The Geological Newsletter

News of the Geological Society of the Oregon Country

2022 Archive of Club Activity

Volume 88, Number 1

CLUB ACTIVITIES

GSOC BOARD OF DIRECTORS 2022-2023

The GSOC Board of Directors serves from March 1, 2022 to March 1, 2023. Slate of nominees for Board of Directors was voted and approved at the Annual Business meeting on February 11, 2022.

President	Clark Niewendorp
Past President	
Secretary	Bonnie Prange
Treasurer	Barbara Stroud
Programming Director	Sheila Alfsen
Membership Director	Barbara Stroud
Field Trip Director	Carol Hasenberg
Communications Director	Paul Edison-Lahm
Outreach Director	Carole Miles
Member at Large	Dawn Juliano
Member at Large	Dennis Chamberlin
Member at Large	Scott Burns
Member at Large	Emily Cahoon

GSOC ACTIVITIES 2022

In 2022, GSOC transitioned into a post-COVID world of guarded contact between members. Over the COVID lockdown, PSU had invested in hybrid technology for their major classrooms – so GSOC members can now choose to attend in person or watch the lecture via Zoom. GSOC Members have gotten used to sitting at home and watching the lectures, and this convenience is still trumping the fellowship of the society for many. GSOC board members are discussing ways that we might use to entice members back to the lecture hall.

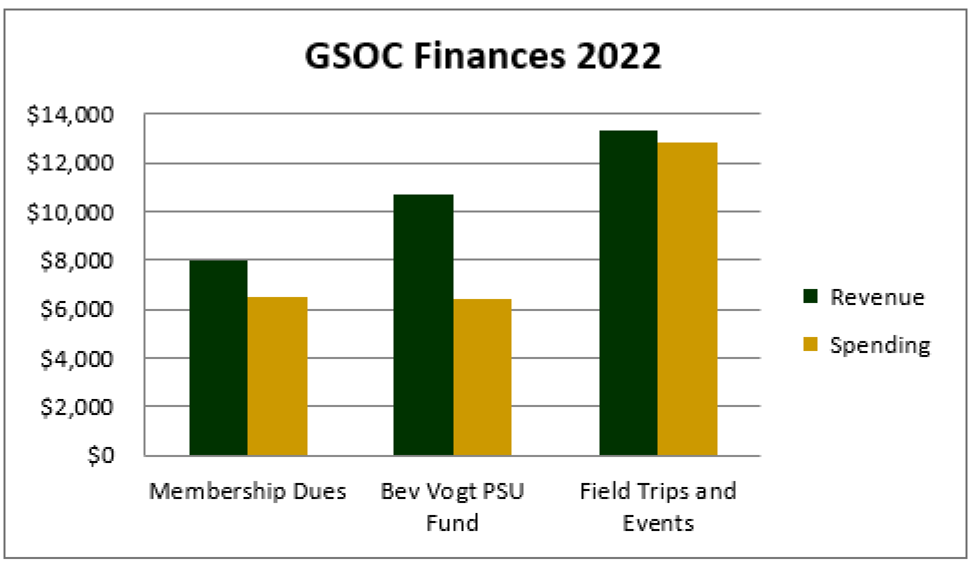
The GSOC Annual Banquet finally returned in November 2022, after cancelling the 2020 and skipping the 2021 banquets. The GSOC Annual Picnic also made a comeback in August 2022. GSOC Field trips had resumed in 2021, and in 2022, GSOC hosted nine field trips! GSOC could not have done this without the volunteer effort of quite a few of its members, and these were recognized at the 2022 Annual Banquet for both 2021 and 2022. Three Life Memberships were awarded to GSOC members Carol Hasenberg, Clay

Kelleher, and Paul Edison-Lahm, for their long and continuing service to the society. GSOC Fellowships were awarded to Barbara Stroud for her outstanding service as a GSOC Board member since 2019, and to Clark Niewendorp for his first very successful and challenging year as society President.

Memberships continued to rise a bit in early 2022, and now are holding fairly steady at 364 members. Our Wild Apricot membership platform has continued to perform well, keeping the society solvent and organized. Many tasks, such as annual dues payment reminders and event registration, are automated, and a new members-only section has been populated with past field trip guides.

GSOC very successfully launched the Beverly Vogt PSU Student Support Fund in 2021 and 2022 -- its purpose is to direct donations made to GSOC toward PSU geoscience students, both recognizing the long-standing relationship between GSOC and PSU and supporting geoscience students in their educational goals. Donations are directed towards the PSU field camp, honorariums to students who present to GSOC, and larger grant awards to graduate students. Students were invited to participate in monthly GSOC Zoom meetups, reporting on Geology news events and sharing their field work. Some assistance in the field was given to students by GSOC members along with helping students connect with local Geology experts to mentor and assist them. Students have begun attending Friday Night Lectures, and some of the grant awardees have agreed to present their work at a future lecture. Overall, our objectives have been met; we got money into the hands of these needy students and they in turn are engaging with and teaching our GSOC members.

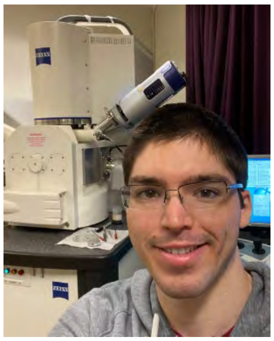
Donations continue to come in for the Beverly Vogt PSU Graduate Student Fund, and in 2022 the first four grant awardees were selected. The society has performed well financially, and we hope that the scholarship fund can help support the research done by PSU graduate students for many years.



2022 GSOC Finances: GSOC Membership Dues pay for overhead expenses and speaker honoraria; Bev Vogt fund is for grants and scholarships in the Geoscience Department at PSU; Field Trips and Events are planned to pay for their own expenses through fees.

THE GSOC BEVERLY VOGT PSU GRADUATE STUDENT FUND – PROGRESS AND RESULTS IN 2023

This past year GSOC was pleased to announce their 2022 PSU Beverly Vogt grant awardees! This was the first year that GSOC was able to support individual graduate students from the recently formed Beverly Vogt PSU Graduate Student Fund. Each applicant was awarded $1,000 to be used toward the achievement of their degree. The recipients were:



Daniel Sheikh, PhD candidate - Daniel's research is in the field of cosmochemistry, with an emphasis on lunar meteorite geochemistry. Daniel is working to understand the physical and chemical effects that meteorite impacts impose on lunar crustal materials through a combined chemical-crystallographic approach. Daniel also hopes to develop a shock transformation index that can distinguish heavily shock-processed lithic clasts from more pristine lithic clasts.

Darlene Gilroy, Master's candidate - Darlene's thesis will focus on defining the pre-eruptive behavior of three Boring Volcanic Field centers: Mt. Tabor (Portland, OR), Prune Hill (Camas, WA), and Battleground Lake (Battleground, WA). Darlene's work will include petrographic study, bulk-geochemistry, and melt inclusion analysis. Understanding the geochemistry, storage depths, and ascent rates for these centers will provide valuable insights into the overall behaviors of monogenetic volcanism in the Portland Basin and aid in determining the risk these fields pose to populated regions.

Julian Cohen, Master's candidate - Julian is working on using stable hydrogen isotopes preserved in hydrated mid-Miocene volcanic glass to better understand the past climate of central and eastern Oregon. Julian hopes to provide a better understanding of how and why ancient water chemistry varies spatially and in comparison with modern water chemistry to create a revised interpretation of the paleotopography and climate of Oregon during the mid to late Miocene.

Rachel Sweeten, Master's candidate - Rachel's thesis involves using exploration geology techniques to determine magma storage locations for the Steens and Picture Gorge Basalts. Rachel intends to resolve whether magma traveled from the point source of Yellowstone Hotspot impingement, or whether there were discrete storage systems for each major magmatic unit of the Columbia River Basalts. Rachel will also examine the mineralogy and geochemistry of these units to determine potential for mineralization of economic ores.

GSOC sends best wishes to the recipients and we look forward to hearing from them on the results of their current research and their future bright careers in geology!

GSOC FRIDAY NIGHT MEETINGS, BANQUETS, PICNICS

Most of the 2022 GSOC Friday night lectures are recorded and available on our website, gsoc.org.

- January 14 – "Seismic Resilience in Oregon and the Pacific NW," by Allison Pyrch, PE, GE, ASCE (American Society of Civil Engineers) Infrastructure Resilience Division. Zoom only.
- February 11 – "Major Reorganization of the Snake River Modulated by Passage of the Yellowstone Hotspot," by Dr. Lydia Staisch, USGS Geology Minerals Energy and Geophysics Science Center. Zoom only.
- March 11 – "Hidden Caldera Beneath the Harney Basin and the Volcano-Tectonic History of the Hood River Graben," by Jason McClaughry of DOGAMI (in lieu of the annual banquet). Zoom only.
- April 8 – "A Visual Presentation of the World of Microscopic Mineral Crystals," by Bruce Kelley, board member for the Pacific Northwest chapter of Friends of Mineralogy. Hybrid lecture.
- April 24 – Old Timers' Get Together. Longtime GSOC members gathered to reminisce and wish beloved Past President Richard Bartels bon voyage to his new home in Iowa.
- May 13 – "Using Lasers to Peer Behind Cascadia's Green Veil," by Dr. Josh Roering, Professor and Head of the Department of Earth Science at the University of Oregon. Hybrid lecture.
- June 10 – "Cascade Magmatic Arc," by Isaac Pope, undergraduate student at Centralia College, Junior Candidate Fellow of the Geological Society of London and an Associate Member of the honor research society Sigma Xi, chair of the Communications Committee of Association of Environmental and Engineering Geologists and the Book Review Editor of the journal *Environmental and Engineering Geoscience.* Zoom only.
- July 8 – "Earthquakes and Glaciers: Paleoseismology of a newly identified active fault and glacial chronology in the Strawberry Mountains," by Andrew Dunning, master's candidate in Geology at Portland State University, GSOC member and clarinetist. Zoom only.
- August 27 – Annual Picnic at Tualatin Community Center and Park.
- September 9 – "Coevolution of Landscape and Terrestrial Mammals over 30 Million Years of Oregon's Geologic History," by Dr. Samantha Hopkins, professor of Earth Sciences at the University of Oregon. Hybrid lecture.
- October 14 – "The "Iron Dream" - Iron smelting in Lake Oswego," by GSOC President Clark Niewendorp. Hybrid lecture.
- November 13 – 85th Annual GSOC Banquet with "Geology of Crater Lake National Park," by Dr. Ben Sloan and Dr. Lee Fairchild, field trip leaders on the August 2022 GSOC Field Trip to Crater Lake. In person event.
- December 3 – GSOC Annual Christmas Party was held at the home of Clark and Joyce Niewendorp. Field trip slide shows were shown at the party.

GSOC FIELD TRIPS IN 2022

The 2022 GSOC field trips are shown in the table below. This past year the lottery system was scrapped and field trip sign-ups were on a first come, first served basis. This is the most field trips GSOC has had in any year of this century.

Field Trip	**Dates**
Rafting the Lower John Day with Gordon Grant, designed and organized by Ouzel Outfitters and advertised to GSOC members	May 18-22, 2022
Willamette Valley Transect with Sheila Alfsen	June 18, 2022
East Bank Willamette Bike GeoTour with Ian Madin & Paul Edison-Lahm	June 26, 2022
Mt. Hood Faults with Ian Madin	July 16-17, 2022
Crater Lake with Ben Sloan & Lee Fairchild	July 29-31, 2022
Strawberry Mountains Faults with Andrew Dunning	August 5-7, 2022
Clackamas River Basin with Clark Niewendorp, Paul Edison-Lahm and Matt Brunengo	August 20, 2022
Willamette Valley Terroir of Wine with Scott Burns	August 24, 2022
Quartzville Mining District with Clark Niewendorp	September 17, 2022
Johnson Creek with Melanie Klym	October 9, 2022

NEW GSOC MEMBERS FOR 2022

At the latest count, GSOC has 320 memberships and 364 members. That's more memberships than the club has had in its history for the third year in a row.

Kris Alman and Mike Siegel
Lowell and Heather Anthony
Brian Brooks
Cary and Margaret Dovenberg
Marion Dresner and Roger Hoffman
Lee and Karen Fairchild
Jack Gray and Mary Jo Wade
Shirley and Eric Hoem
Alisa and Tom Humphrey
David and Katrina Hyman-Rabeler
John Kelley and Sally Wojahn
Scott and Nathaniel Mainwaring
Paul Morris and Janet Malloch
Jacqueline and Eugene Mull
Daniel Murphy-Cairns and Grant Williams
Robert and Vivien Pence
Bart and Debbie Pierce
Esther and Matt Pischel
Allen Poole and Brita Johnson
Jesse and Katie Ratcliffe
David and Lisa Still
Leslie Aickin
Larry Alfieri
Craig Anderson
Anna Ballard
Nancy Betty Baumeister
Jennifer Berry
Andrea Bowen
Sandra Bowman
Christie Bradley
Bill Brauer
Becky Brenton
Susan Bryant
Cathryn Campbell
Susan Cassidy
Ed Cunningham
Daniel Daly
Llyn Doremus
Mark Earnest
Al Elsayed von Bayreuth
Laurie Essig
Robert Ewing
Larry Feldman
Stu Garrett
Ian Godwin
Julie Harvey
Colonel Hodges
Samantha Hopkins
Paul Hsieh
Barbara Jones
Adrienne Kelley
Bruce Kelley
Caleen Kilby
Emma Kuffner
Valkyrie Landrum
Chris Lang
Carol Langner
Jeff Lee
Kathy Lien
Kiran Limaye
Isaak Love
Anne MacDonald
Katie Mahorney
Mike Marshall
Taryn Meyer
Steve Miller
Aaron Minoo
Carole Moss
Michael Olsen
Earl Padfield
Heidi Paulson
Thomas Plawman
Mary Lynne Poole
Matthew Porter
Patrick Pringle
Allison Pyrch
Johnny Ramus
Josh Roering
Michael Rothermel
Diane Routt
John Scharmen
Subrina Sehat
Elfriede Shoemaker
Wanda Solano
Gregory Spear
John Springer
Lydia Staisch
Marissa Swenson
Bruce Thiel
Jim Uerlings
Mark Underhill
Trevor Waldien
Dave Waldrop
Yumei Wang
Eileen Webb
Brianna Young
Brittni Bishop
Julian Cohen
Joseph Garro
Darlene Gilroy
Riley Martin
Daniel Sheikh
Alyssa Smith
Rachel Sweeten
Jerome Torello

2022 GSOC DONORS

The society would like to thank all the members who made donations to GSOC in 2022:

Sheila Alfsen
Lucinda Bidleman
Bonnie Campbell
Joyce Caudell
Srirama Chandra
Gil Cobb
Joseph Cohen and Sally Visher
Lynn Cottin
Julie Demaree
Keith and Carol Dickson
Herb Dirksen
Paul Edison-Lahm
John Gillette
Carrie Gordon
Tom and Diana Gordon
Douglas Henne
Harold E. Hinds
Gary Joaquin
Lawrence Jordan
Jan Kem
Bernadette LeLevier and Brian Scott
Wesley Mahan
Jim and Mary Ann McClellan
Ann McKinney
Carole Miles
Steve Miller
Marty Muncie
Donald Myers
Clark Niewendorp
John Ogden
William N. Orr
Nancy Overpeck
Fenella Robinson
Benjamin Sloan
Barbara and Jon Stroud
Bruce Thiel
Bob Timmer
Yumei Wang
Ray Wells
John Wertzler and Gail Bradley

2022 GSOC BEVERLY VOGT PSU GRADUATE STUDENT FUND COMMITTEE MEMBERS

Paul Edison-Lahm
Steve Boyer
Emily Cahoon
Scott Burns
Patty Hyatt
Carole Miles

GSOC OLD TIMERS' GET TOGETHER

April 26, 2022

Bart Bartels will soon be moving to Iowa, so Rosemary Kenney and Jan Kem suggested a small get together where many of the very active GSOC members from 15 or 20 or even 58! years ago could visit each other and exchange memories before Bart leaves.

We met in Room SB17 – you may remember it if you attended lectures prior to 2014 or so. 25 people attended and we had a nice time talking, looking at a mastodon tooth that Bart has given to GSOC, browsing and giving new homes to books that cannot be moved to Iowa, and exchanging memories of meetings and field trips.

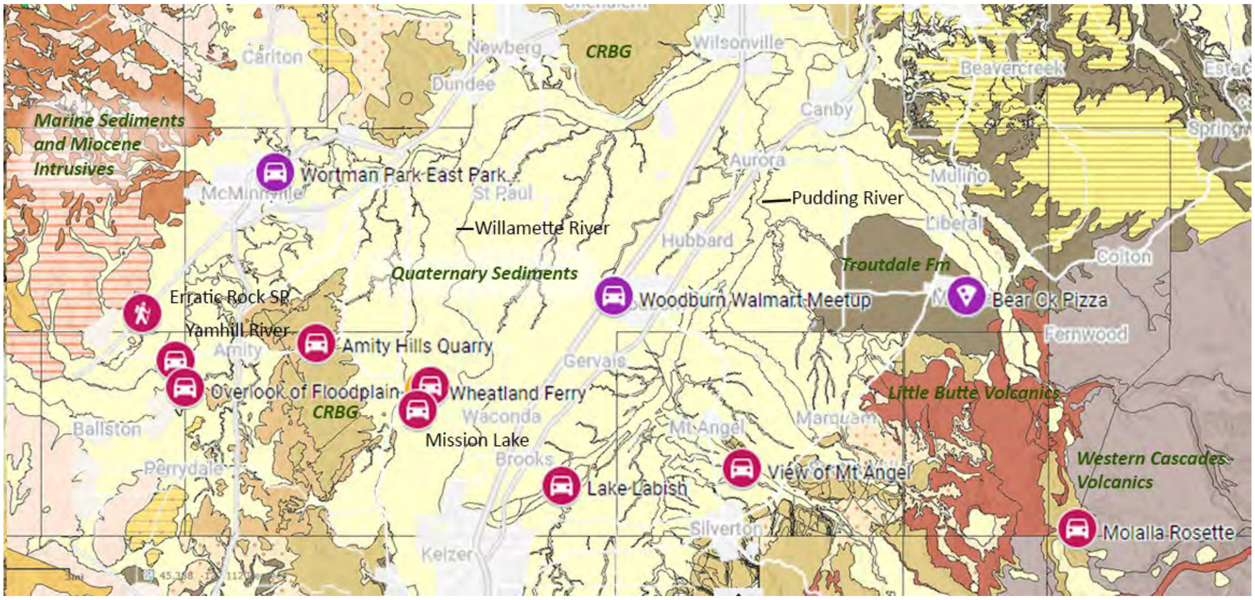
Carol Hasenberg suggested that we take pictures of the GSOC past presidents and of the 25 of us there, 10 had served at least one year as GSOC president!

Ten past presidents attended the Old Timers' Get Together on April 24, 2022. From left to right, Rosemary Kenney, Clay Kelleher, Sheila Alfsen, Carol Hasenberg, Larry Purchase, Bonnie Prange, Janet Rasmussen, Bart Bartels, Rik Smoody, and Paul Edison-Lahm. The bust Carol is holding is of Edwin Hodge, the society's founder.

Thank you to Paul Edison-Lahm for stepping in at the last minute as moderator and Sheila Alfsen for helping out with that. (Unfortunately, Clark Niewendorp was not able to be there due to illness.) Also thanks to Carole Miles for talking a bit about the Bev Vogt Grant Fund and Scott Burns for filling us in on the student perspectives. And to Barb Stroud for setting this up. We hope that all who attended, on the nice warm sunny day in the window-less room SB17, enjoyed seeing their geology friends!

FLUVIAL PROCESSES IN THE WILLAMETTE VALLEY

Recap of the GSOC Willamette Valley Transect Geotour - June 18, 2022



Thirteen happy participants of 2022's first GSOC field trip piled into the back room of the Bear Creek Pizza parlor in Molalla this past Saturday night to eat dinner and sketch up their conclusions from the day's journey across the Willamette Valley. GSOC Past President and Programming Director Sheila Alfsen led the group from Erratic Rock State Park on the west side of the valley to the Molalla Rosette to the east of the valley in more or less a straight line. The purpose of the trip was to observe the landforms of the Willamette Valley, concentrating on the fluvial processes at work in the sediments of the valley floor.

The start of the tour. The group walks up the path to the Bellevue Erratic at the western edge of the Willamette Valley.

The geotour started at Erratic Rock State Park near Bellevue, Oregon. Here, perched upon the valley sides composed of weathered Eocene marine sandstone, a giant chunk of argillite, or metamorphosed shale, from perhaps Montana, landed after the iceberg that floated it down the Columbia River system came to rest and melted. The rock now sits at approximately 140 feet below the crest of the Missoula Flood which bore it to its present location. Alfsen usually conducts this geotour for her Geology of the Pacific Northwest students at Chemeketa Community College, and one of the things they do for the class is make a tiny iceberg that will float an argillite pebble and compute the ratio of the volumes of ice and rock to determine the minimum size of glacier that floated the rock. She says minimum because rock from this boulder was used in pioneer times to construct barn floors in nearby farms, and so it has considerably less volume than in pre-pioneer days. The argillite has a distinct cleavage which makes it a source of very nice flooring material. Also, part of the rock is buried beneath the soil that makes a nearby vineyard flourish.

The argillite erratic rock near Bellevue.

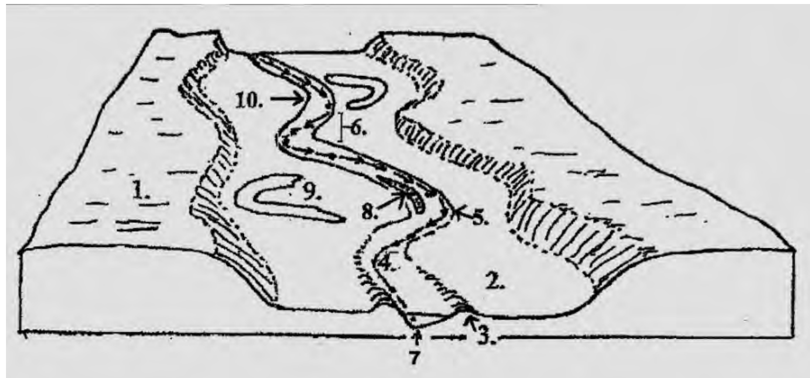
Alfsen also mentioned that vineyards are located on the hillsides around this area to take advantage of the nutrient poor soils that evolved from weathering of both Miocene basalts (Jory-type soils) and Eocene sandstones (Willakenzie-type soils). Vineyards are not located on the valley floor in the nutrient rich sediments derived from the depositions of the Missoula Floods (loess) and rivers carrying sediments from the Cascade Mountains.

Looking east from argillite erratic into Yamhill River Valley.

From the Erratic Rock hilltop, GSOCers were able to look out across the Yamhill River Basin, which forms the westernmost arm of the Willamette Valley between the Coast Range and the Amity Hills. The valley floor is about one hundred sixty feet below the rock, and trees bordering the floodplain of the Yamhill could be seen as well as the Amity Hills beyond.

Alfsen had the participants review a diagram of the anatomy of a typical river basin so that they would be able to name the parts of the Yamhill and Willamette Rivers as we saw them in the field. The names correspond to the numbers on Alfsen's diagram as follows:

1. Terrace
2. Floodplain
3. Levee
4. Thalweg (pronounced TALLveg)
5. Cut bank
6. Meander
7. Channel
8. Channel bar
9. Oxbow lake
10. Point bar



Next stop was on a bridge spanning the Yamhill River on Oregon Highway 153 east of Bellevue. At this location, the group could view the terrace slopes on either side of the river, the floodplain, a point bar and cut bank of a meander in the river and the thalweg (or swiftest path down the river). Alfsen had the participants drop "biodegradable thalweg detectors" (i.e., watermelon rind discs) from the upriver side of the bridge in various points across the river width and time how many seconds it took for them to pop out on the downriver side of the bridge. The disc that took the fewest seconds had the fastest path, which therefore was the thalweg.

Sheila Alfsen and the "biodegradable thalweg detector".

The group then proceeded to the turnoff for Brigittine Monastery off Broadmead Road for stop 3. Here the group could overlook the Yamhill floodplain from the edge of the terrace on the valley floor. The river has cut down approximately 30 feet from the top of the terrace, which is the elevation of the valley floor. Garry Oaks grow along the terrace edge, survivors from the clearing that took place when European settlers prepared fields for growing crops. Alfsen said Bill Orr told her that exclusive stands of Garry Oaks can mark locations of carbonate reefs from when the valley was an embayment of the ocean during the Eocene. Only oaks can survive in the pH of the soils in these locations.

Terrace edge of the Yamhill River floodplain.

The group then headed north to Oregon 153, then east on 153 towards the Wheatland Ferry. On the way to the ferry, the road transverses the Amity Hills, and stop 4 was at the quarry site there. The back wall of the quarry is a cross section through two flows of the Columbia River Basalt Group (CRBG), the Grand Ronde below and the Wanapum above. Sheila toted along a number of core sections given to her by the quarry owner. The first sample was at 25 ft. depth and showed vesicular basalt with large air bubble holes. Down at the 245 ft. depth the sample is of solid basalt.

The most interesting were the samples at 300 ft. and 310 ft. At 300 ft. the sample is of river sediments which are well cemented, implying the ancient path of the Willamette River as it was displaced by the volume of lava pouring into the valley. The sample at 310 ft. is of oceanic bay sediments complete with a fossil gastropod, Bruclarkia, a testament to the shallow seafloor that existed during the Oligocene.

Fossil in the 310' depth sample at Amity Hills quarry.

The Amity Hills, the northern segment of the Eola Hills, rise above the valley floor. Most of the CRBG lies below the Quaternary sediments of the valley floor. The Amity Hills stick up in relief due to the erosion of the softer surrounding sandstone, a process producing what is called, inverted, or reverse topography.

In the quarry pit.

The plan of the tour was to proceed onto the Wheatland Ferry and cross to the east side of the Willamette River to stop 5, where the group was to view Mission Lake, an oxbow lake at Mission Lake State Park. Neither one of those happened on the June 2022 trip, however; the late spring rains had produced minor flood conditions. The Wheatland Ferry was closed and the road to the lake was flooded. The GSOC group had to content itself with detouring across the bridge at Salem and backtracking up to Mission Lake, where they found the access to the lake blocked. Fortunately, the picnic area was open and they ate lunch and proceeded up to the east side of the ferry to view the Willamette River and some of its features by its high rushing waters.

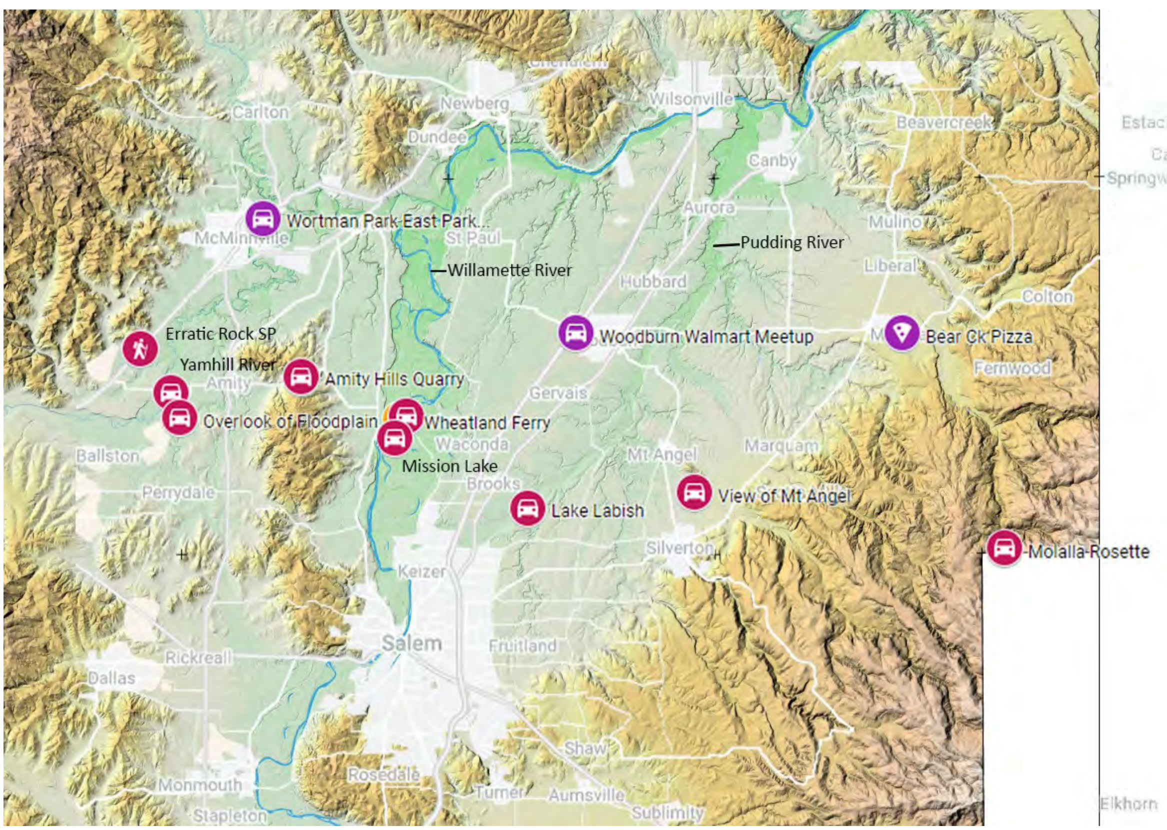
GSOC group alongside the Willamette River at the Wheatland Ferry dock. The sign on the first pylon denotes the height of the 1996 flood.

Stop 6 at the banks of the Willamette was a good place to observe river levees, which are formed as flood waters lose velocity as they leave the main channel to spread out over the floodplain. With the drop in velocity comes the dumping of fine grained sediments that previously had been held in suspension. River levees tend to have a rumply character as the deposition is rapid and uneven.

Terraces that flank Lake Labish.

Heading southeast on Brooklake Road from the ferry area, the group crossed Interstate 5 at Brooks and headed to a small turnoff, stop 7, near the intersection of 65th Ave. NE and Labish Center Road NE. What is known as "Lake Labish" is an abandoned channel of the Willamette River. Looking on the shaded relief map of the trip, one sees that this channel, which contains the Pudding River on its north end, is clearly a much more direct path between Salem and Canby than the current channel of the Willamette River. Fluvial dynamic processes are governed by tectonic uplift and shift, water speed and deposition of sediments; and rivers tend to wander back and forth across their valleys in looping paths that change over time. The Missoula Floods occurring between 15,000 and 12,000 years ago also deposited up to 200 feet of sediment in places, completely obliterating previous channels to be reformed in the time after they ran their course.

Base is shaded relief map by R. W. Givler and R. E. Wells, 2001.



View of Mt. Angel.

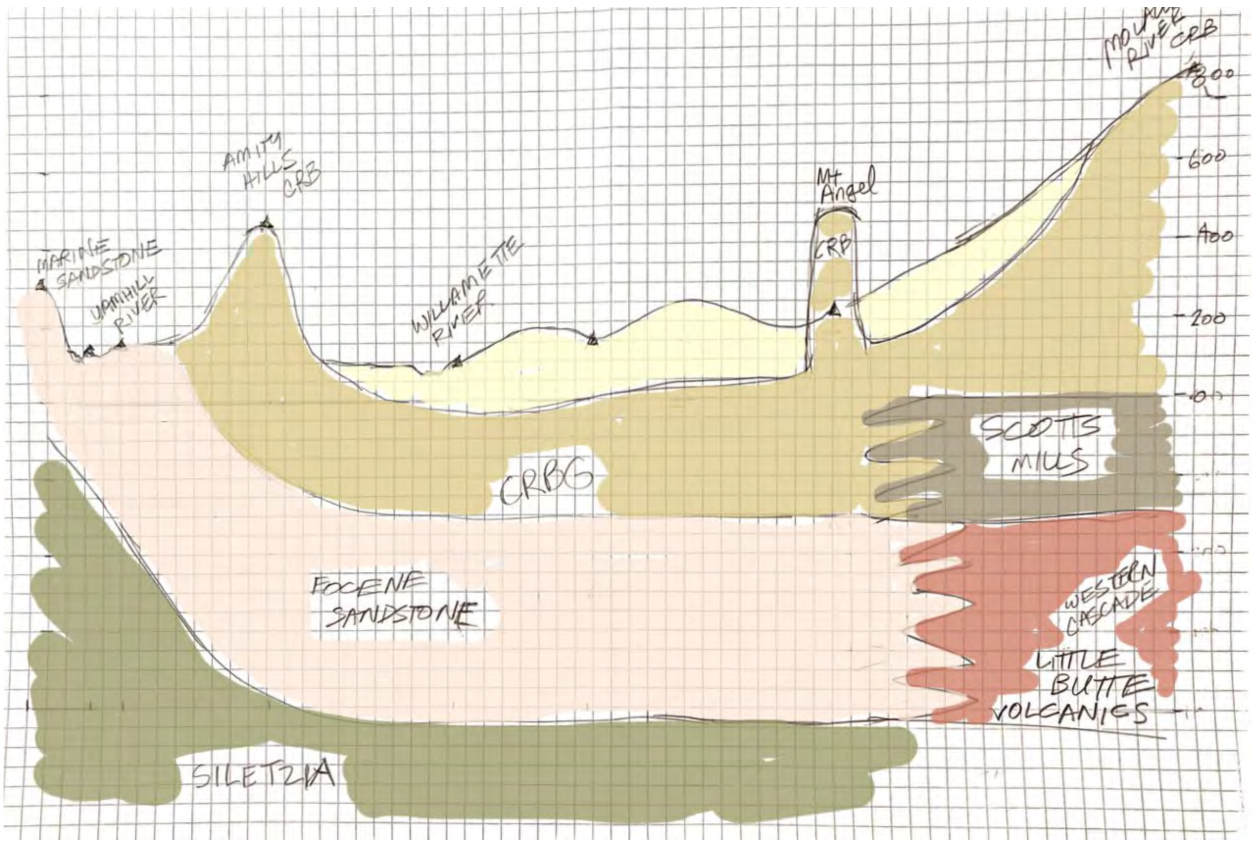
The group headed from Lake Labish east along local roads to a stop east of the village of Downs on Downs Road NE. Here at stop 8 they had an unobstructed view of Mt. Angel, a lozenge-shaped hill of Frenchman Springs CRBG rising two to three hundred feet above the Willamette Valley floor. This hill was extruded out from between two crustal blocks along the Mt. Angel fault zone, which produced the Spring Break Earthquake in 1993. Alfsen told the story of the quake, which fortunately happened when school was out of session, because it toppled a large decorative parapet above the entry to Molalla High School. Tectonic movements of the Willamette Valley include down-warping of the valley in the forearc basin, and movement along faults accommodating the rotation of the crust in response to the nearby plate boundary forces.

From stop 8, the GSOC group headed east to Oregon Hwy 213 and headed north into the town of Molalla, which was to be the location of the dinner restaurant. But meanwhile there was one more stop in the transect. Heading east from Molalla on S Feyrer Park Road, then south on S Dickey Prairie Rd, the group made its way up the Molalla River into the Molalla River Recreation Area, a gorge lined with Columbia River basalt. The last stop, stop 9, was at the Molalla Rosette, a swirling feature of basalt jointing patterns caused by the Frenchman Springs CRBG lava flowing into a narrow canyon in the ancestral Cascade Mountains. This year (2022) was a good year to view basalt, just upriver from the rosette, in the area which had recently been swept by a large forest fire.

The Molalla Rosette.

So, after visiting the Molalla canyon, the group was ready for a pizza party at Bear Creek Pizza in Molalla. While dinner was cooking, the participants grabbed a sheet of graph paper and plotted the elevations of the points in the transect, then filled in the supposed profile of the basin. The assumptions made in the map construction are that older layers, like the Eocene Siletzia basalt, underlie the younger layers in the valley. This can be confirmed by drill core samples and other imaging techniques done by geologists.

Colorized version of profile cartoon by author. Superposition of younger over older layers drives the order of units in this profile. Coloring scheme roughly corresponds to geology map.



Upon completing their cross sections, the participants celebrated the day by digging in to the good food provided by the restaurant.

REFERENCES

Jim E. O'Connor, Andrei Sarna-Wojcicki, Karl C. Wozniak, Danial J. Polette, and Robert J. Fleck, "Origin, Extent, and Thickness of Quaternary Geologic Units in the Willamette Valley, Oregon," U.S. Geological Survey Professional Paper 1620, Prepared in cooperation with Oregon Water Resources Department, Reston, Virginia, 2001. https://pubs.usgs.gov/pp/1620/pdf/pp1620.pdf.

Interactive Maps & Geospatial Data - Oregon Department of Geology, https://www.oregongeology.org/gis

"Map showing faults, bedrock geology, and sediment thickness of the western half of the Oregon City 1:100,000 quadrangle, Washington, Multnomah, Clackamas, and Marion Counties, Oregon, by S. Burns and others, 1997. https://www.oregongeology.org/pubs/ims/IMS-004.pdf

"Color Shaded-Relief Map of the Willamette Valley, Oregon," By. R. W. Givler and R. E. Wells. 2001. https://pubs.usgs.gov/of/2001/0294/pdf/wvc125.pdf

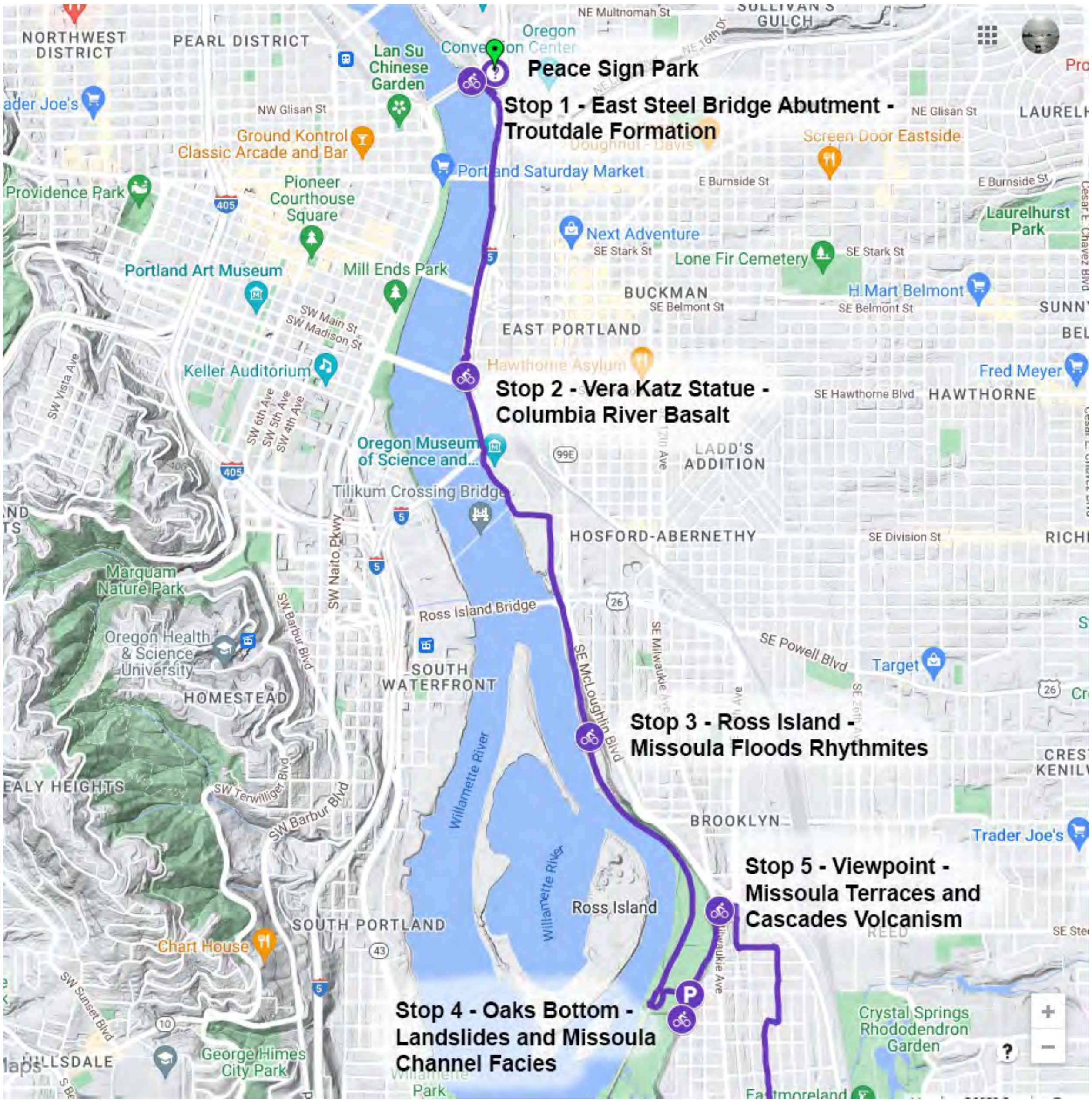
WILLAMETTE EAST BANK BIKE GEOTOUR RECAP AND DIY FIELD TRIP

Map of the tour showing the stops in relation to the surrounding geologic setting.

By Carol Hasenberg

Recap of the GSOC Willamette East Bank Bike Geotour - June 26, 2022

GSOC participants of the 3rd Eastbank Bike Geotour field trip met on the morning of Sunday, June 26, in order to complete the tour before the 90+ degree temperatures of the hottest day of the year (so far) set in. This tour had not been run in three years due to the pandemic, and the leaders included Ian Madin, who just retired from DOGAMI, and Dr. Lalo Guerrero, who teaches geology at Portland Community College. Take a journey with the group and think about biking it for yourself!



A closer view of the first half of the bike tour. This part of the route follows the Willamette East Bank bike path from north to south until the riders come to the Oaks Bottom underpass..

Ian Madin gave most of the geologic explanations at each stop, a product of many years of working in the Portland Basin for the Oregon Department of Geology and Mineral Industries (DOGAMI). The Troutdale Formation at Stop 1 Steel Bridge was described as a conglomerate that has a particularly interesting matrix, or material that cements the rounded river rock together. Madin showed the group a piece of the matrix, which had a texture of fine broken glass with the mustard color of palagonite, indicating that it had been exposed to water when erupting. This material was derived from Cascade eruptions into the Columbia River. That, and a smattering of river rock that had been transported from Idaho and British Columbia, were clues that at least some of the material deposited here came from the Columbia River. Madin also showed the group examples of Cascade porphyry, Boring lava, Columbia

River Basalt, and quartzite that are found here, and pointed to a large cobble of Challis andesite with large pink crystals at the edge of the water.

The GSOC bikers assemble on the Steel Bridge approach at Stop 1.

Looking down from the Steel Bridge approach, we can see an outcrop of the Troutdale formation.

Ian shows the group examples of Cascade porphyry, Boring lava, Columbia River Basalt, and quartzite he has found on the bank.

Ian's sample of the Troutdale Formation matrix material.

Ian Madin gave most of the geologic explanations at each stop, a product of many years of working in the Portland Basin for the Oregon Department of Geology and Mineral Industries (DOGAMI). The Troutdale Formation at Stop 1 Steel Bridge was described as a conglomerate that has a particularly interesting matrix, or material that cements the rounded river rock together. Madin showed the group a piece of the matrix, which had a texture of fine broken glass with the mustard color of palagonite, indicating that it had been exposed to water when erupting. This material was derived from Cascade eruptions into the Columbia River. That, and a smattering of river rock that had been transported from Idaho and British Columbia, were clues that at least some of the material deposited here came from the Columbia River. Madin also showed the group examples of Cascade porphyry, Boring lava, Columbia River Basalt, and quartzite that are found here, and pointed to a large cobble of Challis andesite with large pink crystals at the edge of the water.

Vera Katz and Paul Edison-Lahm watch over our bikes while Ian tells us about CRBG at Stop 2. The columns we discussed are in the center of the photo.

The group proceeded south along the Eastbank Esplanade to the Stop 2 Vera Katz statue just north of the Hawthorne Bridge abutment. A bronze replica of former Portland mayor Vera Katz is seated along a low wall and surrounded by a number of columns of the Sentinel Gap Unit of the Frenchman Springs Member of the Wanapum

Basalt Formation. These decorative columns of Columbia River Basalt are representative of material that was plucked from its outcrops in Eastern Washington and Oregon and carried down the Columbia River Gorge in the raging Missoula Floods during the end of the last Ice Age. It is also presumed to be the material underlying the 1500 feet or so of sediment that fills the Willamette Valley here.

Vera and I in 2019 on the second running of the trip.

Madin further talked about the structure of the Columbia River Basalt, or CRBG as it is known in local geology circles. There was a large gap in time between the flows of two of the formations, the Grande Ronde and the Wanapum, at about 15.6 million years ago, and a significant layer of red clay soil developed that is called the Vantage Horizon. This gooey layer is responsible for a number of giant landslides in the Portland Hills to the west of the river. Madin's work at DOGAMI largely focused on geohazards, and much work involved the identification of landslides in the state including Portland.

Missoula rhythmites as viewed from the Willamette East Bank bike path and across the railroad tracks. This cut bank is getting somewhat grown over, but there is another cut bank down the path a little ways.

The same bluff in 2019.

Stop 3 was about a mile further south at the old Ross Island Sand and Gravel quarry. The deposits of gravel go deep within the sediments here, because during the Ice Ages, river levels were much lower because sea level was much lower than it is today. Much sea water was locked up in the continental and mountain glaciers that existed then. Near the end of the Ice Ages, the Missoula Floods, which were up to 400 feet deep at this location, made more deposits and reworked material in the river floodplain.

Ian discusses the Missoula Floods at Stop 3.Photo by Paul Edison-Lahm.

To the east of Stop 3, Madin pointed out a bluff about a hundred feet from the group that contains rhythmites from the Missoula Floods. The rhythmites consist of layers of fine-grained material, and each layer represents the deposit of a different flood event. Each layer of the rhythmite would have been deposited decades or centuries apart from the preceding layer. This characteristic distinguishes rhythmites from varves, which represent the yearly deposits at the bottom of lakes. Madin also told the group that another place to view rhythmites in the Willamette Valley is along the Pudding River (the course of which is discussed in the article on the 2022 GSOC Willamette Transect Field Trip).

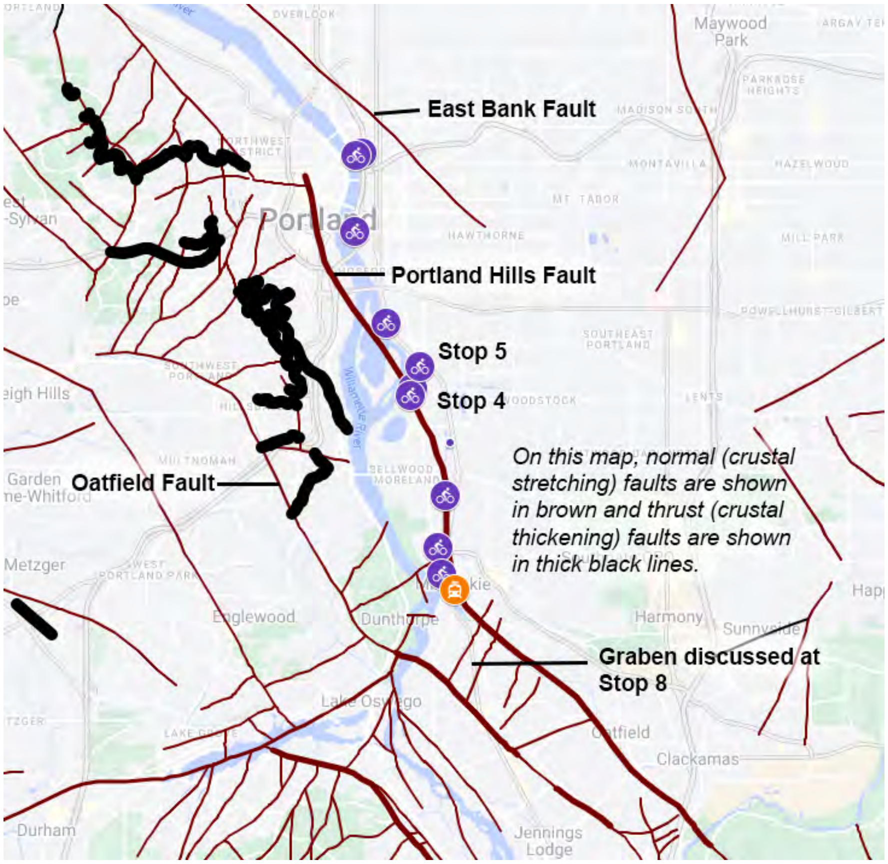
Another topic discussed here by Madin was the bog iron that was mined in the Lake Oswego area. This is a product of weatherization, sedimentation, and collection of iron-bearing basalt lavas in a reducing swampy environment and is found in the Vantage Horizon layers in a band stretching from Lake Oswego to St. Helens, Oregon, with the richest deposits found at either end. The iron ore was found in the 1840's and smelted until it became uneconomical in the early 1900's. Imagine someone trying to mine and smelt iron there today!

GSOC bikers lock their bikes to the racks provided at the base of the terrace before walking south on the footpath to Stop 4.

Ian discusses the landslide at the base of the terrace.

Granite is not exposed in this part of Oregon. Where did it originate?

The GSOC bikers next biked another mile or so down to the Oaks Bottom area along the river bike route, then turned left under the railroad tracks to the Oaks Bottom trails. Parking their bikes along the main trail, they walked along the base of the river terrace slope on a side trail to Stop 4. Here a landslide could be observed amongst the trees. Madin began collecting LiDAR (Light Detection and Ranging) data for the state of Oregon about 12 years ago, and this recent technology has been a real breakthrough as a tool for geologists, especially those working in heavily forested areas like the Pacific Northwest. Using ultra-sharply focused LiDAR ground images, many thousands of landslides have been mapped in the state. This tool is also useful for finding earthquake faults which are recent enough to have left fresh tracks of scarps in the landscape. In fact, two other GSOC field trips this summer have been produced to examine earthquake faults in Oregon found by Madin.

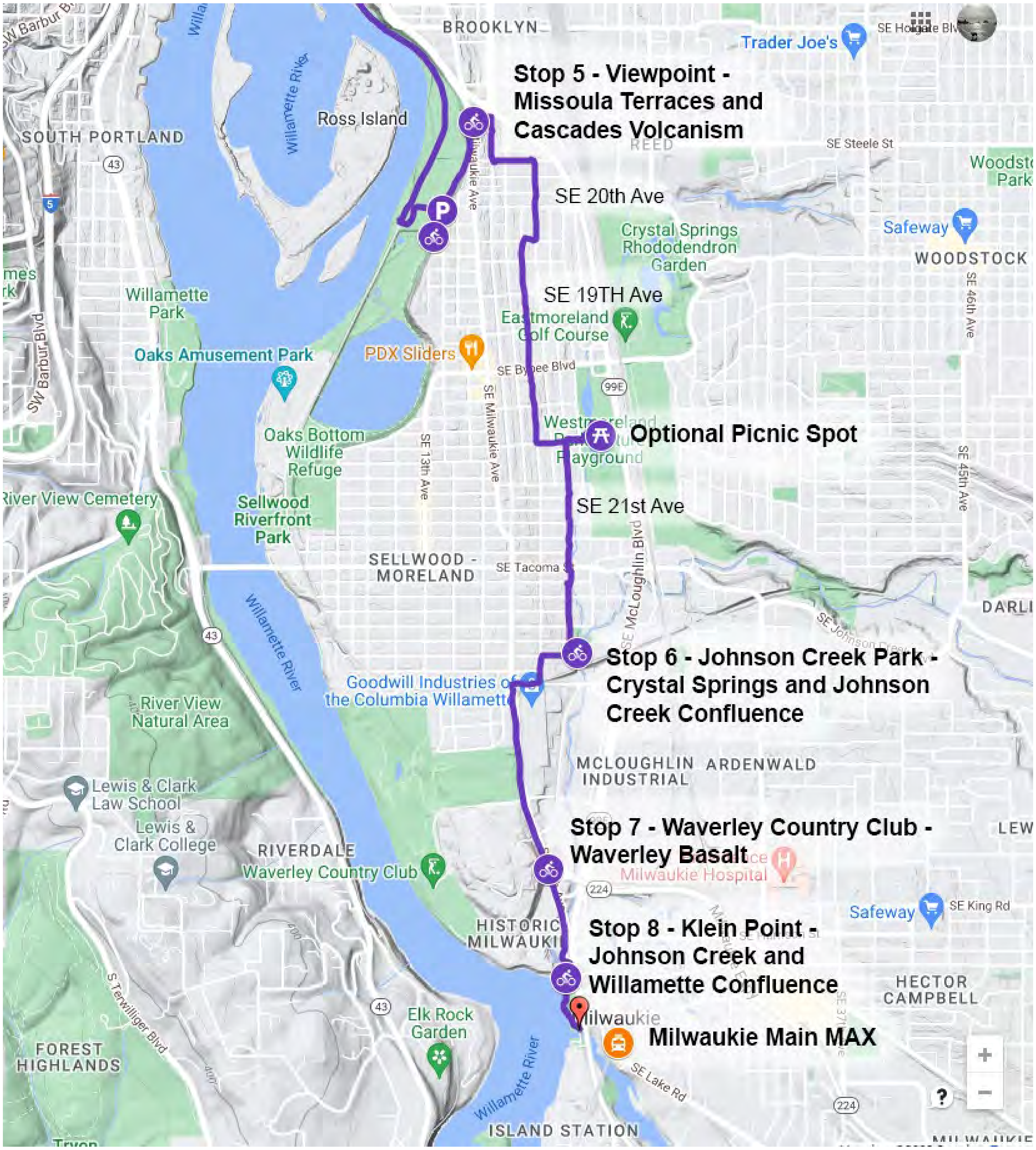


Portland map showing bike geotour stops and the faults mapped in the area.

And speaking of which, the Portland Hills Fault is mapped running through the Oaks Bottom area. This shallow crustal fault, one of several running NW to SE in this part of the state, has been evaluated as potentially producing M6.8 earthquakes in the Portland metropolitan area. Later in the tour Madin discussed the major crustal faults of the Portland basin. Although their primary motion is strike/slip, or sideways movement, they also produce vertical movement as well – about 200’ for the Portland Hills Fault and at least 800’ on the Oatfield Fault to the west. The Oatfield Fault in particular had cut through the light rail tunnel, and it was observed here that Columbia River Basalt was thrust overtop the younger Boring Lava.

Another feature of the area discovered using the LiDAR imaging are known as “pits of mystery,” or odd depressions. About 3000 of these have been mapped along edges of major Missoula Floodways. They mark iceberg melt sites, as the floods occurred as a result of the bursting of a wall of ice of the lobe of a continental ice sheet. The bergs also floated down many large erratic rocks and dropstones in their makeup.

While the group was listening to Madin talking about the uses of LiDAR technology, their attention was directed to some rounded gravel and cobbles below the landslide edge. Madin selected a small cobble to show the group that was made from granite, which does not occur naturally in the Portland basin. Another reminder that this area is full of exotic stones.



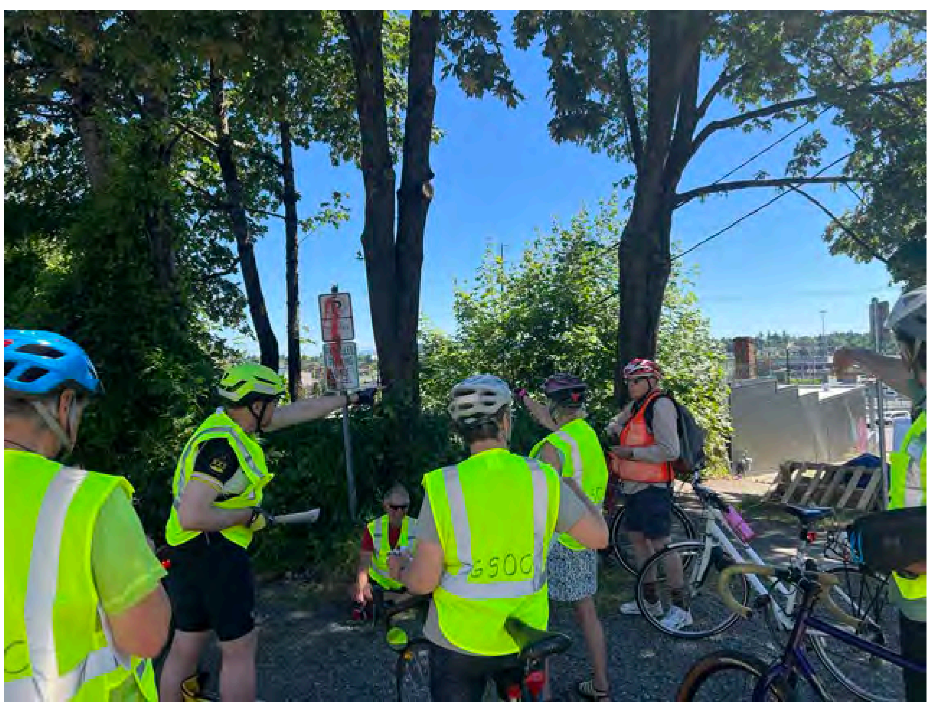
The south half of the bike tour. Major north-south streets used by the group are marked.

After gleaning the information told to them at Stop 4, the group proceeded northeast up the terrace slope and out of the floodplain of the Willamette River. Looking east from Stop 5, a parking lot close to the intersection of SE 17th Avenue and McLoughlin Blvd., the group could see the edge of another terrace at Reed College, and beyond to mounds of Boring Lava volcanoes and the High Cascades in the far distance.

Both the High Cascades, represented by Mt. Hood, and the Boring Lava volcanoes of Mt. Tabor, Kelly Butte, and Mt. Scott, were the products of subduction fed mantle material. Madin also distinguished two types of Boring Lava volcanoes – true stratovolcanoes like Mt. Scott, Jenne Butte, and Scouters Mountain, and hills created by material which leaked through preexisting faults like Mt. Tabor and Kelly Butte.

Looking ESE from the viewpoint one can see the Reed College terrace edge (greensward above and to the left of the Mobil sign) and Mt. Hood beyond.

Ian points to Rocky Butte and Mt. Tabor, two close-by examples of Boring Lava seen from the viewpoint.



Closer to the viewpoint, the railroad yards to the east of McLoughlin Blvd. were sited upon Missoula fine sediments, and the terrace at Reed College was formed by a deposit of gravel from the early Missoula floods, which were

highest and carried the most sediment and rock. Later floods carved bars and channels from the earlier floods.

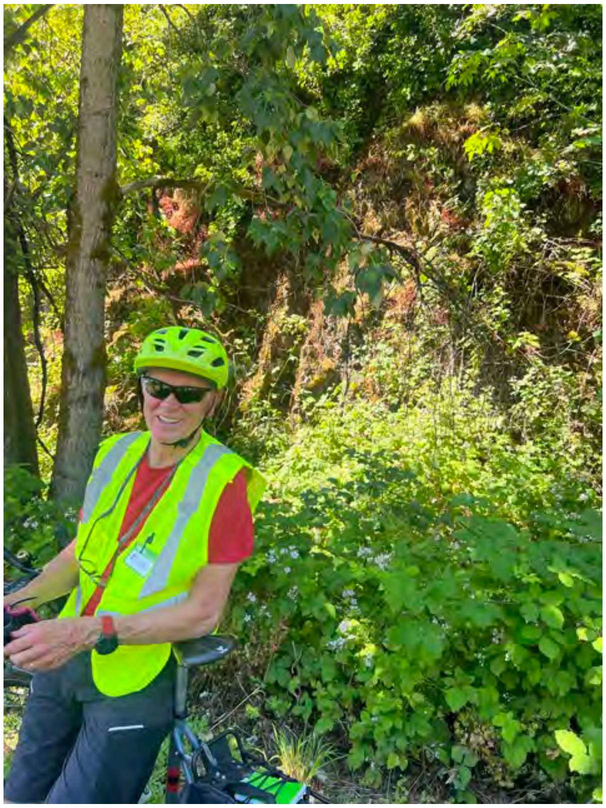
Ian discusses the temperature differences between the creeks at Stop 6.

From the viewpoint, the group traveled south to Sellwood along residential streets of Westmoreland. The next destination was Stop 6 Johnson Creek Park in Sellwood, where Johnson Creek is fed by Crystal Springs Creek. Madin had the group compare the temperature of the two creeks and it was found that Crystal Springs Creek, true to its name, is spring-fed and much colder. Johnson Creek travels above ground for miles before reaching this point.

Crystal Springs in the park, taken in 2019.

The topic then jumped to earthquake hazards in this area of Portland. One of the major causes of damage to buildings in earthquakes is liquefaction, where the grains of saturated, poorly consolidated soil, especially loose sand, will, during the shaking, lose contact with one another and float in the surrounding groundwater. When that happens, the soil cannot support foundations, and structures can sink, tilt, crack, and move laterally if there is any slope to the grade. Some of the Missoula Flood sediments can be susceptible to liquefaction even though they were deposited

15,000 years ago. Madin recommends that anyone planning to build upon or buy property in this material spend the comparatively small amount of money necessary to hire a geotechnical expert to determine the hazard.



The mini-bluff behind Bruce is formed by Waverley Basalt. This is taken from the bike path along 17th Avenue south of McBrod Avenue. We stopped here for the shade this year.

Paul is describing the Waverley Basalt from the mapped stop in 2019.

The Waverley Basalt contains zeolites formed by hydrothermal fluids circulating through the original rock. Photo by Paul Edison-Lahm.

The group left Stop 6 and headed south down the bike path between SE 17th Avenue and Waverley Golf Course, paralleling the path of Johnson Creek one block to the east. The group stopped along this path in the shade of a tree just south of McBrod Avenue. Here the path was adjacent to a grade change, which nicely exposed Waverley Basalt, the topic of Stop 7. Madin found a few samples of this 40-million-year-old, hydrothermally altered basalt for the group to examine. The material was buffy brown, weathered, and riddled with zeolite crystals due to the hydrothermal alteration.

Madin discussed the origins of this volcanic material. The Waverley Basalt, like the older Siletzia Basalt underlying the coast range and the Portland basin, is a product of the Yellowstone Hot Spot. This material was produced as the volcanic Siletzia Terrane, firmly docked to the North American plate after colliding with it about 50 million years ago, passed over the plume of magma on its westward journey. A number of volcanic sills and dikes were produced at about this time all throughout the Coast Range in a similar manner.

The GSOC bikers assemble at Klein Pt. Johnson Creek is flowing towards the viewer.

The group continued south along the 17th Avenue bike path into Milwaukie, and rode into the park as 17th Avenue terminated into McLoughlin Blvd. Turning right at a sharp angle, they rode down to Stop 8 Klein Point, where Johnson Creek flows into the Willamette River. Looking across to the west bank of the Willamette, Madin told them that the slope is mostly composed of Waverley Basalt with a few spots of Columbia River Basalt overlying it. There is a 23-million-year unconformity between the two layers. Other spots where Waverley Basalt occur are islands upstream of this point, near Willamette Falls in Oregon City.

Johnson Creek flows into the Willamette here at Klein Pt. The West Bank beyond is a large outcrop of Waverley Basalt with a smattering of CRBG atop it.

Madin discussed some of the landforms in this area and the causes of the topography. The Willamette River is 130’ deep in this area as it has eroded down into its former canyon. Upstream from Milwaukie, the river passes through the center of a lowland bounded by faults, called a graben, whose axis is oriented NW to SE. On either side of this graben lie uplands called the Gladstone Horst and the West Linn Horst. The Portland Hills Fault and the Oatfield Fault define the edges of this low area.

If you DIY’ers do this trip on a summer Sunday, you’ll get to eat lunch at the Milwaukie Farmer’s Market. Otherwise, you’ll have to choose from amongst the food trucks near the Milwaukie Main MAX station.

Having completed the bike tour, the group headed back up the slope into the heart of the town, and luckily the Milwaukie Farmers Market was in business for lunch. After their repast, tour participants could ride a few blocks south to catch the MAX orange line at the Milwaukie Main rail station, where more food carts were situated. The MAX cars were air-conditioned and a handy way to ride back to Portland to connect back to the ride home.

But hey, don't just take our word about how great this bike trip is - experience it for yourselves! Wait for the perfect day and take a ride down the Willamette East Bank. DIY pointers are provided in this article.

REFERENCES

Russell C. Evarts, Jim E. O'Connor, Ray E. Wells, Ian P. Madin, "The Portland Basin: A (big) river runs through it," GSA Today, Geological Society of America, Volume 19 Issue 9, September 2009. https://www.geosociety.org/gsatoday/archive/19/9/article/i1052-5173-19-9-4.htm

Ira A. Williams and Henry M. Parks, "The Limonite Ores of Columbia County, Oregon," The Mineral Resources of Oregon, The Oregon Bureau of Mines and Geology, Volume 3, Number 3, May 1923, https://www.oregongeology.org/pubs/bomg/MineralResourcesofOregonVol3No3.pdf.

Bill Tompkins, "Oregon's First Iron Smelter, Lake Oswego, Oregon," https://www.mindat.org/article.php/982/Oregon%27s+First+Iron+Smelter

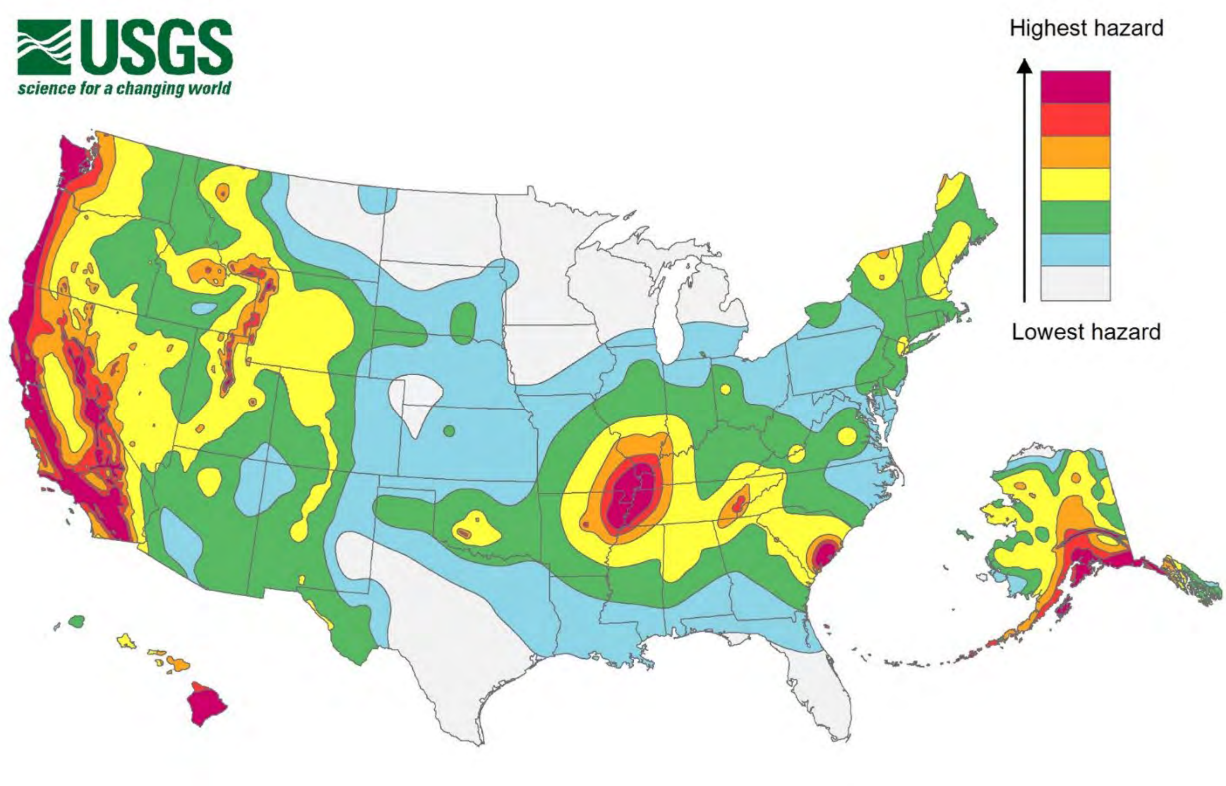
NAME	LATITUDE	LONGITUDE
Peace Sign Park	45.52839	-122.66606
Stop 1 Troutdale bank at Steel Bridge	45.528	-122.6678
Stop 2 Vera Katz Statue	45.51294	-122.66822
Stop 3 Missoula rhythmites	45.4946	-122.6592
Bike trail parking	45.48149	-122.65183
Stop 4 Landslide & Missoula Cobbles	45.4802	-122.65246
Stop 5 Viewpoint east	45.48578	-122.64971
Optional Picnic Stop - Westmoreland Park Nature Playground	45.47063	-122.64096
Stop 6 Johnson Creek Park	45.46018	-122.64258
Stop 7 Waverley at SE 17th across from Hwy 224	45.4498	-122.64459
Stop 8 Klein Point & View South	45.44455	-122.64335
Milwaukie/Main St MAX Station	45.44143	-122.63981

GSOC STRAWBERRY MOUNTAIN FIELD TRIP

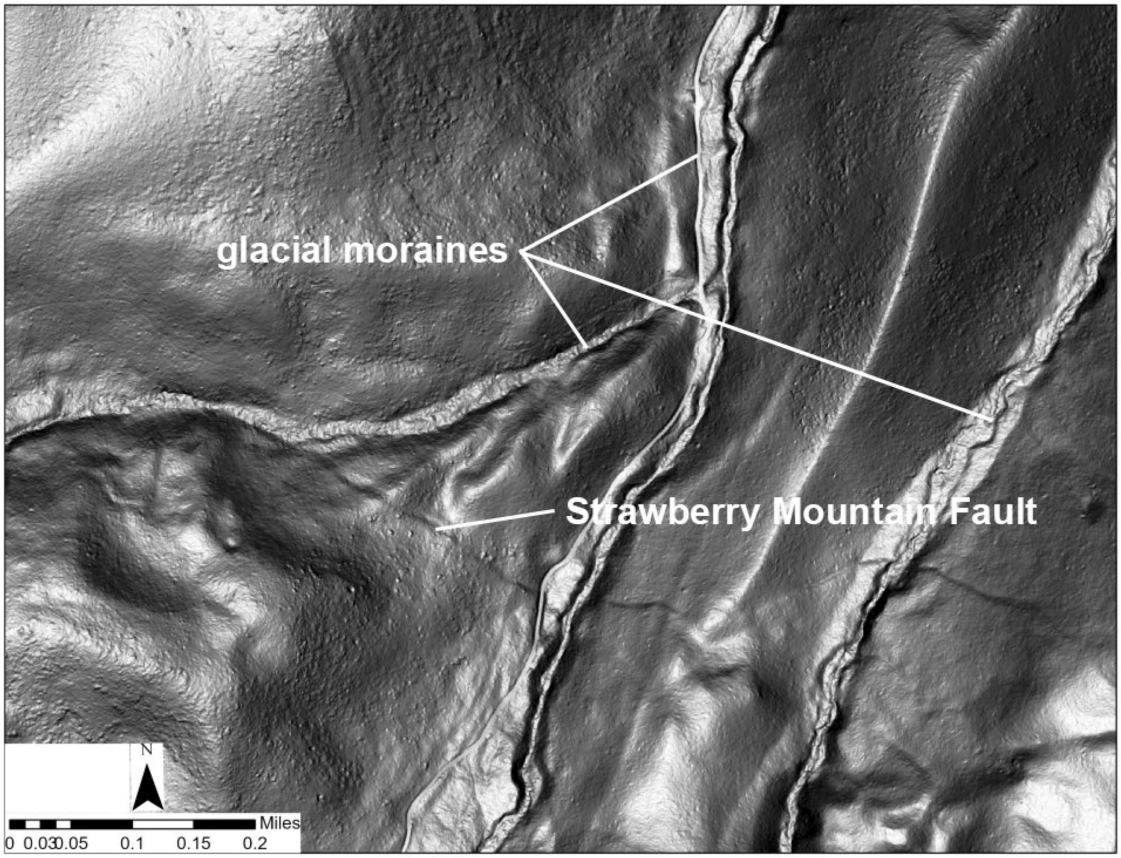
story text by Carole Miles

photos by Carole Miles, Denny Chamberlin, and Kate Ely

The Strawberry Mountain fault was discovered in 2019 by DOGAMI's Ian Madin upon reviewing new LiDAR maps of the area. Andrew Dunning, looking for a project for his master's thesis at Portland State University, realized that a lack of high-quality seismic data in this area of Oregon may have erroneously led to an inaccurate assessment of the seismic risk in Eastern Oregon on the USGS National Seismic Hazard Map. He has been working on gathering data related to timing and offset of the Strawberry Mountain fault for the past two years. He was excited to take GSOC members into the field to show us what he has learned.



An example of a USGS seismic hazard map. This maps the relative earthquake hazards in the U.S.



This is a LiDAR image of the Strawberry Mountain Fault.

Field Trip led by: Andrew Dunning, PSU Geology Masters student

Co-facilitated by: Denny Chamberlin and Carole Miles

story text by Carole Miles

photos by Carole Miles, Denny Chamberlin, and Kate Ely

The Strawberry Mountain fault was discovered in 2019 by DOGAMI's Ian Madin upon reviewing new LiDAR maps of the area. Andrew Dunning, looking for a project for his master's thesis at Portland State University, realized that a lack of high-quality seismic data in this area of Oregon may have erroneously led to an inaccurate assessment of the seismic risk in Eastern Oregon on the USGS National Seismic Hazard Map. He has been working on gathering data related to timing and offset of the Strawberry Mountain fault for the past two years. He was excited to take GSOC members into the field to show us what he has learned.

We met at the historic Cant Ranch in the John Day Fossil Beds National Monument to organize, then moved on to our first stop — the Mascall Overlook for a view north to Picture Gorge (Sheep Rock is the point between the notch).

Next, we stopped along Hwy 26 for a rare, although somewhat unimpressive, exposure of the John Day fault which controls the morphology of the John Day valley. The fault line is evident where the red rock abuts the black rock.

We stopped at the Kam-Wah-Chung State Park to see one of the oldest buildings in Oregon and the oldest Chinese-American business in the Northwest, built in 1865. It served the Chinese residents who came to work mining gold in Eastern Oregon during that era. It was also a good spot to see the numerous landslides and all the major rock units of the area. Landslides are common due to the meandering John Day River which undercuts and over-steepens the soft rocks and clays of the John Day, Mascall, and Rattlesnake formations. The cap rock of Rattlesnake tuff and the low-angle dip of the formations creates perfect conditions for landsliding. We ended Day 1 with a stop at the foot of the Strawberry Mountains to look at glacially-carved valleys and alluvial fans.

Day 2 was spent hiking the Onion Creek trail to the location of Andrew's research study area along the Strawberry fault and helping with auger core sampling and trench digging in search of the fault line.

Starting the 1.5 mile hike at about 5,000 feet elevation…

…and working our way up to about 6,500 feet elevation. We observed the natural re-growth of trees and native plants since a large wildfire in 2002.

Including lots of Mariposa lilies (and bee friends).

We learned how to make an auger core…

Those with strong backs helped to dig a trench in search of the fault line.

And analyze the soil layers found at various depths (including a 10 cm layer of Mt. Mazama ash!).

Andrew jumped in to do some of the detail work, still unsure that we actually found it.

Another 1.25 miles up the trail took us to a beautiful overlook of the John Day valley to north.

And a nice look at the Strawberry Mountain volcanic layers to the south.

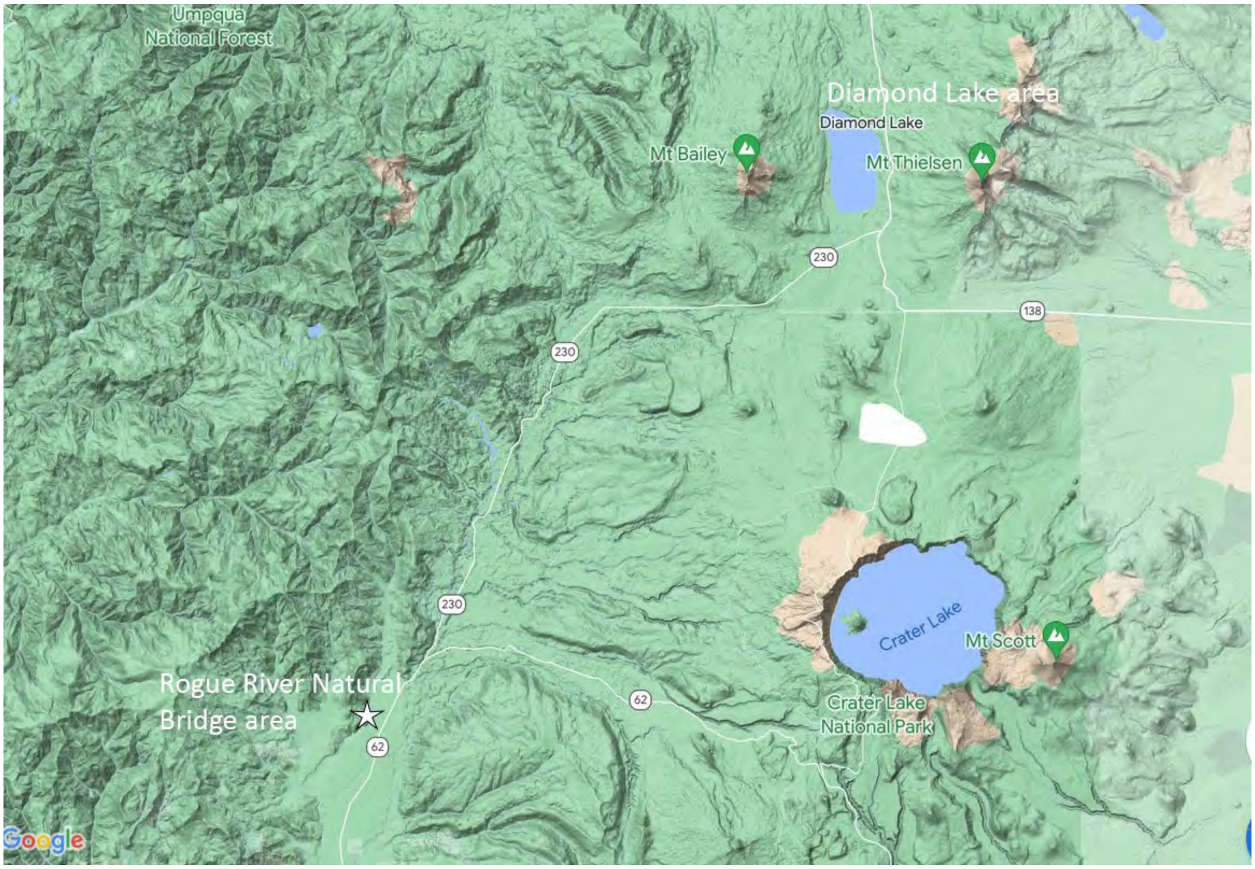
On Day 3, we enjoyed the easier 1.4 mile hike up to Strawberry Lake, a glacially-carved lake that has been dammed by a massive landslide at the north end. There is no outflow to this lake — it flows underground through the loose landslide debris and, about 30 days later, comes out of the ground as springs close to the Strawberry campground.

This outcrop at the northwest corner of the lake is where the landslide came from. You can also see the beige layer of Dinner Creek Tuff sandwiched between layers of red scoria.

Final group photo including most (but not all) participants.

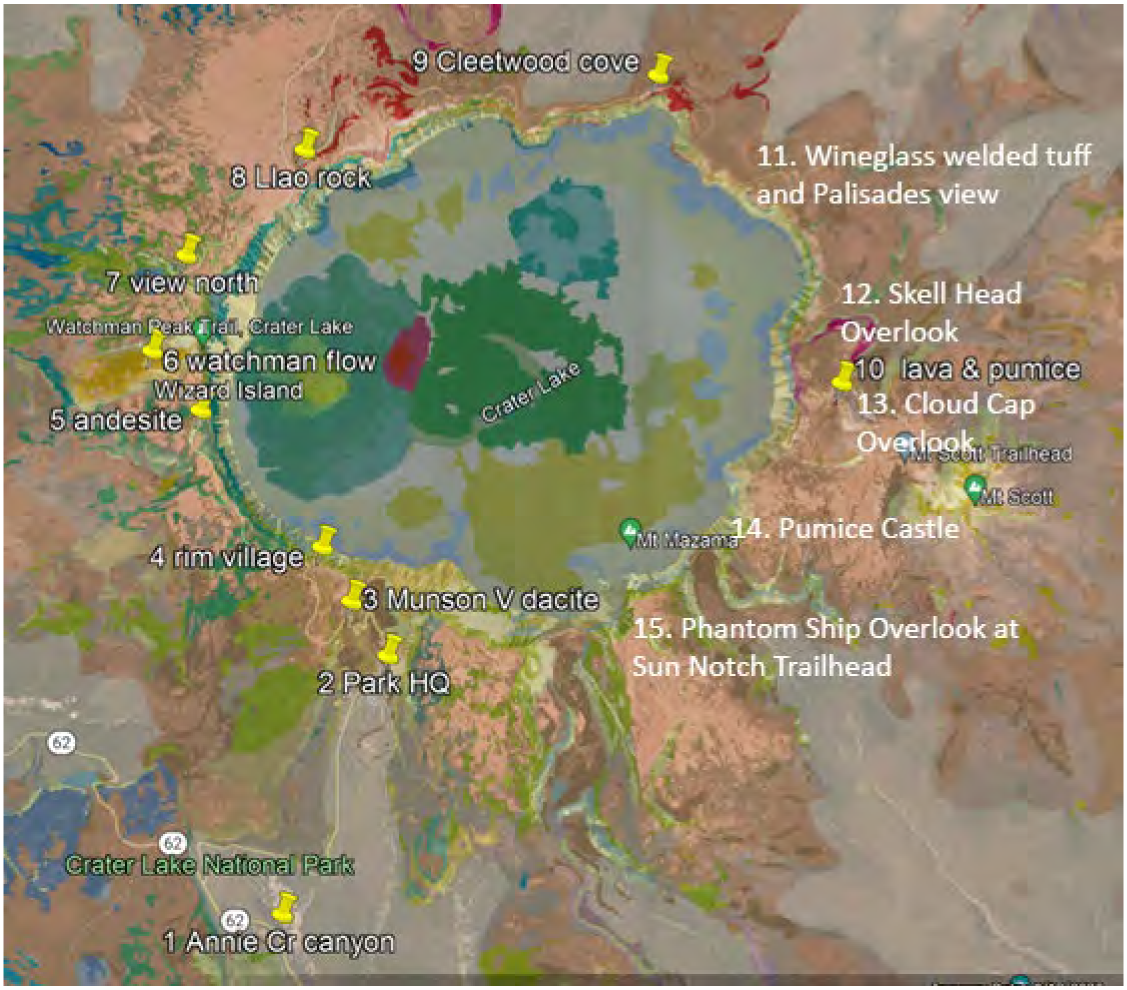
THE BIG KAPOW! CRATER LAKE FIELD TRIP RECAP

article by Field Trip Director Carol Hasenberg with edits by Dr. Benjamin Sloan



Vicinity of the trip. The GSOC group lodged at Diamond Lake, toured Crater Lake area in Crater Lake National Park, and visited the Rogue River Natural Bridge area at the end of Day 2.

This trip began in the mind of GSOC member Dr. Benjamin Sloan after he joined the society last year and participated in the Coaledo trip last summer. By September he was emailing me and asking whether we would consider doing a trip to Crater Lake. I replied that we'd consider the trip, then added a long list of logistical considerations that needed to be worked out, thinking that would be the last I'd hear from him. Well, one month later he had researched the technical papers, gone to Crater Lake to research lodging and travel routes, and sent me a list of tasks he'd completed. Turns out that Ben has been planning field trips worldwide and teaching geology for years as well as doing oil exploration. We then went after the trip full bore, with Ben and co-leader Dr. Lee Fairchild drafting a thorough field trip guide, speaking to Crater Lake researchers, etc. We worked out the logistical considerations of transportation, permits and lodging by midwinter, and Ben made several reconnaissance trips to the area. So, after a year of meticulous planning and anticipating, the GSOC trip to Crater Lake finally began.



This is a revised trip map from the field guide. We visited stops 1-4 and 6-9 on Day 1 and stops 11-15 on Day 2, plus the Rogue River Natural Bridge area (see vicinity map above).

The trip agenda is derived largely from an excellent field trip guide written by volcanologists Charles Bacon and Heather Wright and published by the USGS in 2017. Their publication was deemed highly technical, so Ben and Lee wrote a field trip guide with a long introduction about volcanoes in general and Cascades Volcanoes in particular, to give trip participants with less technical knowledge the background they needed for the trip. They also rewrote the stop information in less technical language. Lavishly illustrated, this is one of GSOC's best field guides ever.

The trip co-leaders conducted the trip in an engaging method of presenting the material at the stops. At each stop, we were asked to first list our objective observations before considering interpretations based on the observations. Then, we compared the results to the published conclusions of the researchers. For example, at stop 2 there is a roadcut with poorly sorted angular clasts of rock surrounded by a tan matrix. Is this a pyroclastic flow, an ashfall, river deposit, glacial till, lahar, or landslide? How does one distinguish the cause? This was a good method because it engaged our minds and there were a lot of similar roadcuts on the trip. We needed to look at regional context, whether there were inclusions of organic material, bed flow, clast form and size amongst other considerations.

The geology of Mount Mazama can be broken down into four stages:

1. The oldest sections of the mountain are of an andesitic shield and stratovolcano, and the very oldest sections, represented by the volcanic plug of Phantom Ship and Mount Scott, are located on the southeast sections of the caldera and mountain edifice. The ages for the stage 1 outcrops are from 400,000 to 30,000 years. These outcrops are represented on the caldera walls as relatively thin layers of material accumulating over these years.

2. About 30,000 years ago, the volcanic output became more silicic and viscous. A number of dacite domes built atop the andesitic edifice. The pasty magma in the volcanoes' magma chamber accumulated during this period and set up stage 3. Today we can see Llao Rock on the northwest caldera wall which is the best example of a dacite dome of this period.

3. Just 7,700 years ago Mount Mazama blew its top. This event, which occurred over a period of days or weeks, began with a Plinean-style eruption from a central vent. This highly explosive eruption ejected a large column of material which went high into the atmosphere and then fell as pyroclastic flows down the northeast side of the mountain. With a large volume of material gone from the rather shallow magma chamber, the top of the mountain began to collapse into the void. The resulting cracking and failing of the material around the edges of the magma chamber became conduits for the expulsion of more magma, and this ring-vent phase was a second huge eruption.

4. The final stage of the life of Mount Mazama has seen some resurgent andesitic dome building in the caldera, similar to what we see at Mt. St. Helens today. Wizard Island within the lake is the part of this that sticks up above the water.

On this trip, we did not get much of an opportunity to talk about the water of the lake itself, which is also a unique and marvelous system. However, we did get to talk about the rather steady level of the lake. Why doesn't the water in the lake fill to the top of the caldera walls and burst over the top? Well, most of the walls of the caldera are impervious, but there is old glacial till and fluvial deposits underneath the 159,000-year-old Palisades andesite on the northeast wall of the caldera. These porous sediments probably control the level of the lake and give researchers important insights into what the height and summit location of ancient Mount Mazama were like.

We also observed the ashfall and pyroclastic output of the climactic eruption, which is very thick near the volcano and also can be found all over the Pacific Northwest. The ash and pyroclastic flows came out in 4 stages, and these can be easily seen in the eastern caldera walls at the overlook near Skell Head. The central vent erupted first, so the buff layer at the bottom came from this vent. The welded orange tuff above that is the Wineglass Welded Tuff from the pyroclastic flows at the conclusion of this eruption. Then the clast laden, brownish layer above the tuff is the ring vents "clearing their throats." Finally, the fine whitish ash layer at the top is the remainder of the magma being ejected in the main ring vent eruptions.

The trip was originally planned for a day around the caldera and a day that included a boat trip inside the caldera. Unfortunately, the boat vendor was not up and running this year and the boat trip did not happen. Instead, Ben and Lee added a second day of touring in the vans around the caldera to replace the boat trip, and Ben added a supplement to the field trip guide.

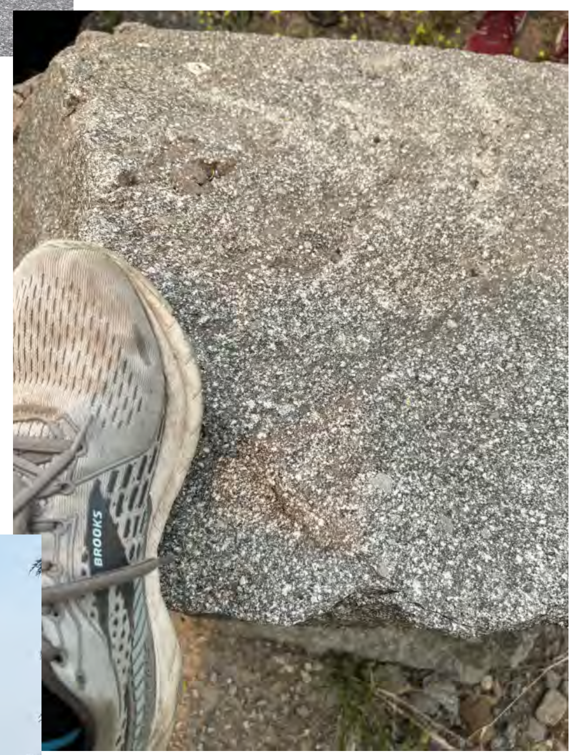
We would also like to offer special thanks to the volunteers who drove the vans for the trip, Sheila Alfsen and Larry Jordan. They did a great job and had to drive those vans for 4 days. We could not have done the trip without their service.

And as the trip wound to its conclusion, we drove over to the Rogue River Gorge to see some outrageous lava tubes and stopped off at Beckie's Restaurant to gobble down fresh berry pie and ice cream. This was a great way to end the trip and the ice cream helped to beat the heat from unusually high temperatures both days of the trip.

Pictures of the geology on Day 1:

Stop 1 – This incredible deposit of ash fall and tuff at Annie Creek Canyon represents a total inversion of the magma chamber in the ring vent phase of the climactic eruption. Notice that the color of the material goes from buffy at the bottom to grayish at the top, reflecting the transition from rhyodacitic to more andesitic composition up the column. The steepness of the layers are indicative of the resistance to erosion.

Stop 2 - This roadcut near the park headquarters has been interpreted as a proximal pyroclastic deposit. Being so close to the source of the eruption, the maximum clast size is fairly large.



This chunk of Munson Valley dacite found at Stop 3 exhibits a very grainy texture from all the phenocrysts it contains.

From Stop 4 Rim Village we could see Wizard Island and Llao Rock in the crater rim beyond.

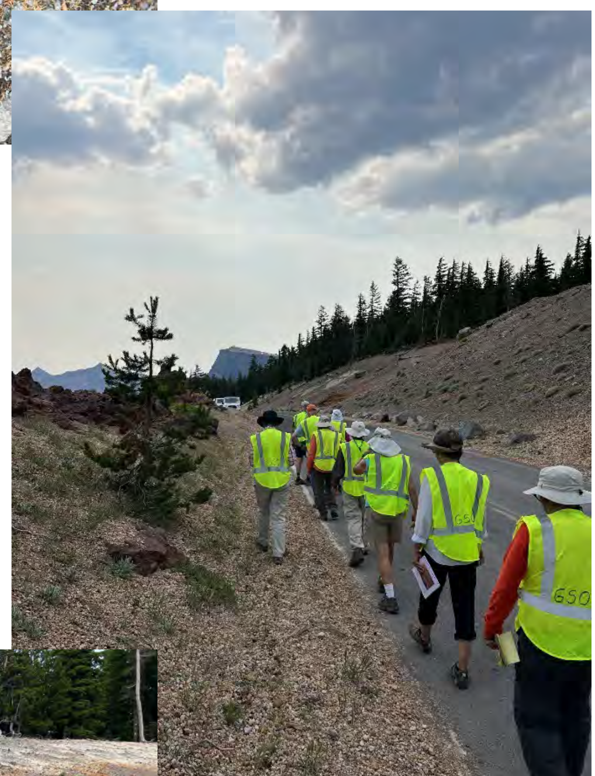
From the Watchman Flow of Stop 6, we could look to the southwest and see Union Peak and Mt. McLoughlin in the distance. Mt. Shasta was not visible due to fire smoke haze in the atmosphere.

Lee points out the intact dacite flow in the roadcut on the crater side of the rim road at Stop 6. The 50,000-year-old Watchman Flow has a very glassy texture.

Stop 7 - Llao Rock Overlook. Llao Rock was a dacite flow that occurred just about 200 years before the climactic eruption. It consists of viscous, glassy rhyodacite.

A close up of a beautiful obsidian boulder at Stop 8. This was produced by the Llao Rock eruption.

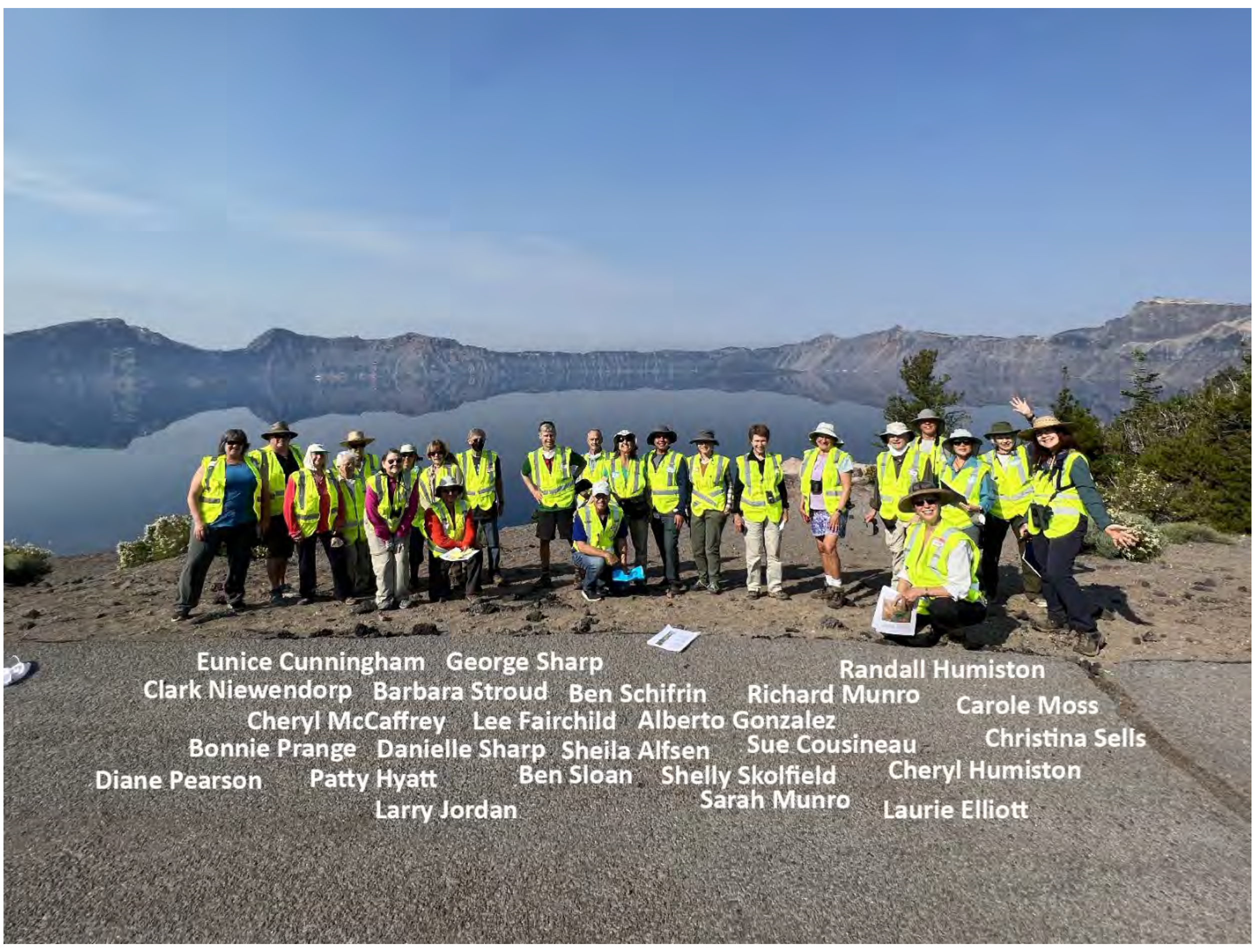
Stop 9 - GSOCers demonstrating good safety precautions along the Crater Rim Road with their safety vests and single file walking.



Stop 9 - Pumice of Cleetwood Cove. This flow occurred directly prior to the climactic eruption and some of the material oozed back into the crater after the eruption.

A little chunk of pumice.

GSOCers give a fist pump for all the great stuff we saw on Day 1!



The group shot taken from the Wineglass Tuff stop at the beginning of Day 2.

Here are some shots of the people on the trip:


Ben


Ben


Lee


Cheryl


Alberto


Randall


Driver Sheila


Christina


Bonnie


Larry


Author Carol


Barb

Day 2 Geology shots:

Stop 11 - Wineglass Welded Tuff - This orange colored material was deposited in a pyroclastic flow at the collapse of the Plinian eruption column in the first part of the climactic eruption. Material above this layer would be from the ring-vent phase of the eruption.

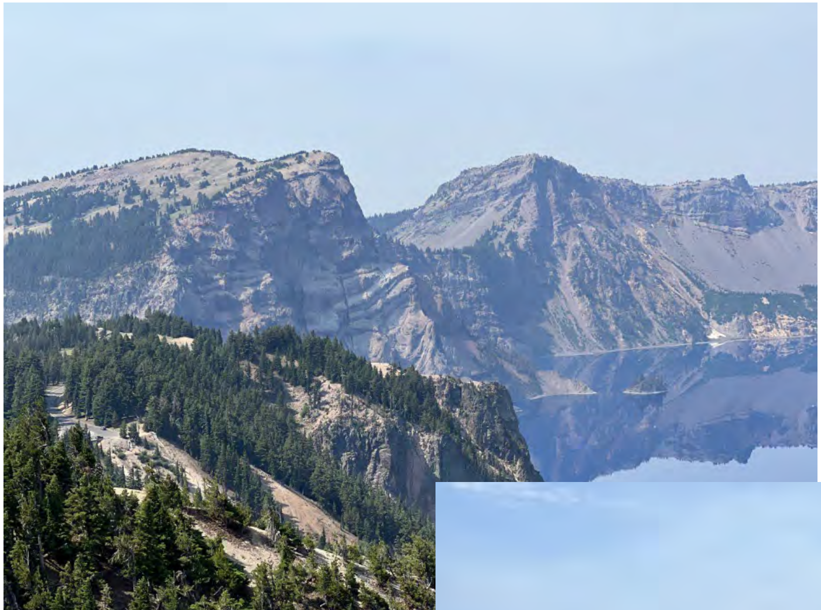
Lee has the GSOC participants come down in small groups to observe the composition of the Wineglass Tuff.

Note the inclusions of pumice in the material.

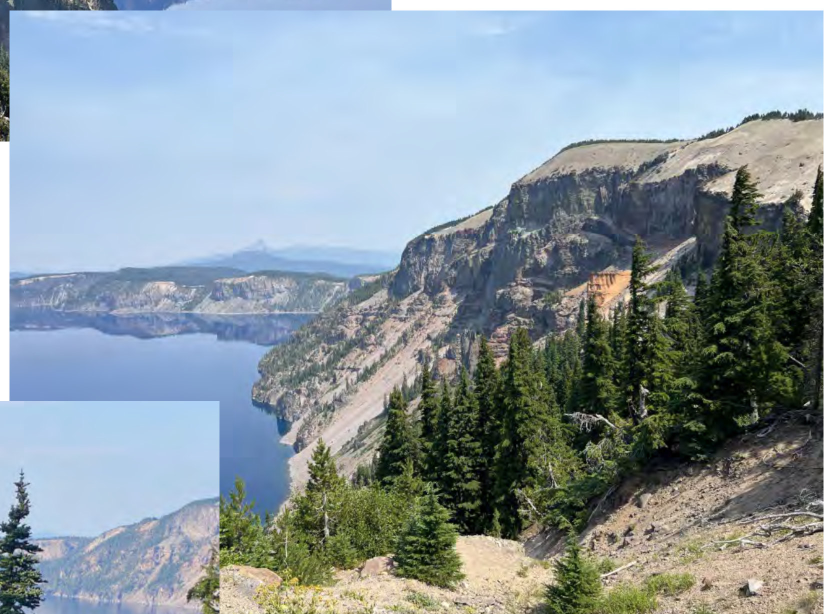
The base of the Palisades Cliff is an old glacial till deposit from a previous glacial maximum.

A boulder at Skell Head Overlook is loaded with phenocrysts.

This escarpment clearly shows all the phases of the climactic eruption. The central vent erupted first, so the buff layer at the bottom came from this vent. The welded orange tuff above that is the Wineglass Welded Tuff from the pyroclastic flows at the conclusion of this eruption. Then the clast laden, brownish layer above the tuff is the ring vents "clearing their throats." Finally, the fine whitish ash layer at the top is the remainder of the magma being ejected in the main ring vent eruptions.



Dutton Cliff and Applegate Peak frame the Sun Notch along the south rim of the crater as seen from Stop 13 Cloud Cap Overlook. The light and dark banding at the lower part of Dutton cliff are from the phantom cone eruptions and are some of the oldest rocks in the crater walls.



The 71,000-year-old Pumice Castle and overlying 27,000-year-old Redcloud rhyodacite flow form the Redcloud Cliff. Mt. Thielsen is in the background.

Phantom Ship, the heart of the Phantom Cone eruptions.

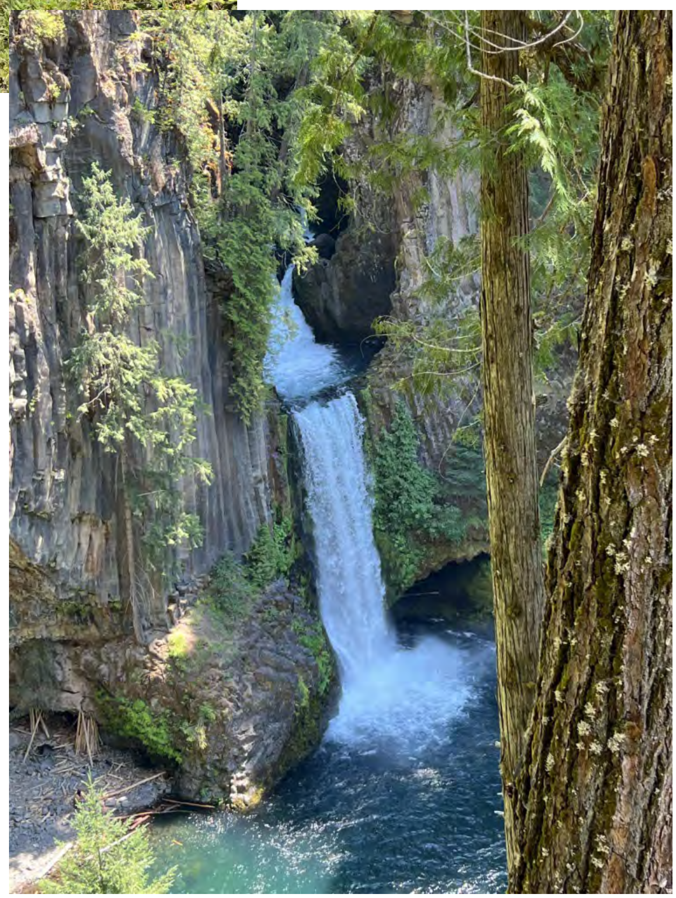
At the Rogue River Gorge, we visit the Natural Bridge formation where the Rogue River travels through a lava tube in a one-million-year-old flow. Here the water flows into the tube…

…and comes out further downstream.

On the way back to Diamond Lake from the Rogue River Gorge, we see a fine roadcut of Mazama Ash.

Here are some photos peripheral to the trip:

On the highway 138 route from Roseburg to Diamond Lake, we stopped at Falls Creek to observe the fire damage and huge boulders of basalt or andesite that were strewn in the creek vale.



Tokatee Falls cuts through 25,000-year-old basalt from Mt. Bailey. Refer to Marli Miller's discussion of Oregon Hwy 138 geology between Roseburg and US 97, starting on page 164 of Roadside Geology of Oregon, second edition.

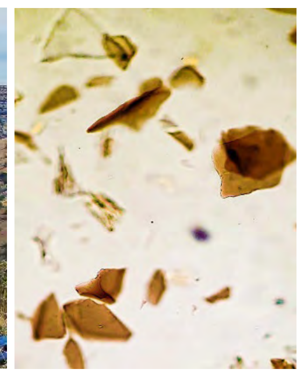
The view from the pizza parlor dining area at the end of the trip.

BEVERLY VOGT SCHOLAR UPDATE FALL 2022

If you attended the recent GSOC banquet, you may have had the chance to meet and talk with a couple of our 2022 Beverly Vogt Grant Scholars. You will also get a chance to hear them speak about their thesis work in upcoming Friday Night lectures at PSU or via our Zoom meetup. Below is a brief summary with photos of their summer fieldwork and what's coming up for them. The GSOC Board and Vogt Scholarship Committee members are gratified that GSOC was able to provide these students with some financial support and to see them progressing toward their goals. We hope you are too, for this support would not have been possible without the generous donations to the Beverly Vogt PSU Graduate Student Fund by our members. THANK YOU!

We are looking ahead to 2023 and opening up Beverly Vogt grant applications in the spring to new and returning PSU graduate students. With your continued support, we will be able to provide further financial assistance to PSU graduate Geoscience students. As you look at where to place your end-of-year charitable donations, please consider a contribution to this fund. Donation is easy — simply click the 'Donations' button on the home page at https://www.gsoc.org/. If you have any questions about donating, please contact the GSOC treasurer at: treasurer@gsoc.org.

Julian Cohen

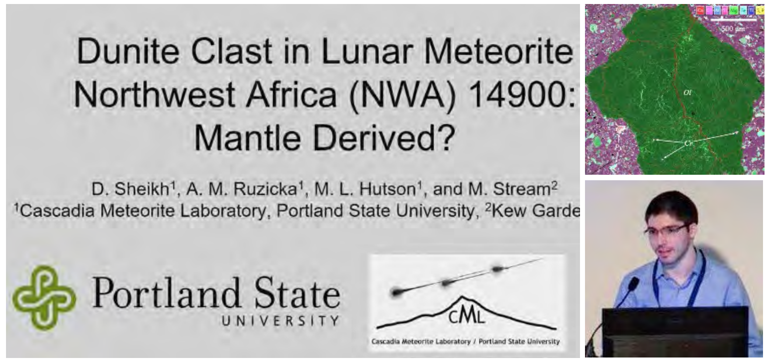


"I completed my field work over 11 days at the end of August and collected around 30 glass samples from various places all over central and eastern Oregon. Since then, I've been working to prepare them for mass spectrometry analysis by crushing, sieving, and cleaning the glass shards. Photo (left) is of some relatively "clean" glass, meaning there aren't a lot of surface precipitates on it that might impact the analysis. I'll have to run many samples through a series of acid washes to clean the shards to insure there isn't contamination! I'll be at the University of Texas Austin in December to do my analyses."

Darlene Gilroy

"I am currently in the picking stage of lab work. In this stage, I am using a microscope to look at crushed scoria and "pick" out specific grains of olivine. (Photo right: view under a microscope showing olivine which are the "amber colored" grains among the darker scoria.) The scoria is from the Boring Volcanic Mt. Tabor. After finishing the Mount Tabor samples I will move on to my other sample sites, also Boring Volcanic: Prune Hill, Mount Scott, and Battle Ground Lake. The olivine grains will be mounted in epoxy and sent off for electron microprobe and Fourier-transform infrared spectroscopy to establish the rate of ascent and storage depth of magma for the Boring volcanics. I recently sent samples from all four locations to WSU for bulk geochemical analysis."

Daniel Sheikh



"I recently had the opportunity to present some of my research at the 85th Annual Meeting of the Meteoritical Society, held in Glasgow in August. In this talk, I presented on a unique dunite clast (photo upper right) found within one of my lunar meteorite samples for research, and implications on how it likely formed. This is a component of the larger research focus that I am involved in, which is to constrain the range of lunar lithologies found in lithic clasts from lunar meteorites and to characterize the degree of shock deformation imposed on each of them."

Rachel Sweeten

"This year we were able to successfully locate another ~30 dikes as well as a potential layered mafic intrusion exposure (middle photo) with an inferred 600 cubic km volume. Lab work will continue this fall and winter in the form of clinopyroxene thermobarometry (to determine storage depth) as well as the full suite of XRF [X-ray fluorescence] and ICPMS [Inductively Coupled Plasma Mass Spectrometry] analysis of all new samples." Photo on right is of field assistant Heather Ziff next to a large boulder of the upper portion of the layered intrusion that fell to the bottom of the slope as a result of a rockfall.

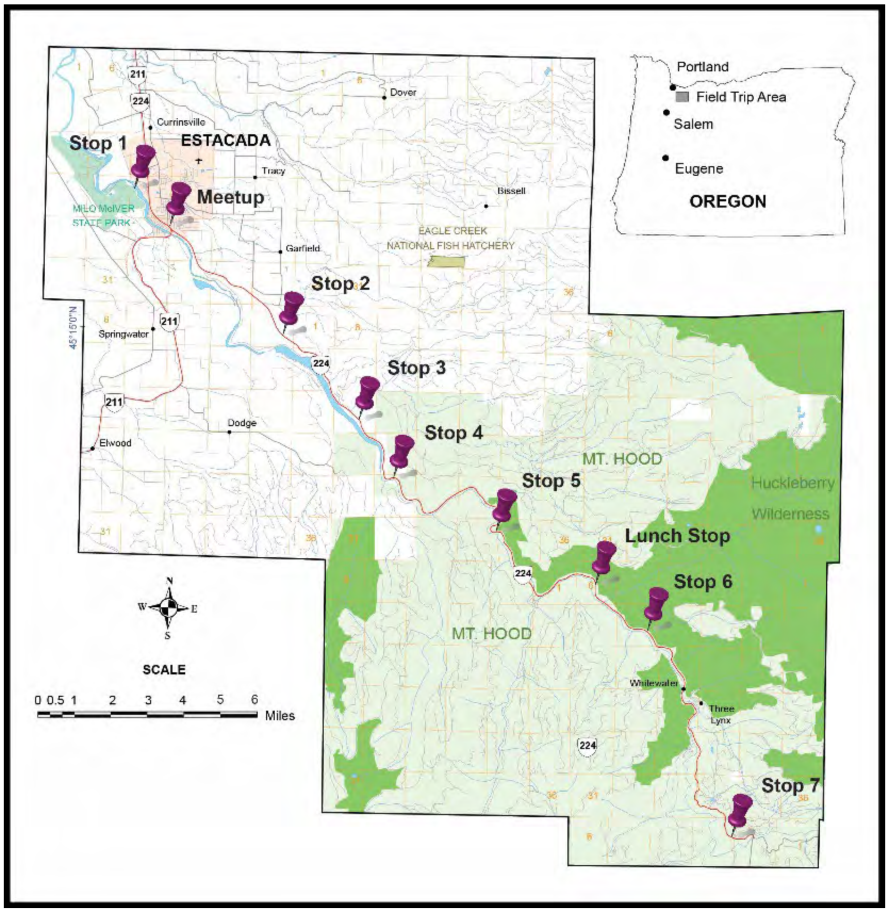
CLACKAMAS RIVER FIELD TRIP RECAP

Circle marks the spot on a geologic map of the Estacada area where 24 GSOCers assembled in Estacada to begin the Clackamas River field trip. Finally, after a two year wait, a 19-mile stretch of Highway 224 east of Estacada was finally reopened. If you recall, the Riverside Fire in September of 2020 ravaged Clackamas River canyon corridor and countryside leaving the road unsafe and closed. Fast forward to the day of the field trip. I felt sad, probably like many others, seeing all the burned trees and the wildfire damage left behind. The fire also impacted the geology along the closed part of the highway. No, not in a gloomy way. Because there was little or no tree canopy left, we could see every bit of the canyon cliffs, and we were not disappointed.

By Clark Niewendorp

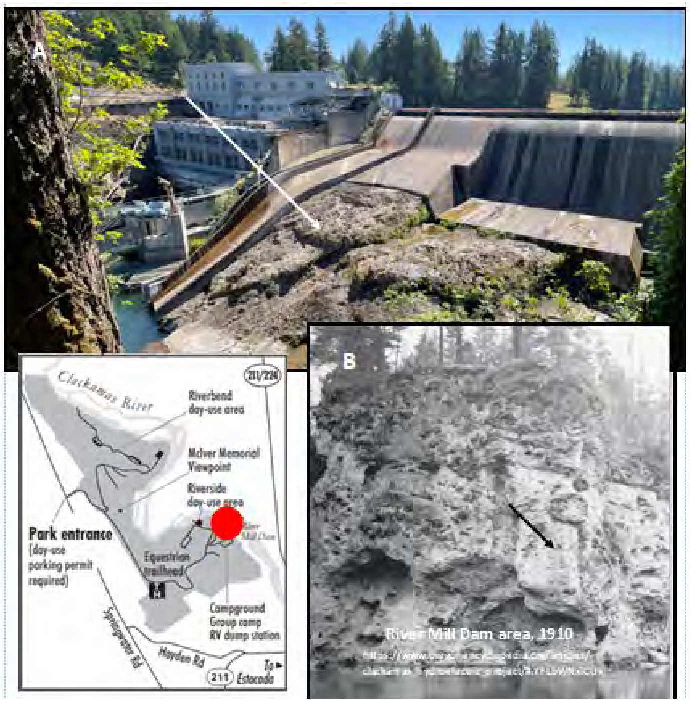
Recap of the GSOC Clackamas River Field Trip – August 20, 2022

Field Trip leaders: Clark Niewendorp, Dr. Matt Brunengo, and Paul Edson-Lahm

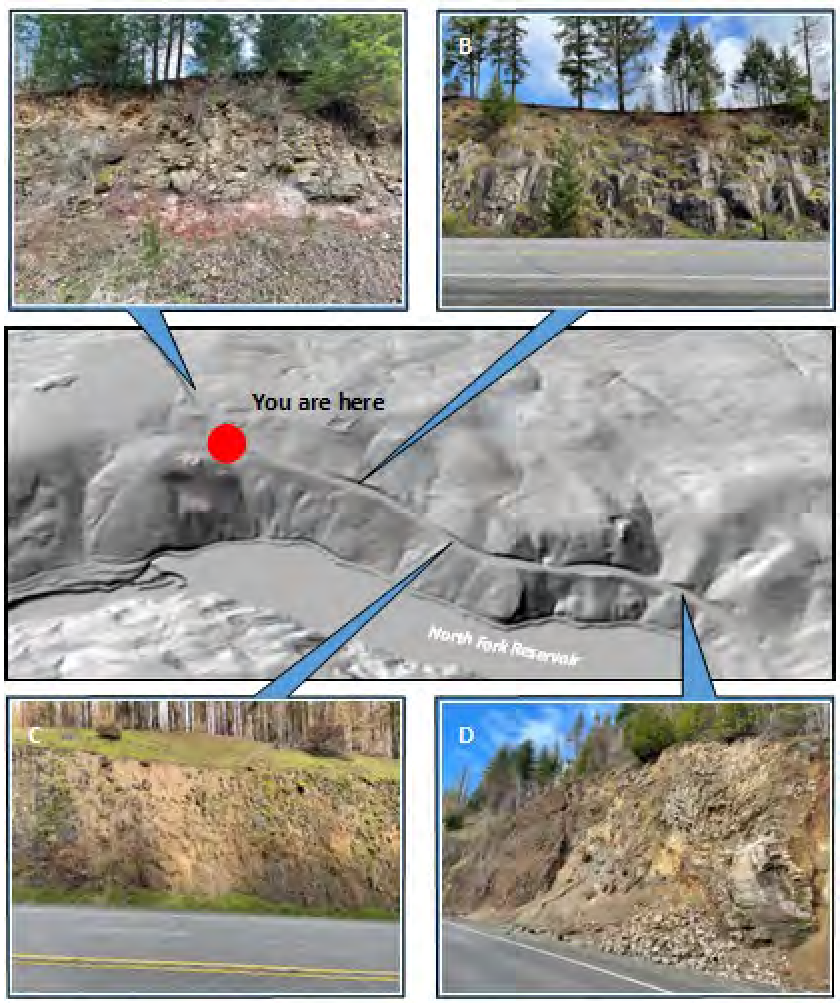


Map of the field trip stops.

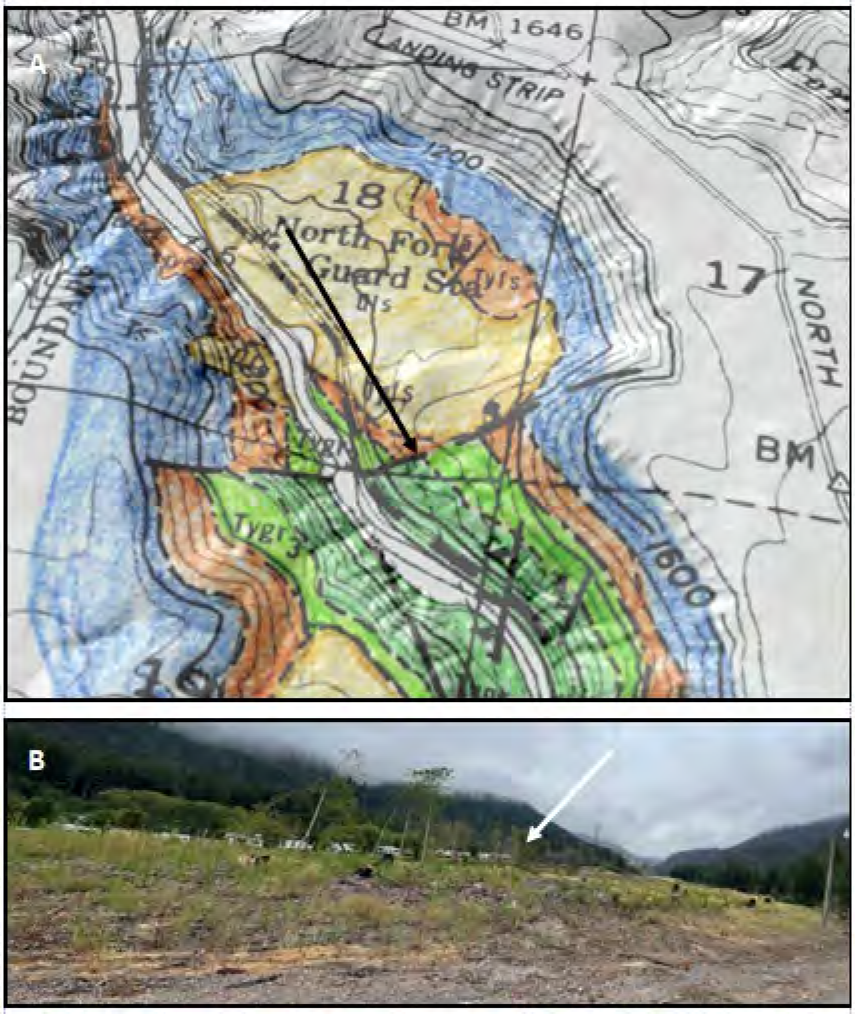
The overlook at the River Mill Dam, a hydroelectric dam and powerhouse just north of Estacada on the Clackamas River, was our first stop. This dam is one of four dams on the Clackamas River and built in 1911. Photograph A shows the bedrock (white arrow) on which this concrete-slab-and-buttress dam sets. The rock is a lithic, volcanic breccia of the Sardine Formation (or is it the Rhododendron Formation?). For a closer (and historical) look, photograph B shows an outcrop of the breccia near the dam. You can see clasts (up to 4 ft; black arrow) in a matrix of indurated fine-grained ash and clay. These clasts are matrix supported and predominantly andesitic.



From the dam, the group carpooled to the next stop on Highway 224 south of the Estacada at the North Fork viewpoint. It was a road pull-off at the top of the grade between Milepost 27 and 28 (before the road descends into the Clackamas River valley). Here the leaders pointed out some of the middle Miocene Rhododendron Formation's stratigraphy we would see on our way to Stop 3. The top right photograph (A) displays a "biscuit" columnar jointed andesite overlying a reddish laterite zone (saprolite). Photograph B shows a columnar lava section of the same andesite. Photograph C shows off a volcanic mudflow breccia. Photograph D is a panoramic view of light-colored pyroclastic deposits. The perspective hillshade map is keyed to the roadcuts where the photographs were taken.

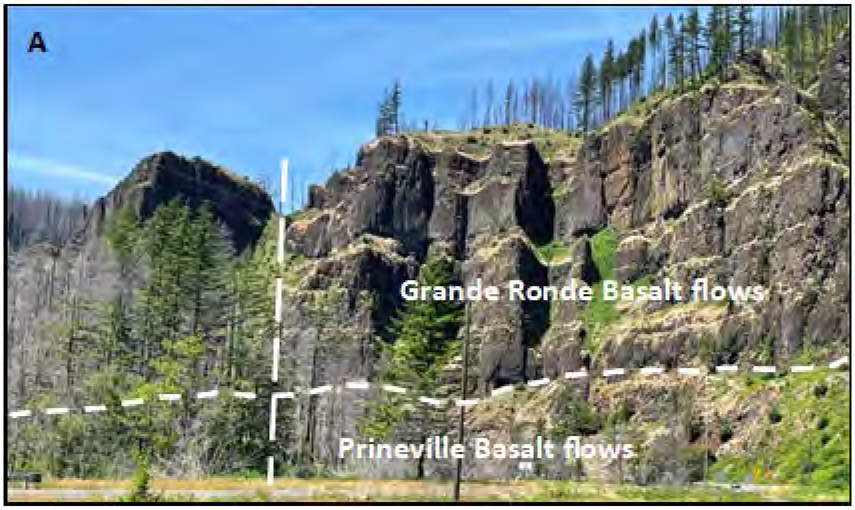


Stop 3 served as a spot to introduce the geology of the Clackamas River canyon and an observation point to view the northeast trending Promontory Park fault. Photograph A is a geologic map of the fault (arrow) showing a normal offset of the Columbia River Basalt Group (CRBG) more than 492 ft down to the northwest. Fault = thick black line (black arrow pointing to the fault), dashed where approximate; ball and bar on downthrown block; the geologic map is draped over a hillshade lidar base (3-foot bare earth lidar digital elevation model, scale 1:24,000). Photograph B is a view looking southeast from the Clackamas River RV Park at the steep hills on the horizon, which is the topographic expression of the fault (white arrow).

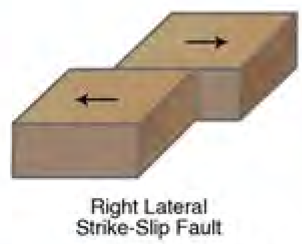


There are at least five individual lava flows exposed at Big Cliff (Stop 4). Photograph A shows the well-developed colonnade and entablature of the Grande Ronde flows (four of them) in contrast to the underlying Prineville flow which consists entirely of broad columns at road level. The short dashed white line is the approximate contact and the white longer dashed line through the ravine traces a northwest-trending, right-lateral strike-slip Big Cliff fault. Photograph B displays the fault's gouge zone (white arrow). There is no visible offset of individual flow contacts.

GSOC'ers at Stop 5.

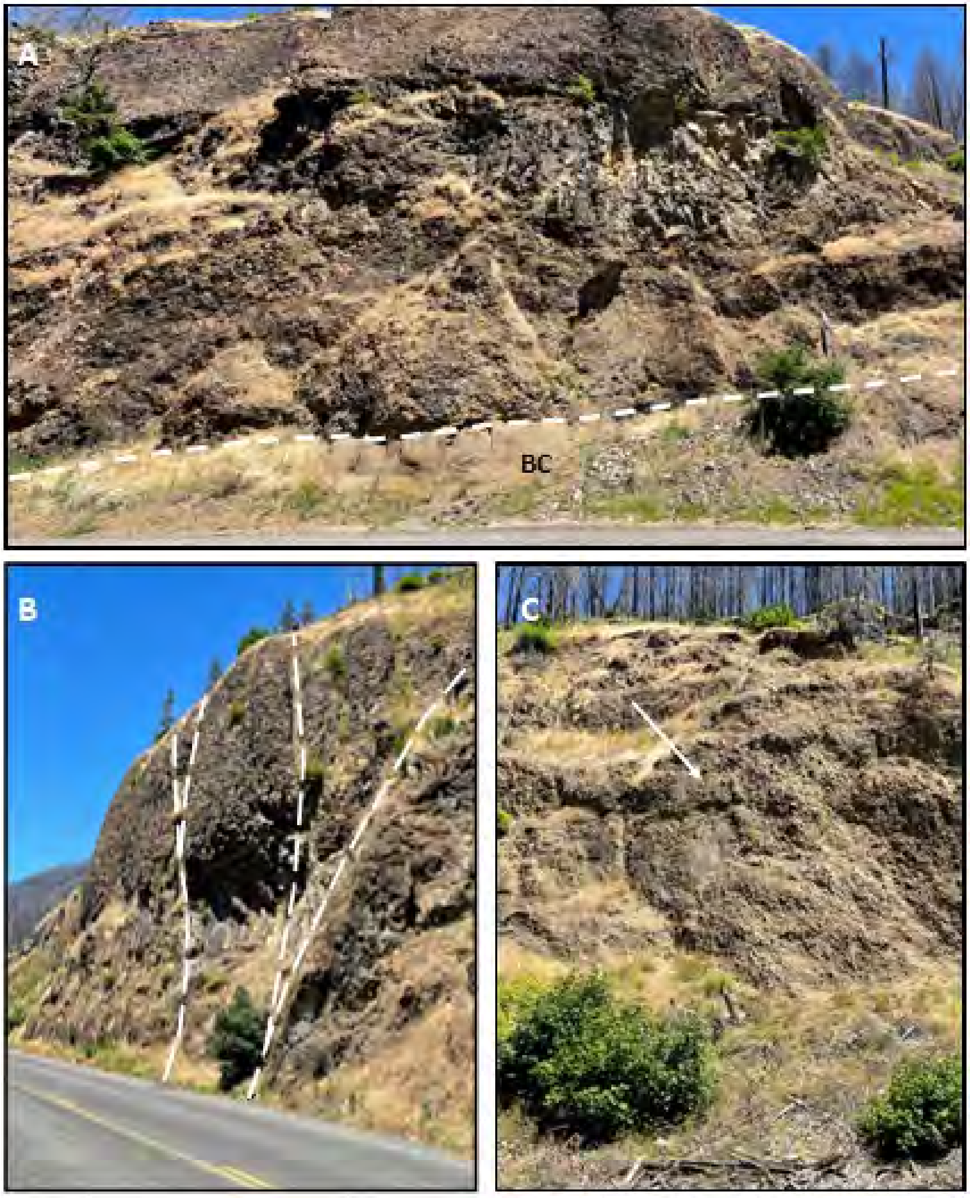


At the Big Eddy in the Clackamas River (Stop 5), between Milepost 37 and 39), there is a rock exposure along the road of a hackly-jointed, upper Grande Ronde Basalt flow (GRBf) overlain by two, upper Prineville flows (Pf 1 and Pf 2). The white short, dashed line is the approximate contact. The northwest-trending Lockaby (normal) fault is exposed in the ravine along the right side of the photograph. It is outlined by the long dashed white line. The displacement on this fault has juxtaposed the upper Prineville flows on the downthrown southwest side of the fault (left of the ravine) against the top of the uppermost Grande Ronde flow. The offset is as much as 345 ft. Parallel arrows show direction of slip or offset.



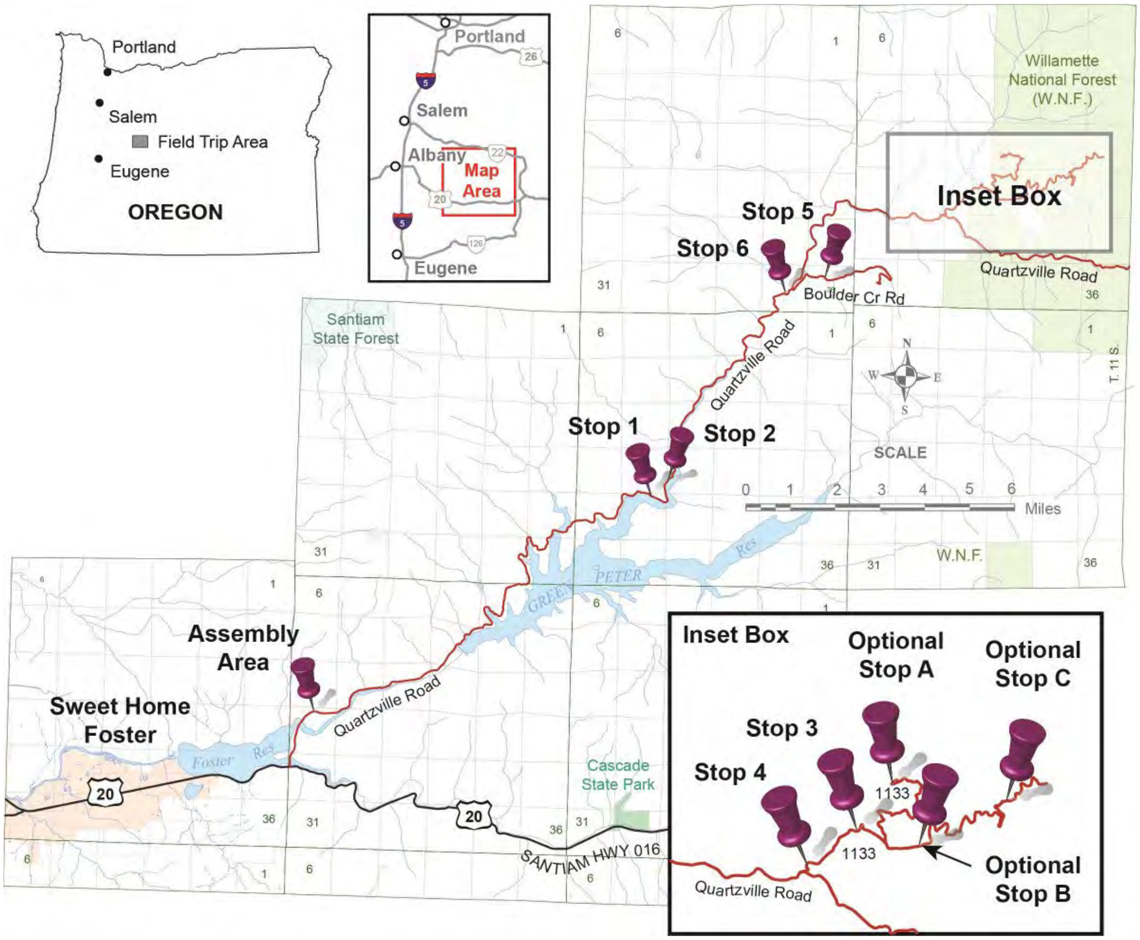
The main sense of slip across a strike-slip fault is horizontal. To recognize a right-lateral strike-slip fault, the block on the opposite side of the fault from an observer has moved to the right.

The base of the CRBG is exposed at Stop 6 along with the Dinner Creek fault zone. From south to north, photograph A displays the base of the Grande Ronde Basalt (white dashed line) and the underlying volcanogenic beds of Bull Creek (BC) which are part of the Oligocene and lower Miocene Little Butte Volcanics. Photograph B shows the north-south trending Dinner Creek fault (faults = white dashed lines) cutting the exposure. Photograph C is showing a broad swath of tectonic breccia exposed at the north end of the exposure (white arrow).



The last stop of the field trip visited the landslide terrain near the Ripplebrook Range Station between Milepost 48 and 49. So far, the trip route followed the narrow gorge of the Clackamas River, but from here, the gorge has widened because the CRBG has pinched out not far past Stop 6, and we have passed into the volcanogenic beds of Bull Creek. The road became rough, and the landscape dotted with hummocky hills. These features are a consequence of landslides and slope failure of the underlying rocks. Photograph A shows a roadcut exposure a landslide lobe (near Milepost 48) cut off by OR 224. A pond/bog at the intersection of Timber Ln. and OR 224 and hummocky hills behind it is shown in photograph B.

FIELD TRIP TO THE HISTORIC QUARTZVILLE MINING DISTRICT



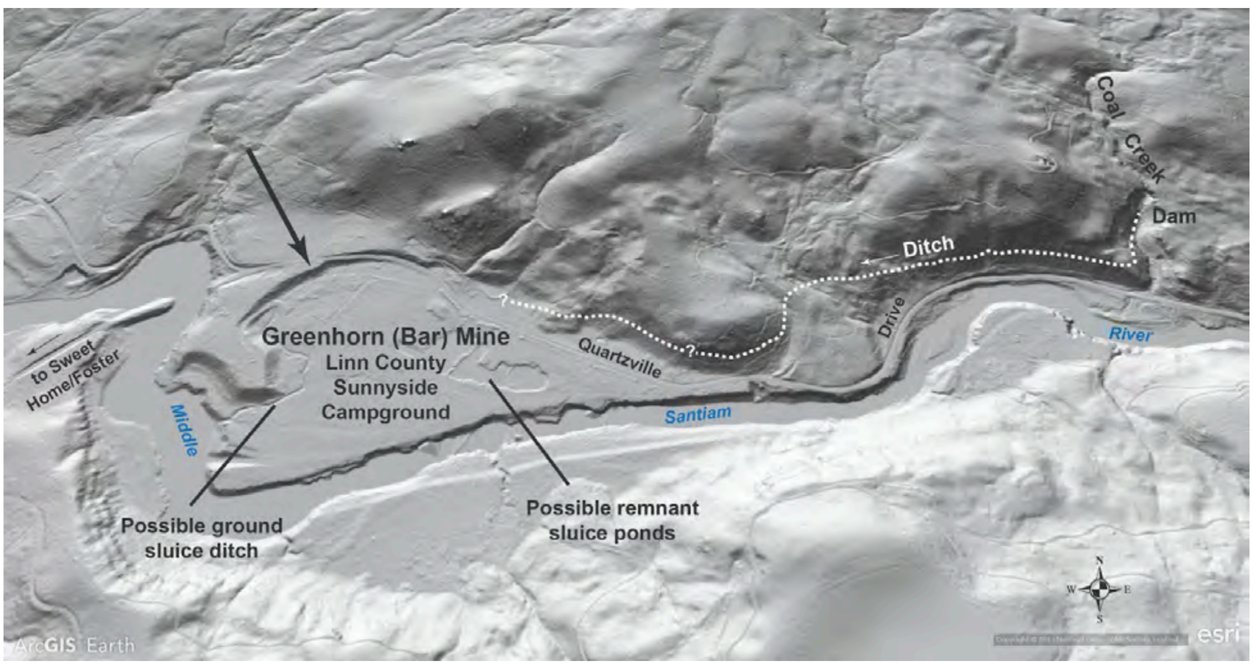
Map of the Quartzville area showing the stops along Quartzville Road to the mining district. Unfortunately, we were not able to visit the stop on Boulder Creek Road (Gate was closed).

By Clark Niewendorp

Recap of the GSOC Quartzville Mining District Trip

Clark Niewendorp and President of the GSOC led a group to the Quartzville mining district on September 17. The district produced gold in the late-1860's, 1880's to 1900's, and now recreationally. The district is one of five in the Cascade Range of Western Oregon, extending from Clackamas County on the north to the Lane County on the south. It lies about 35 air miles east-northeast from Sweet Home/Foster in Linn County, Oregon.

The group met at Linn County's Sunnyside Campground and Park that was once the site of the Greenhorn (Bar) mine, a hydraulic placer mine, ca. late-1870's. Here water was shot through a 2.5-inch nozzle (referred to as a "giant" or "monitor") at high pressure to dislodge gold-bearing gravels. The lidar image below shows some of the hydraulic mining features at the park such as a hydraulic water ditch (dotted white line) which tapped into Coal Creek and a westerly facing hillside (arrow) where gravels were washed down to the sluice boxes.



Then we carpooled to our first stop eastward along Quartzville Drive — a massive cliff cut that exposes rocks of the Oligocene to early Miocene (40-18 Ma) Little Butte Volcanics in the Early Western Cascades. In the photograph below, the arrow points to an irregular contact between volcanic lava above and volcaniclastic rocks below.

Next at Stop 2, we viewed an alteration zone. The rocks here have been hydrothermally altered and display argillic alteration (white-orange-yellow colored zone) that has completely replaced the original rock. This alteration was caused by ascending fluids through a fault zone or alongside a dike.

Stop 3 lies in the middle of the Quartzville mining district at the Lucille Prospect (Snowstrom & Bell, formerly Edson and Carbonate Group). This stop is a good example of the mineralization and alteration processes within the district. Photograph A shows part of a broad zone of rhyodacite breccia cemented by massive or vuggy quartz veinlets which contains an occasional "pocket" with gold. Photograph B shows an adit (the Bell tunnel) following a quartz vein about 15 ft above the road just to the right of photograph A.

A small pit exposes part of a volcanic cinder cone at Stop 4. Yes, a cinder pit this far west! We saw plenty of scoria and cinders here, along with a few lava bombs and fragments of granitic rocks. The dip of the layers of cinders in the pit wall indicates that the cone itself should be upslope and to the south of this location. The eruption of the cinder cone may be as young as 10,000 years B.P. and associated with a Quaternary intracanyon flow of olivine basalt, on which we were parked, that fills the valley of Canal Creek to the north and extends east into Dry Gulch.

The last stop of trip (Stop 5) was a quarry at the confluence of Yellowstone and Quartzville creeks. I pointed the group to the eastern side of the quarry. There is a zone of argillically-altered breccia that contains “clots” of tourmaline (black spots in the photograph) and cubes of pyrite. It didn’t take long for the group to get busy collecting samples of tourmaline trying to find radiating sunbursts up 1 inch.