Director, USGS Virginia and West Virginia Water Science Center

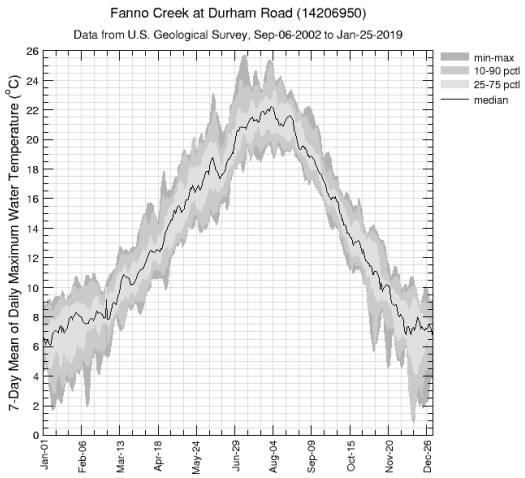
Stewart Rounds, a respected scientist, conscientious employee, and generous mentor in the USGS Oregon Water Science Center, is retiring on March 31, 2020. In addition to the accomplishments and acknowledgments listed below, Stewart was responsible for developing major programs in the Center. Of the many projects, two should be noted. Stewart developed a comprehensive, long term study with the U.S. Army Corps of Engineers in the Willamette River basin which has a profound impact on fish habitat, recreation, and how the Corps thinks about water quality and operation of dams. The other major study was with Clean Water Services which has resulted in many firsts (establishing a TMDL, incorporating beaver activity in water quality management, and recognizing the interaction of geology and water quality), and helped a growing part of the Portland metro area understand the effect of development on water quality and possible implications for mitigating that effect.

-James D. (Dar) Crammon , Director, Oregon Water Science Center

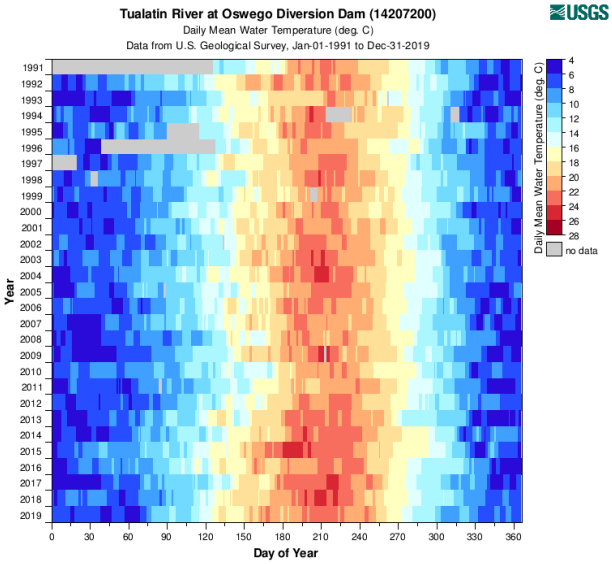
Stewart Rounds will be retiring and moving to a volunteer status after March 31, 2020 after nearly 28 years with USGS in Oregon. Actually, he took early retirement in April of 2018, but was re-hired part time to keep working, complete reports, and provide mentoring.

Stewart spent his entire career with USGS in the Portland, Oregon office, starting in 1992 not long after defending his Ph.D. and declaring an end to his many years as a student. As a hydrologist (and environmental chemist), Stewart specialized in water-quality monitoring, data visualization, and water-quality modeling. Early on, he started working with the CE-QUAL-W2 two-dimensional water-quality model He enjoyed tinkering “under the hood,” adding new capabilities to various versions of the model. Working with his colleagues, he enjoyed applying W2 to numerous waterbodies, including the Tualatin River, Henry Hagg Lake, Detroit Lake, the upper Klamath River, and waters of the Willamette River basin. The best part of those studies was working with a group of talented modelers, including Tammy Wood, Annett Sullivan, Norman Buccola, Laurel Stratton, and others. The USGS Oregon office has been a great place to work, and Stewart

enjoyed working with colleagues like Dennis Lynch, Micelis Doyle, Bernie Bonn, Jim Caldwell, Kurt Carpenter, Chauncey Anderson, Dan Snyder, Casie Smith, Zach Freed, Krista Jones, James White, Ken Skach, Erin Poor, Valerie Kelly, and many others.



Always looking for new computer programming challenges, and finally realizing that he was more of a tool-builder than an honest-to-goodness scientist, Stewart enjoyed building data-analysis and data-visualization tools for his colleagues to use. He wrote and programmed the USGS Alkalinity Calculator (https://or.water.usgs.gov/alk/) that is widely used in USGS and internationally to analyze alkalinity titration data. Over many years, he wrote the suite of online data-visualization tools called the USGS Data Grapher (https://or.water.usgs.gov/grapher/), which is used to create custom graphs and tables of continuous streamflow, water-quality, and meteorological datasets. Stewart wrote the popular online DOTABLES program for the computation of the solubility of oxygen in water (https://water.usgs.gov/software/DOTABLES/). In his studies, he was always looking for ways to create useful tools that our partners could use.



Stewart was fortunate to work with groups of USGS scientists at the national level in various capacities, including the Continuous Water Quality Committee and the steering committee for the National Field Manual. Stewart rewrote the National Field Manual chapters on alkalinity and dissolved oxygen. He enjoyed working with his USGS colleagues across the nation, and is thankful to everyone over the years for their kind support and helpful interactions, especially Pat Rasmussen, Andy Ziegler, Jerad Bales, Paul Conrads, Ken Bencala, Ken Hyer, Jim Eychaner, Bob Broshears, and David Boldt.

After retirement, Stewart plans to volunteer for USGS in some capacity, and hopes to find time to do more hiking and traveling with his wife, Bernie Bonn, of 30+ years. With any luck, he'll end up in a small university town with a good baseball team, find some challenging computer programming hobbies, and enjoy teaching and tutoring the next generation of young scientists.

NOTE: The editorial staff regrets the above black and white figure of the Tulalatin River above, since the printed copy is done in black and white the colors do not translate in the final print. Color version of the newsletter can be found on the retirees' website.

Pierre Sargent is retired on January 3, 2020 from the Baton Rouge office of the Lower Mississippi-Gulf Water Science Center. Pierre began his career with the USGS in the New Jersey District in the early 1980s. He published several reports on groundwater and soil conditions at the Picatinny Arsenal and then worked on the NWIS 2 development team during the early to mid-1990s. Pierre transferred to Louisiana in 1994, where his focus on water-use studies became an integral part of the Investigations Section in Baton Rouge. For about the last 20 years, Pierre has been heavily involved in the National Water-Use Program, participating in various national and regional projects, as well as chairing the Water-Use Users Group. After retirement Pierre plans to stay in Baton Rouge and enjoy more cycling as well as ministry work with his home church.

MEMORIALS

James W. Bingham, 94, of South Glastonbury, CT, passed away peacefully on January 30, 2020, at Glastonbury Health Care. James was born in St. Paul, MN, on September 25, 1925. He was a veteran of World War II, having served in the US Army Air Corps as an aircraft engine mechanic. After his discharge, he enrolled in the University of Minnesota and graduated in 1950 with a degree in geology and geophysics. He worked for the Minnesota Highway Department for three years, and then he joined the USGS in 1954 in St. Paul, MN. In 1959 he moved to the USGS office in Tacoma, WA. There he specialized in groundwater hydrology in the Columbia Basin. In 1971 he moved to the Hartford, CT office where he continued his work as a groundwater hydrologist until he retired in 1989 after thirty-five years with the Survey. After retirement, he worked for ten years as a consultant for Groundwater, Inc. in Haddam, CT. James was a member of the Glastonbury Conservation Commission, the Connecticut Groundwater Association, the Bristol Mineral and Gem Club, and he taught lapidary classes at the Glastonbury Senior Center. He was an avid rockbound, mineralogist and lapidarist all his life, having learned these skills from his father, William J. Bingham, who had discovered the mineral Binghamite in 1935 in northern Minnesota. He was the beloved husband of Carol Bingham for 71 years. In addition to his wife, he is survived by his four sons, four grandchildren, and three great-grandchildren. A Mass of Christian Burial was celebrated February 5, 2020, at St. Augustine Church, in South Glastonbury, CT. Burial, with Military Honors, was held in St. Augustine Cemetery, South Glastonbury, CT.

Sidney Harold Bishop, 86, passed away on January 14, 2020 in Clinton, MS. He was born in Conehatta, MS He retired from the from the U.S. Geological Survey in 1991. Leaving to mourn are family and friends. He was loved and cherished by many people including: his three children, seven grandchildren, and 3 great-grandchildren his children. He was preceded in death by his wife Nancy and his parents, Sam Bishop and Sallie Bishop.

Bobby and Vada Byrd passed away January 24, 2020. (Bobby retired from the U.S. Geological Survey in 1995.) Bobby loved to work with his hands. From fixing cars to breaking down car parts or building new foundations for his many out-buildings, he was always tinkering with a project. Vada was the kindest, gentlest soul. She loved everyone she encountered and enjoyed cooking for all. She was the best home cook ever. Whether it was her baked goods or her famous hamburger squash dish, her food was always memorable. Their presence and love will truly be missed by all who knew them. Bobby was preceded in death by his parents and his brother and his sister. Vada was preceded in death by her parents and her brother. Survivors for Bobby include his daughter, a sister and a brother, as well as extended family. Vada is survived by her sister and her two brothers. A visitation was set for February 8, 2020, at Leak Memory Chapel to celebrate their lives.

Patricia "Pat" A. Freiberger, 75, (*wife of retiree Herb Freiberger)* passed away on February 22, 2020 at her home in Bel Air, MD with her family at her side. Pat was born January 25, 1945 in Philadelphia, PA to the late James W. Hoffman and Kathryn E. Cantwell Hoffman. Pat graduated from Council Rock High School in Newtown, PA in 1962 and then earned a degree in Nursing from the Bryn Mawr School of Nursing in Bryn Mawr, PA in 1965. She was then employed by Holy Redeemer Hospital in Meadowbrook, PA as a Registered Professional Nurse. On June 24, 1967, she married Herb Freiberger and in 1969, they had two children, Kathryn and Anjanette. In 1970, Pat took a reprieve from nursing to become the primary parent in raising their children. That reprieve continued until the late 1980's, when she enrolled in a 9-week nursing refresher course at Harford Community College in Bel Air finishing number 1 in her class. She was immediately employed by Stella Maris Long-Term Care facility in Timonium, MD in about 1990. In 1993, she became an Assistant Director of Nursing at Oak Crest Long-Term Care Facility in Parkville MD, where she was instrumental in developing the first ever dementia program at the facility. She retired from Oak Crest in 2000 and joined in retirement with Herb in 2002 from the U.S. Geological Survey. Pat's favorite things in life were Christmas (where everyone in the family knew that on Christmas Eve, they were to be at her house no matter

what), reading, hosting wine dinners, and traveling. She and Herb went on many fabulous trips in the Caribbean and Europe, and later in their retirement to many “out of the way” places in the USA during enjoyment of their timeshares. Pat was preceded in death by her parents and sister, Dianne. She is survived by her husband Herb, her two daughters and their spouses; Kathryn Freiberger and Mark King, and Anjanette Freiberger and Kevin Soper, three grandchildren, Ariana, Rachel, and Connor, one uncle, Mike “Uncle Mike” Cantwell, and many nieces, nephews, and cousins. Pat will be missed by many people in many places. Relatives and friends were invited to gather at Schimunek Funeral Home of Bel Air on March 8, 2020 where a memorial service was held.

Steven Martin Hindall, PE 77, passed away on April 21, 2020. Steve was born in Ada, OH on June 22, 1942 where he earned his BSA Eagle Scout at age 12. He attended Ohio Northern University where he earned his BSCE in 1964 and was a Sigma Phi Epsilon brother at Ohio Alpha. Upon graduation he married his high school sweetheart, Sandra Lynn Fulks and they journeyed to Arizona where Steve earned his MS in hydraulic engineering from the University of Arizona in 1966. Moving then to Madison, WI he began his 37-year career with the USGS. He advanced from field hydrologist to Assistant District Chief in Trenton, NJ and finally ending his career as District Chief of Ohio where he retired in 2003. Steve was fondly remembered by his peers as the most brightly dressed District Chief in the USA. His upbeat personality matched his clothing. He resided in Worthington, OH where he was an active member at Worthington Presbyterian Church for 40 years and joyfully sang in the Chancel Choir. Steve is survived by his loving wife of 55 years Sandy, a son and a daughter, 3 grandchildren, a step-grandson, his brother and sister-in-law, and a sister-in-law. When friends and family can gather in numbers, a memorial service at WPC will be planned and family internment will follow at Greenlawn Cemetery in Ada, OH. service at WPC will be planned and family internment will follow at Greenlawn Cemetery in Ada, OH.

Augustine H. ‘Gus’ Ludwig, 86, passed away on November 10, 2019. He was born August 31, 1933 in Rice Lake, WI to Edward and Amelia Ludwig. He graduated from St. John's Prep School and attended St. John University, then graduated as a Mining Engineer from Colorado School of Mines in 1958. He served in the U.S. Army and was stationed in Germany where he and his wife, Betty, enjoyed touring all over Europe. In 1960 he began his work for the USGS as a hydrologist in Denver, CO. In 1965 he was transferred as a hydrologist to Little Rock, AR where he worked and then retired in 1988. Among many projects throughout his career, he helped complete reports on the health and longevity of the underground aquifers in the Arkansas Region of Mississippi River valley. He also helped establish the registration of Professional Geologists for the state of Arkansas, where he held the #2 position in the state. As a member of Optimist Club, he enjoyed working with children for many years as well as working with other charitable organizations. Gus loved going to the family lake house at Greer’s Ferry Lake where he and Betty enjoyed many years of entertaining friends and family. In retirement he did land development in the Greer’s Ferry Lake area and later moved to Heber Springs where he and Betty expanded their lives with many new friendships. Gus was preceded in death by his parents, one sister and five brothers. He is survived by his wife Betty, of 61 years, a daughter and son, a grandson, two granddaughters, and one great-grandson. He also leaves behind many nieces and nephews, family and friends. His memorial service was held at St. Albert Catholic Church in Heber Springs, AR on November 22, 2019.

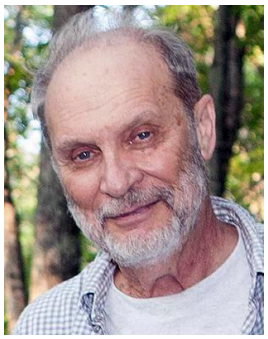
Lois Irene McGovern, 90, ***(widow of retiree Harold McGovern)*** passed away on January 1, 2020, at Hillside Village of De Soto, KS. She was born on November 17, 1929 in Colorado Springs, CO, the daughter of Nelse and Irene H. (Neer) Peterson. Lois attended Colorado College (CC) in Colorado Springs, CO, and was a member of Kappa Kappa Gamma sorority. She met Hal McGovern at CC and they were married on February 26, 1949, in Colorado Springs, CO. Lois worked as an office secretary at St. Thomas Episcopal Church, Garden City, KS and later in the Finney County Clerk’s office from 1968 to 1972. After the family move to Lawrence, she was an Administrative Officer for the Douglas County Clerk’s Office until retiring in 1993. Lois was also an active member of Corpus Christi Catholic Church, involved with the Altar Society, a weekly spiritual book club, a founding member of the Serra Club, helped with funeral dinners, and served as Eucharistic Minister. Lois and

Hal were on the building committee for the new church in 1981 and 1997. In addition, Lois was an active in the American Legion Auxiliary and other community services. She had many talents and hobbies over the years, including family camping, singing and playing piano, exceptional seamstress work, knitting, needle point and gardening. Lois was preceded in death by her parents, husband (July 5, 1997) and brother. She is survived by their eight children, 21 grandchildren, 30 great-grandchildren and 5 great-great grandchildren. Services were held on January 27, 2020, at Corpus Christi Catholic Church, Lawrence, KS. Burial was held January 28, 2020, at Leavenworth National Cemetery in Leavenworth, KS.

Clifford 'Ronnie' McPherson, 84, ***(husband of retiree Emma McPherson)*** passed away on January 16, 2020 in Austin, TX. Clifford was a distinguished educator and coach with Austin Independent School District for 41 years. Many folks may recall that Emma worked in the Austin Water Quality Laboratory.
The funeral service was held on January 25, 2020 at St. James Episcopal Church, Austin, TX.

Dee Molenaar, 101, passed on January 19, 2020 surrounded in love, at Cedar Grove Adult Family Home in Burlington, WA. Dee was born in Los Angeles, CA on June 21, 1918. His parents, Pete and Marina Molenaar, immigrated to the United States from the Netherlands. He was the middle child of three. Dee and his younger brother, Cornelius "K" took to hiking and climbing by exploring the mountains in Southern California before traveling to the Pacific Northwest. During World War II, Dee served with the U.S. Coast Guard, and was dispatched to the Pacific Theater. After the war, Dee went to the University of Washington, earning a Bachelor of Science in geology and a minor in art. He lettered while competing on the UW track team, clearing 13 feet using a bamboo pole. Dee helped found the Seattle Mountain Rescue Council in 1948, and was involved with The Mountaineers, the American Alpine Club and the Appalachian Mountain Club. In 1954, Dee married the love of his life, Colleen Haag. They spent their honeymoon scaling a rocky spire in the southwestern United States. They had three children – a daughter and two sons. The sight of Mount Rainier drew Dee to its slopes, and he spent several years there with the National Park Service as a summit guide and ranger. He climbed the mountain more than 50 times. Dee followed his stint on Rainier to pursue a career as a hydrogeologist. Dee began his career with the USGS, WRD in 1966 at the District Office in Tacoma, Washington, as the project report specialist and reviewer. He seemed to have a knack for re-arranging sections of reports - like puzzle pieces - to convey the clearest possible description of the data that was collected and the picture that it painted. Dee was also involved as a project member and author for several ground-water projects. He was the sole author on two ground-water studies that he conducted and was a co-author on the reports for three other ground-water studies conducted in conjunction with several of his colleagues. The second report, for which Dee was the sole author, was WSP 2265, "The Spokane Aquifer, Washington: Its Geologic Origin and Water-Bearing and Water-Quality Characteristics". All but four of the 46 illustrations in that report, which included beautiful maps, diagrams, and graphs, were all hand drawn by Dee. Although Dee had not yet completed the report by the time of his retirement in1983, he continued to work on it until it was approved for publication in1988, which exemplified Dee's dedication to his work. Dee is an icon in the Pacific Northwest climbing community. He was presented with The Mountaineers' Lifetime Achievement Award in July 2019. He wrote three books: (1) The Challenge of Rainier: A Record of the Explorations and Ascents, Triumphs and Tragedies, on the Northwest's Greatest Mountain; (2) The Mountains Don't Care, But We Do; and (3) Memoirs of a Dinosaur Mountaineer. He also was a painter and a cartographer. Dee's mountaineering travels took him around the world. He took part in memorable and historic climbs, including the second ascent of Mount St. Elias (18,008 feet) in 1946, the third American attempt of K2 in 1953 (where he painted at 25,000 feet the highest known locale for a watercolor rendering) and Mount Kennedy in 1965 (where he joined an expedition that took Bobby Kennedy to the summit of the mountain named after his late brother, President John F. Kennedy). Dee was a devoted family man. He helped raise his three children with his wife, Colleen first in Lacey, WA, then in Port Orchard, WA where the family lived on seven acres on the Kitsap Peninsula. Their home was a welcoming place for friends who visited from all over the world. It was also the place where Dee created his pictorial landform maps for WSP 2265, painstakingly rendered by hand using colored pencil and ink; and his realistic watercolor paintings, often depicting the mountains he visited and loved. Dee was preceded in death by his wife Colleen, his brother and his sister. He is survived by his daughter and two sons, as well as his four grandchildren.

Robert L. Narducci, 72, *(spouse of deceased retiree Dorothy Narducci)* passed away on February 14, 2020 in Santa Rosa, CA. Robert was born on born on November 5, 1947 in Santa Rosa, CA. Devoted son to Dorothy Audrey and Robert Louis Narducci, Sr. Served his country during the Vietnam War, United States Army. Faithful to his God, loved his family, passionate about his trains. Rest in Peace, dear Bob. Private services.



Waite R. Osterkamp, 80, of Tucson, AZ, passed away on March 8, 2020. He and his wife, Linda Kautz Osterkamp, who passed away in 2017, are survived by four children and stepchildren, and eight grandchildren. Above all, Waite was a family man. Waite grew up in Kirkwood, MI, but he and his family vacationed frequently in Colorado, and the Rockies became his second home. Waite obtained B.S. degrees in Geology (1961) and Chemistry (1963) from the University of Colorado. In 1961, while an undergraduate, he began working with the U.S. Geological Survey (USGS) Water Resources Division (WRD) in Colorado and remained there until 1966. He then worked on water-quality studies in the WRD Montana District Office (1966-1968) and went on to earn his M.S. and Ph.D. in geology and hydrology from the University of Arizona in 1970 and 1976, respectively. While in Tucson, he worked for the Arizona District Office in (1971-1974) and later moved to Lawrence, where he worked in the Kansas District Office (1974-1980). Waite joined the WRD's National Research Program (NRP) and served as Project Chief for Sediment Impacts from Disturbed Lands from 1980 until his 2010 retirement. His NRP duty stations in WRD spanned the Eastern (Reston, VA), Central (Lakewood, CO) and Western (Tucson, AZ) Regions, and his career in USGS spanned 44 years and 7 months. In 1991-1992 and 2002-2004, Waite served as Research Advisor for the Geomorphology and Sediment Transport Discipline in the WRD. He also held adjunct faculty appointments at the University of Denver, George Mason University, and the University of Arizona; and served as Visiting Scientist at the USDA Agricultural Research Office in Tucson. In recognition of his many contributions, Waite was an elected fellow of the Geological Society of America in 1993. Waite significantly advanced the science of geomorphology through his interdisciplinary research and many publications. His early papers in USGS publication series and various journals (*GSA Bulletin, Water Resources Bulletin, Journal of Soil and Water Conservation, Environmental Geology, International Journal of Sediment Research, Hydrological Processes,* and *Journal of Hydrological Engineering*) dealt with the classic problems of erosion, sediment transport, sedimentation, and landform evolution, including playas, debris flows, and river channels. But Waite's most cited works helped pioneer, in collaboration with Cliff Hupp, the field of biogeomorphology, the study of the interactions between geomorphological processes and biota to explain the evolution of fluvial landforms and hillslopes from Virginia to Mt. Shasta to Puerto Rico. These seminal studies were published in journals such as *Geomorphology*, *Ecology*, *Wetlands*, *Geological Society of America Bulletin*, *Earth Surface Processes, Earth Surface Processes and Landforms;* and *Forest Ecology and Management*. Waite's paper with Cliff on the interaction of riparian vegetation and fluvial geomorphology (Hupp and Osterkamp, 1996) has been recognized as one of the most oft-cited papers published in the journal *Geomorphology*. Waite's coauthored papers with Luna Leopold and William Emmett on the Vigil Network demonstrate Waite's interest in the value of long-term measurements of landscapes and the preservation of technically supportable, network-design data for future generations. Waite served capably on several advisory committees and panels. He served on the Board of Directors, and as Vice President, for the Research Ranch Foundation of the Appleton-Whittell Research Ranch, a National Audubon Society facility in Southern Arizona. He also served as consultant for the Department of Justice and U.S. Fish and Wildlife Service in litigation for the adjudication of water along the Snake River, Idaho, where he had carefully studied the evolution of islands in the river channel. Waite's hallmark "USGS-first" attitude greatly benefited the USGS and the Nation. He was much appreciated and admired by his closest associates inside the USGS and across the broader scientific community. At Waite's retirement celebration in 2010, Terry Toy, his frequent collaborator at the University of Denver, gave a tribute entitled "The Gentle Giant," a lightly edited version of which follows: "A well-deserved retirement is forthcoming for the 'gentle giant.' Few would contest that Waite is always the gentle-man, gentle in disposition and a true gentleman in demeanor. However, Waite is also a giant in the science of Geomorphology. His research with the USGS spans many years and a few

decades. But more importantly, his research is always scientifically significant.Based upon my time with Waite, I believe it is his ability to see relationships in the field that fuels his eclectic interests and has led to his diverse studies and publications. He sees a phenomenon in the field, notes the surrounding environmental setting, speculates as to the cause of the phenomenon, reviews the related literature, collects and analyzes the data to prove or disprove the hypothesis, and finally places the results in the context of the larger science. This strict scientific approach produces the high-quality of research for which Waite is known. There is another side of Waite of which some may be unaware. Waite was unselfish in his mentorship of geomorphology students and early career scientists. He was a highly effective teacher of geomorphology in both formal and informal venues. He is always available to provide classroom lectures and thoroughly enjoys the interaction with the students. He has served on innumerable institutional, academic departmental and graduate student committees. He has worked with graduate students from the U.S. and several foreign countries throughout his career. There are many, many professionals in many disciplines who have been directed and influenced by Waite over the years. Everyone who works with Waite in the field learns from the experience. He gave generously of his time – daytime, evenings, and weekends. For many of us, he was our most-influential mentor and colleague [last sentence added to this tribute in 2020]. In both research and advising, Waite stands for integrity. Just as my father would say, Waite would say as well: 'Do it right, or don't do it.' If you want a complete and candid review of your manuscript, ask Waite. Your ego may get bloodied up, but your manuscript and research reputation will be the better for it. He may not tell you what you want to hear, but he will tell you what you need to hear. To draw an athletic analogy: 'if you can stand the pain, there is much to gain.' In fact, honest critique is the heart and soul of research. Just don't try to run those Latin phrases past him: it's your research design, not your modus operandi! Lastly, Waite is always a good friend. He is honest and straight-forward in personal relationships. He was forgiving when you say the wrong thing or fail to devote the necessary time to a joint project. He was quick with a laugh and a broad smile. He was also quick to enjoy a cold 'barley-malted' after a hard day in the field or even a hard day in the office. He was a great researcher and teacher, and a most wonderful friend.

"***Thanks to Julio Betancourt for his yeoman effort; to Terry Toy (U. of Denver, retired) for their tribute presented at Waite's 2008 retirement part; and to Jeff Osterkamp (son), Bill Emmett, Cliff Hupp, Faith Fitzpatrick, Allen Gellis, and Jim O'Connor for their reviews/insights.***

-John Gray, Retiree

Betty Saboe, 85*, (wife of retiree Carroll 'Will' Saboe)* passed on January 3, 2020 in Carmel, IN passed peacefully and in comfort in Carmel, IN with her children at her side. Betty was reunited with her husband of 59 years. She was also born on a farm in Delano MN on April 26, 1934. She worked for Lutheran Brotherhood, prior to meeting Will, at which time she became a wonderful full-time wife and mother. Betty and Will were married on September 10, 1960. She and Will had three children a son and a daughter and one child that passed away shortly after being born. Both our parents were loved by all they met and befriended. They resided at Woodland Terrace in Carmel, IN and were blessed with many friends. They were also faithful and active members of Christ the Savior Lutheran Church. Betty is survived by four grandchildren and one great-grandchild. A Celebration of Life service was held at Christ the Savior Lutheran Church in Fishers, IN on January 18, 2020.

Carroll W. 'Will' Saboe, 91, passed on January 1, 2020 in Carmel, IN. In heaven with his wife of 59 years, Betty Saboe who passed on January 3, 2020. Both passed peacefully and in comfort in Carmel, IN with their children at their sides. Dad was born on a farm in Badger IA on January 25,1928. He enlisted in the US Army and served a tour of duty in occupied Japan, serving as a guard at the WWII Sagamo war crimes trials. Post service, he became the first person in his family to earn a college degree and served as a high school math teacher prior to joining the U.S. Geological Survey, where he worked until his retirement in 1984 focused on local and national water resources. Will and Betty were married on September 10, 1960, had three children a son and a daughter and one child that passed away shortly after being born. Both parents were loved by all they met and befriended. They resided at Woodland Terrace in Carmel, IN and were blessed with many friends. They were also faithful and active members of Christ the Savior Lutheran Church. Will is survived by four grandchildren and one great-grandchild. A Celebration of Life service was held at Christ the Savior Lutheran Church in Fishers, IN on January 18, 2020.

Janice Whipple, 89, passed away on February 1, 2020 in Utica, NY. No matter how one knew Janice in this life, one realized her life was extraordinary. Born on May 1, 1930, she and her sister, Elsie, lived happily in the Cooperstown area. When her mother, Madilyn, died, their beloved Aunt Martha took the girls in and raised them. Both girls learned quickly–it was no surprise that Janice was named Valedictorian of Cooperstown Central School in 1947. She graduated magna cum laude from Syracuse University in 1951, with an engineering degree in photogrammetry and structural engineering. In 1969 she earned a doctorate from Rensselaer Polytechnic Institute in glacial geology and geomorphology. Her crowning achievement was to qualify and become a registered professional engineer in 1957. Janice worked as a consulting engineer on numerous projects, was a professor and she worked for the U.S. Geological Survey. Her passion was traveling. Her adventures took her around the world. She especially loved trekking the Himalayas where she immersed herself in the cultures she experienced there. She took her Buddhist vows in the country of Bhutan. Janice was an avid reader and loved opera. Often, she enjoyed broadcasts from the Metropolitan Opera in New York City. She was also involved in preservation projects by historical societies wherever she resided. Her appreciation of art of any genre was evident and she took lessons involving watercolors. She sketched and painted wherever she traveled. Janice was someone who was never afraid to voice her opinions. She knew what she liked, as well as, what she didn't. Giving advice freely was certainly one of her many strengths, whether you wanted it or not! She was a dear friend to many people. Over the years Janice shared with us that in the end only three things matter: 1) How much you loved, how gently you lived and how gracefully you let go of things not meant for you, 2) My actions are my only true belongings, and 3) A Trail Guide's Psalm 23 - sent to her by dear friends Edwina and Allen Randall. Pursuant to her wishes, there will be no service. We know that Janice would like you to go for a walk and enjoy the beauty of nature and our Earth. We are thankful to have known her, to have known her convictions and her strong spirit. Na-ma-ste.

NEWS NOTES ON SUSTAINABLE WATER RESOURCES (received March 14, 2020 – Tim Smith)

National Water Census

https://www.usgs.gov/mission-areas/water-resources/science/water-availability-and-use-science-program-national-water?qt-science_center_objects=0#qt-science_center_objects

"The **Water Availability and Use Science Program** (WAUSP) supports the National Water Census through work to understand and quantify the inputs, outputs, and changes in the water budget."

"The primary building blocks of the water budget are base layers of precipitation, streamflow, evapotranspiration (ET), water use, and change in groundwater storage. Measurements or estimates of water budget components provide a means for decision makers to evaluate the water available for human and ecological needs as well as where stresses to the budget exist or may develop."

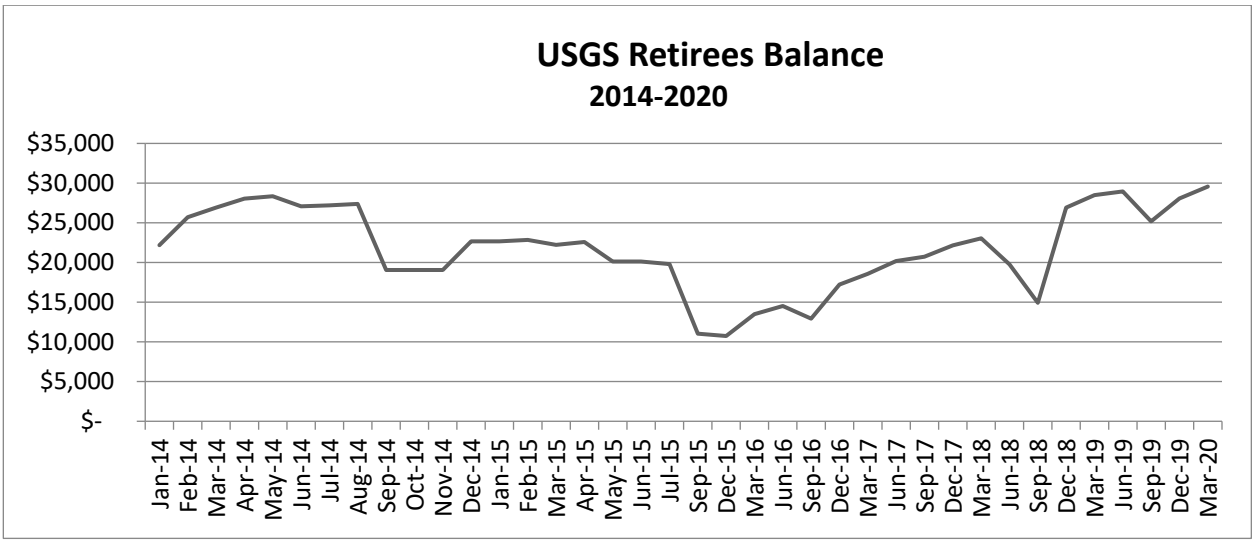
"Ideally, the WAUSP seeks to provide estimates of selected water budget components that are compiled via the National Water Census at consistent spatial and temporal scales. Through development of advanced techniques and new accounting methods for the NWC components, the WAUSP strives to provide resource managers with more accurate and finer scale information to support near-real time, local management decisions related to water availability and use."

More information on sustainable water resources is available at https://sites.google.com/site/sustainablewaterresources/

TREASURER'S REPORT, FIRST QUARTER 2020

Treasurer Cathy Hill reports the organization had $29,556 at the end of the first quarter, March 2020. The 2019 Federal taxes have been filed and accepted by the IRS. Whew!

Special thanks for contributions above dues to Jim and Merilee Bennett as well as John Guswa. Many thanks for your generosity.



Remembrance of Richard F. Hadley (continuation)

Ken Vanlier re: Dick Hadley (NL186 February 2020) story. I have written a short blurb based on it and I have it attached. Please include it in the Newsletter as space permits.

I would like to thank Ken Vanlier for sending his thoughts on Dick Hadley's service in World War II. Ken informed me that he and Dick both served in the Riverton WY office of WRD in the early 1950s, and that they once had an occasion to discuss their experiences during WWII. Ken remembers that Dick told him that he (Dick) was the only member of his infantry squad who made it ashore on D Day.

Ken was stationed at an airbase in the south of England on D Day, and he recalls seeing C47s towing gliders on their way to Normandy. That was how he knew that the invasion was underway.

I too remember gliders being towed in training during that period. However, I was in the safety of my grand-parents front yard in Greenville SC. The glider training was being conducted at Donaldson Air Base just outside of Greenville. Donaldson was established early during WWII and was decommissioned in 1963 after losing out to Colorado Springs CO for the establishment of the U.S. Air Force Academy. We all owe a great debt to Ken, Dick, and their colleagues who served so valiantly at that critical point in World history.

-Written by Marshall Moss

DIRECTORY

NEW MEMBERS

Chriatman, Jeffrey D. (20) (Sherry L.) – 100 Brentwood St., Bucyrus, OH 44820, (c) 419-569-1083, jdchriat@columbus.rr.com
Pierce, Robert R. (18) (Linda) – 9075 Old Keith Bridge Rd., Gainesville, GA 30506 (c) 770.318.3654, rrpiercekayak@gmail.com
Rogers, Laurel Lynn (19) – 2105 39th Street, San Diego, CA 92105, (c) 619.889.3455, larogers.a@gmail.com
Thomas, Randy (19) (Opal J.) – 3655 Tulip Tree Circle, Memphis, TN 38115, (c) 901.412.6960 (h) 901.542.0152, randyopal@comcast.net

AFFILIATE LIAISON

Carter, Janet M. (AL) (Mike) – 1608 Mt. View Road, Rapid City, SD 57702, (c) 605.593.3308 (w) 605.394.3215, jmcarter@usgs.gov ***(South Dakota Water Science Center)***
Galloway, Joel Michael (AL) (Angela Lynn) – 821 East Interstate Ave. Bismarck, ND 58503, (w) 701.250.7402 (c) 701.426.4775, jgalloway@usgs.gov ***(North Dakota Water Science Center)***
Gordon, Debbie W. (AL) (Michael) – 1770 Corporate Dr. Suite 500, Norcross, GA 30093 (w) 678.924.6647 dwarner@usgs.gov ***(Georgia Water Science Center)***
McBride, W. Scott (AL) (Tamera) – 4446 Pet Lane, Suite 108, Lutz, FL 33559, (w) 813.498.5077, (c) 352.446.4904, wmcbride@usgs.gov ***(Florida Water Science Center)***
Weir, Lori R. (AL) (Chris) – ***please exchange middle initial and add middle name of 'Renee'***

DIRECTORY CHANGES

Bingham, Donald L. (97) – 3916 N. Potsdam Avenue #692, Sioux Falls, SD 57104-7048 addr
Coble, Ronald W. (94) (Nancy) – 6498 Ray Road Apt.117, Raleigh, NC 27613, 919.600.5644, necoble@me.com addr phone email
Cornwell, Judith (94) (Richard) – 1805 S. Balsam St. Apt. 283, Lakewood, CO 80232-6780 addr
DeHerrera, Carole (A) – 5302 S. Robb Ct., Littleton, CO 80127-3301 cdsnogirl1966@gmail.com addr email
Dension, Ernest S. (84) – 2917 Alta Vista Lane, San Angelo, TX 76904, 315.374.0263, ernest.dension@gmail.com
Dion, Norman E. 'Norm' (95) – 253.509.0554, npdion7531@gmail.com phone email
Favor, Barbara (01) – ***remove 'Unit 3'; otherwise address is correct***
Goss, Sharon S. (99) (Rick) – adds previous name also known by **(Kuhnlein)**
Katzer, Terry L. (85) (Virginia) – terrylkatzer@gmailc.om email
Livesay, Robert L (89) (Marlene) – ***cancel membership***
Nicholas, James R. 'Jim' (11) (Bonnie) – 5321 Fish Road, Shelby, MI addr
Porter, Jo (95) (Charles) -- ***cancel membership***
Price, Mrs. William E. (Helen) (S) – 13775 E. Langtry Lane #106, Tucson, AZ 85747 addr
Price, Helen (S) – 13775 E. Langtry Lane #108, Tucson, AZ 95747-9632 addr
Rickman, Ronald L. 'Ron' (16) (Nicole Stucki) – 970.342.5638 phone
Thomas, Carole L. (02) (Dick) – carole_thomas@icloud.com email

2019 -- UPDATE OF TELEPHONE DIRECTOY

In an effort to update the 2020 retirees' telephone directory, Kate Flynn (Retirees' Org. Secretary) went person by person through the 2019 directory. The list below represents those retirees and spouses who have passed, but no notification was made at the time of their passing.

NAME	MEMBERSHIP	DATE OF PASSING
Adams, D. Briane	03	Dec 14 2019
Allingham, John	79	Apr 27 2013
Allingham, Patricia	S	Nov 20 2019
Arnett, Daniel	S	Mar 12 2016
Bertoldi, Deanna	S	Dec 26 2012
Bishop, Nancy	S	Sep 29 2017
Boettcher, Arnold	88	Jul 14 2013
Bryant, Charles T.	87	Apr 19 2017
Cardwell, Charles	84	Jul 10 2016
Conroy, Earl	S	Mar 15 2019
Conroy, Loretta	93	Mar 11 2019
Craig, Janet	S	Jan 2 2018
Culbertson, Constance	S	May 7 2018
Dickerman, David	00	Oct 19 2019
Dion, Madelein	S	Oct 1 2018
Dorminey, Darrell	90	Nov 26 2015
Dorminey, Frances	S	Dec 11 2018
Ehlke, Kathleen	S	Dec 12 2017
Elder, Elizabeth	S	Jun 30 2017
Farlekas, Elizabeth	S	Nov28 2011
Faust, Robert	90	Oct 6 2014
Flint, Russell	82	Oct 17 2019
Friel, Eugene	86	Jul 22 2010
Gabrysch, Robert	91	Nov 3 2017
Hanson, Ronald	94	May 1 2017
Holms, Betty	S	Nov 4 2016
Hudson, Merle	S	Sep 4 2016
Kirkland, Edith	S	Mar 17 2019
Kjelstrom, Carlene	S	Sep 10 2013
LaMoreaux, Bunnie	S	Sep 20 2015
Lennox, Anna	05	Oct 18 2019
Lichtler, Jean	S	May 2 2012
MacCary, Rosalie	S	Sep 17 2013
Meyer, Fredrick	85	May 31 2015
Mills Luther	81	Jan 29 2017
Moshinsky, Edward	95	May 27 2012
Mullen, James	97	May 6 2019
Newcome, Nancy	S	May 1 2018
Noehre, Barbara	S	Apr 8 2011
Olsen, Raymond	S	Jan 26 2016
Omang Alice	S	Jan 9 2015
Price, Lee	07	Jan 20 2019
Rosenau, Jean	S	Sep 24 2007
Sauer, MaryLou	S	Feb 17 2019
Schiavo, Salvatore	07	Mar 30 2017
Schultz, Cerese	S	May 28 2016
Sieger, Theodore	85	Jul 29 2016
Sloss, Elinor	S	Mar 31 2018
Spiers, Betty	S	May 13 2013
Stulken, Lorna	S	Aug 22 2004
Whetstone, Clara	S	Jul 28 2018