

THE PLEISTOCENE POST

Newsletter of the Ice Age Floods Institute



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WHERE IS THIS FLOODS' SITE AND WHY IS IT IMPORTANT?

Each newsletter has a mystery photograph of an important Ice Age Floods site. See if you can determine where it is and why it is an important part of the Floods story. We hope you have some fun with this.

Here are 2 photos of the same feature for this issue (courtesy of George Last and Bruce Bjornstad). See if you can find other photos of this feature in this newsletter. It is one of the most prominent features along the paths of the Floods. The answer can be found on page 7.



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PRESIDENT'S MESSAGE

Greetings Students of the Floods!

Here is your Summer 2016 issue of the Pleistocene Post. We hope you enjoy reading it.

September 24, 2016 Institute Field Trip in western Montana - This year's fall IAFI field trip is sponsored by the Glacial Lake Missoula Chapter. The two buses for the field trip are now full so no more registrations are being taken. September 23rd will be the fall Board of Directors meeting at the Missoula Holiday Inn Downtown from 8:30am-4:00pm. An evening membership meeting and pre-field trip lecture will be at the Holiday Inn at 7 pm.

Passing of Roy Breckenridge – It is with sadness that we report the passing of Board member Roy Breckenridge. Roy was the retired Idaho State Geologist and spent much of his career studying the Floods and supporting the Trail. In this newsletter, several of his colleagues share some of their remembrances of Roy.

What is new with the IAFI Store? – Some exciting things are happening with the IAFI Store. See the article by Store Manager Patty Hurd for more details.

New Website - I am pleased to announce that we have pretty much a new website. Lloyd DeKay, President of the Columbia Gorge Chapter and an accomplished webmaster, has helped us develop a much improved website. See the article by Lloyd in this newsletter that describes some of the new features.

A Message from the National Park Service - Dan Foster, the Ice Age Floods National Geologic Trail Superintendent, discusses the recently completed long-range interpretative plan.

Institute Activities - Our eleven chapters offer a wide variety of member oriented activities. We hope you enjoy reading about some of their recent interesting activities. Consult the IAFI website periodically to find out about upcoming events offered by our chapters.

Thank you to IAFI Supporters – We thank all of you for continuing your memberships and for the donations you make to the Institute. We couldn't do any of this without you!

All Tasks Great and Small – All of the work that is done by our chapters is done by volunteers. We are always looking for new volunteers to help with both small tasks and large events. If you have some time and interest we would be pleased to have your help. Please see any of your chapter officers or board members to learn about local volunteer opportunities.

Meet Signe White - Signe is our volunteer newsletter editor. We thought you might enjoy learning more about her so check out the short article on page 16.

-- Gary Ford
IAFI President

*Another view of the
mystery feature*



Photo by Bruce Bjonstad

IN REMEMBRANCE

ROY BRECKENRIDGE



On August 1 the IAFI lost one of its pioneers when Roy Breckenridge died. Roy was the retired Idaho State Geologist and a long-time researcher/teacher of the Floods. He was also one of the early people who recognized the need for an Ice Age Floods National

Geologic Trail. Listed below are some comments from some of his IAFI colleagues.

ROY BRECKENRIDGE: A SKETCH OF HIS ACADEMIC CAREER

Roy M. Breckenridge studied and mapped the Quaternary geology of Idaho throughout his long career with the Idaho Geological Survey, where he retired in 2014 as Idaho State Geologist and Director. Roy received a B.S. in geology from Washington State University and his M.S. and PhD in geology from the University of Wyoming. Before joining the Idaho Bureau of Mines and Geology (now Idaho Geological Survey), he worked for the Wyoming Geological Survey from 1974-1977 gaining experience in surficial geologic mapping, remote sensing, thermal springs, and geologic hazards. Roy enjoyed all disciplines of geology working in many different settings during his career, but had a particular interest in glacial geology, publishing maps of northern Idaho and the Long Valley area near McCall. Roy was a contributor to the first National Park Service Ice Age Floods Study and has been involved with the Ice Age Floods Institute since it was formed in 1995. Passionate about education of local geology, he led numerous field trips throughout the Pacific Northwest for the Coeur du Deluge chapter of the Ice Age Floods Institute, Inland Northwest Land Trust, University of Idaho, and the Geological Society of America.

-- Dean Garwood

REMEMBRANCES BY SEVERAL OF HIS COLLEAGUES

Thoughts from Tony Lewis

Roy Breckenridge has been the cornerstone of the Coeur du Déluge Chapter of the Ice Age Floods Institute since its inception in 2005. For the eight years that I have been a member of the CDD Chapter, Roy was either the sole or co-leader of every one of our Ice Age Floods field trips in North Idaho. His knowledge of the regional geology and of the Ice Age Floods and their impact on the landscapes of North Idaho was without equal. In addition, this depth and breadth of knowledge was enhanced by the extensive time he spent doing field work and focused research in the area. He loved his work and was modest about the extent of his geologic knowledge. However, what really made Roy such a treasure to our chapter, and all those he interacted with was his ability to impart his knowledge without a trace of arrogance. Roy was a teacher without an ego. He would answer any question no matter how basic, or even foolish, with clarity and charity. The questioner was always treated with respect and made to feel that the question was important. I know this from personal experience. He was a critical thinker but not critical of others.

Roy was easy to get along with and comfortable to be around. We always had a good time together, just not as many as I would have liked. I thoroughly enjoyed and will sorely miss our conversations about geology and landscapes, academics, life and a plethora of other topics we seemed to wind up talking about.

Thoughts from Norm Smyers

My earliest memories of Roy Breckenridge take me back to the early days of the Ice Age Floods Institute; this would have been in mid-1993 to early 1994. Sometime after the formal creation of the Institute in 1994, Roy was promoted to Idaho State Geologist.

His position as State Geologist allowed him to produce and erect several of the Ice Age Floods interpretative signs found along many of northern Idaho's highway routes. The one that sticks foremost

in my mind is found along State Highway 200, also known as the Pend Oreille Scenic Highway, between the small communities of Hope and Clark Fork, Idaho. In reading the sign and studying the detailed graphics one's attention is quickly drawn south over the sign and toward Lake Pend Oreille. The reader quickly learns how glaciers helped excavate the basin now occupied by the lake and also how they blocked the Clark Fork River near Cabinet Gorge Dam to create Glacial Lake Missoula. Further reading reveals how repeated ice dam failures released numerous large-scale floods that raced across central Washington and down the Columbia River drainage to Astoria, Oregon. No better site along the north edge of Lake Pend Oreille provides such a view where the sign's text stands as testament to Roy's efforts in the telling of the Ice Age Floods story. In my opinion it is also a fitting location where a remembrance to Roy should be placed in recognition of the many efforts he took on to share geologic history with the general public.



As a fellow geologist, Roy provided me with additional geological insights regarding the Ice Age Floods story and, as well, the complex geology of eastern Washington, northern Idaho, and western Montana. It was because of his extensive geologic knowledge of these areas that I asked him to join me in being a field trip co-leader for the 2003 Annual Meeting of the Geological Society of America. That trip visited important "Floods sites" in eastern Washington, western Montana and northern Idaho. He charged me with creating the rough draft of the field trip guide book. I found Roy to be a most gentle critic and patient editor; to that end the quality of the finished product can be directly attributed to his editorial efforts.

As Roy neared retirement a few years ago, he was able to assume a position on the Institute's Board of Directors. For me, his presence on the Board

filled a gap with a representative who had an intimate knowledge of the regional geology and how that geology had been modified in part by late Pleistocene flood waters.

I believe that Roy, through his quiet and thoughtful nature, was one of those individuals that helped the Institute move forward to what it is today, an affiliation of diverse interests and expertise recognized by many governmental and scientific entities as a credible source of information and assistance in the telling of an accurate story of the Ice Age Floods and the topographic features that initially brought together a diverse collection of individuals that today comprise the membership of the Ice Age Floods Institute.

In closing, I would like to add that his presence in my life and his participation in the Institute's activities will be greatly missed by me and other members of the Institute as well.

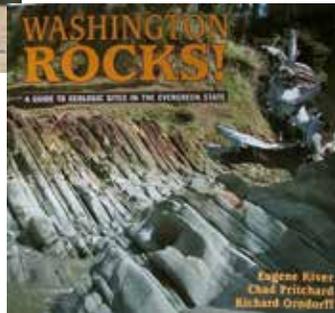
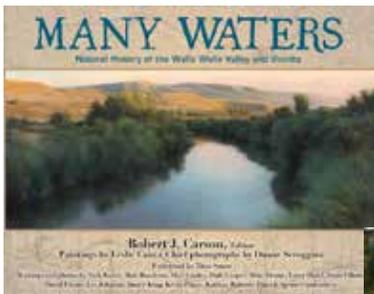
Thoughts from Gene Kiver

It is an honor to have known Roy through the decades. We met in graduate school in the 1960s, and found that we both loved the mountains and particularly the glaciers that are and have ground through these spectacular landscapes. We had a number of subsequent contacts both professionally and socially through the years. It was a thrill when he showed up as a board member at the IAFI meeting and we could once again work together. Roy's contributions to the understanding and awareness of the Ice Age Floods story have helped our cause through the years. His quiet but persistent manner will be sorely missed by his many friends and colleagues.



WHAT IS NEW AT THE IAFI STORE?

If you have not visited the store website recently, you may not be aware that we have added a few items to the inventory. Upon recommendation of the store advisory board, the store is pleased to be carrying two new books: “Many Waters: Natural History of the Walla Walla Valley and Vicinity,” a book of writings, photos, and paintings edited by Whitman College geologist Robert Carlson; and “Washington Rocks! A Guide to Geologic Sites in the Evergreen State” by Eugene Kiver, Chad Pritchard, and Richard Orndorff, a guide to “...57 amazing yet accessible geologic sites between the Washington coast and the Rocky Mountains.” More information about each book and how to order it is available in the “Books” section of the store website. Earlier last year we added Ellen Morris Bishop’s book “Living with Thunder”, in which she examines the geologic history of the Pacific Northwest, and supplements it with her own beautiful photography.



And in an exciting new arrangement, Stev Ominski has made seven of his prints in his Great Ice Age Floods series of paintings available through the bookstore. This is so new that the information is not yet on the website, but we are working to get all the information and thumbprints of the available prints up as soon as we can. In the meantime, I can let you know that we will have the following titles available, and as a bonus, Stev has personally signed each one: Number 5 and Number 6 “Palouse Falls Then and Now”, Number 8 “Beginning of the End”, Number 9.5 “Rowena Incident”, Number 10 “Inundation at Beacon Rock”, Number 11 “Ages End”, and Number

12 “Bellevue Erratic.” I personally think of Numbers 5 and 6 as a set, but they are sold separately. If you are interested in any of these prints, or if you are familiar with other prints in the series and think we should carry them, you can let me know in an email to pattyhurdretired@gmail.com.



I am planning to bring some of the store’s inventory to the meeting in September in Missoula, and I hope to see you there and will be happy to show you the Ice Age Floods materials we sell. You can pay for your purchases onsite with cash or a check (sorry, but I am still not smart enough to use the new technology to allow you to just swipe and pay). If you have any questions, just email me.

-- Patty Hurd
IAFI Store Manager



IAFI LAUNCHES NEW WEBSITE

BY LLOYD DEKAY

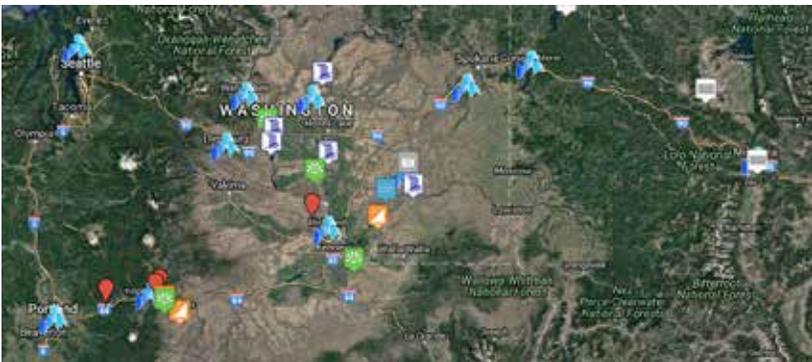
Have you seen the new IAFI.org website? We developed and launched a new website on May 22nd that is fashioned closely after and retains much of the look of the old website. But its new features and more timely posting of content take us into a new era of sharing information, news, and events with our audience about the Floods, the Ice Age Floods Institute, and the activities of our chapters. Some of the many advantages of the new website include:



- IAFI chapters will be able to post their information directly to the website rather than sending through the webmaster. This will allow chapters to share their news and information more timely, effectively, and efficiently.
- Each chapter will have a sub-site within the main website that will focus on their specific news and activities, while also sharing information with the rest of IAFI.
- Website articles will post directly to our new [Facebook page](#) and to other social media, greatly improving our communication with each other and our outreach to the public.
- There are several new website features: we can readily improve existing features, and we can add useful new ones to attract new interest and increase our exposure.
- Members will be able to contribute directly to the website through local chapter representatives.

One important new feature is the interactive [Floods Features Map](#) that will display the map location of floods features along with short descriptions and images. And there's a link for anyone to suggest new locations which can be readily added to the map.

We have a general calendar page that lists all IAFI events, a separate calendar showing only field trips and talks, and each individual chapter's page(s) will only list their own upcoming events.



There are other changes that will allow us to take online registrations for field trips and other programs, make it easier to run the online store, and make it easier to update reference resources.

And we have done all this and more at substantially lower cost, saving money that can be put to other important uses.

As with any major change like this there will likely be a few glitches along the way, so we ask you to help by reporting the details of any problems you find to Webmaster@IAFI.org. Meanwhile, you're invited to explore and enjoy the new IAFI.org website. While you're at it, if you are on Facebook, please visit and "Like" our new Facebook page so you'll be more likely to see our news when it's posted online.

A MESSAGE FROM THE NATIONAL PARK SERVICE

In June of this year, we reached another milestone with Ice Age Floods National Geologic Trail. With the assistance of so many partners, we all were able to finalize and publish the Long-range Interpretive Plan for the trail. The plan is on the Ice Age Floods National Geologic Trail website and can be found at: <https://www.nps.gov/iafl/learn/management/index.htm>. This plan is a blueprint for how we can work together over the next few years to build the best possible interpretive and educational programming for visitors along the trail's entire length.

As with any plan, it is only as effective as the people who implement it. I have confidence that all of us involved with the trail will work to make this a lasting success. The partners, volunteers, experts, novices, enthusiasts, and supporters of the trail are an extraordinary group of people who have and are joining forces to bring to light this unique landscape.

We all worked hard during the planning process to identify management goals for the Ice Age Floods National Geologic Trail Long-range Interpretive Plan. These goals have been identified as follows:

- Set the stage for future trail interpretation and clarify how partners will work together.

- Emphasize and highlight interpretation of the trail as a separate endeavor from other partner roles.
- Help partners identify the best stories along the trail and develop the best methodologies for communicating these stories to the public.
- Clarify for partners that the NPS will take the lead in guiding and supporting partners in trail interpretation by providing structure for collaborative, consistent efforts on interpretation.
- Establish the Long-range Interpretive Plan as the key document for trail partners in providing a roadmap for how partners can work together on trail interpretation.
- Help elucidate the trail's thematic content and the roles and responsibilities of trail partners in communicating this content.
- Clarify that while groups with different goals or at a distance from the trail may not be a good match as primary partners, they may provide accurate, IAFL-approved interpretation of the trail.

Please use this plan as a resource and inspiration as you work to interpret the amazing vestiges of the Ice Age Floods. Good things are happening.

-- Dan Foster, Superintendent
Ice Age Floods National Geologic Trail

ANSWER TO IAFI PUZZLER



Wallula Gap, a National Natural Landmark, is one of the most spectacular flood features found anywhere along the Floods' route (Bjornstad 2006). All floodwaters that crossed the Channeled Scablands were funneled through this narrow mile-wide gap (O'Conner and Baker 1992). The floods were so large that water backed up behind this constriction, filling the Pasco, Yakima, and

Touchet valleys to form temporary Lake Lewis with depths up to about 900 feet. The peak flow through this constriction was about 353 million cubic feet per second (O'Conner and Baker 1992); ten times the combined flow of all the rivers in the world. Other photos can be found on pages 2 and 20.

-- Gary Kleinknecht

CHAPTER NEWS

Cheney – Spokane Chapter

Behind the scenes: the planning of a field trip within the densely populated Spokane area - An annual spring field trip has been offered by the Cheney-Spokane Chapter of the Ice Age Floods Institute since 2003. Most of the 80+ participants are unaware of the massive planning by leaders that goes into this type of outing. The most recent field trip, “Glacial Outburst Flood and Other Features within the Spokane Region,” was conducted on a beautiful Saturday, May 7, 2016, and each participant was given a detailed guidebook written by Michael and Linda McCollum. As field trip leaders, they were joined by Michael Hamilton and Gene Kiver. This is their story.

In late summer of 2015, the trip leaders began planning the field trip looking at a wide range of geologic features within the confines of the Spokane River valley, from the Bowl and Pitcher within the Washington State Riverside Park, and continuing upriver to Spokane Falls to the Antoine Plante’s ferry and Mirabeau Point, eastward to the largest active gravel pit located on Sullivan Road, and finally to the south where the Floods crossed a low mountainous gap at Mica. This was a great opportunity to give a brief summation of the diverse geology and the economic importance of the extractive mineral industry, along with a discussion of what geomorphic features could be attributed to the glacial Lake Missoula outburst flood, and which features were post-flood.



Spokane Falls in downtown Spokane, WA

Mike Hamilton took the lead on the local history and the development of Spokane and the importance of the extractive minerals industry. Gene Kiver focused

on river incision and the importance of Spokane Falls as the major knickpoint along the Spokane River profile, and along with the McCollums, a discussion of the river terrace development. The McCollums provided evidence that a single glacial Lake Missoula outburst flood, approximately 16,000 years ago, had literally filled the Spokane Valley with sand up to the surface level of glacial Lake Columbia at just over 2400 feet. And now the fun began by putting together a viable field trip route.

The one fixed point in the field trip route was noon lunch at Arbor Crest Winery which is perched on top of a 400 foot cliffy remnant of the Columbia River Plateau basalt overlooking Antoine Plante’s ferry site on the Spokane River. Twelve stops were planned for Spokane’s west side in the morning and east and south side in the afternoon, with the beginning and ending in downtown Spokane. The leaders ran a pre-trip version of the field trip route in October 2015 with first stop at Spokane Falls, second stop a small park on Pettit Drive (known as Doomsday Hill to Bloomsday runners) on down to Downriver Drive and north to the Bowl and Pitcher, Riverside Park and then northeast onto Five Mile Prairie, then south to Francis and onto Bigelow Gulch Road and south to Arbor Crest Wine Cellars where lunch was scheduled. The afternoon trip was to historic sites including Plantes Ferry Park, viewpoints along the Spokane River at Mirabeau Point, and stops at an active gravel pit, an abandoned dimension stone quarry in the Dishman Hill and a 30 minute tour of the only remaining active brick manufacturing plant in the Pacific Northwest. The only thing left to do was prepare the guidebook.



Bowl and Pitcher

From the leader's perspective, the pre-trip on that sunny day in October went without a flaw. Now they only had to write up the guidebook over winter, submit it for printing in early April, so what could go wrong? You'd be surprised! The first problem was scheduling lunch. Arbor Crest is very popular year round, but especially in May. They are booked extensively for the Bloomsday's Race weekend, graduations, weddings, etc. so we finally received a slot that included a wine-tasting during the noon-hour on Saturday, May 7th. When the contract was signed, we were notified that with wine tasting, "no minors" were allowed. Chapter organizers scrambled to re-write registration confirmations to include this age limit requirement.



Trip Leaders Mike Hamilton, Mike McCollum and Gene Kiver discussing the geology of the Bowl and Pitcher area

The leaders ran another pre-trip on a Saturday in early April and discovered that Pettit Drive was closed for construction for the next seven months due to installment of major storm water pipes under the road. When they arrived at the Bowl and Pitcher site around mid-morning, it had reached capacity and was closed by the Park Service. Leaders were then informed that this was common for weekends during the spring and parking was on a first come, first served basis until full, so come early was the advice. This caused the leaders to quickly rewrite the morning trip segment including alternative stops and to change the order of some stops to accommodate an ever changing city infrastructure. Saturday, May 7th arrived and the field trip went-off without a hitch!

-- Michael McCollum
Board Member

Columbia River Gorge Chapter

The Columbia River Gorge Chapter continues to spark interest in the geology of the Gorge, including the story of the Ice Age Floods, with extremely popular and captivating talks, Gorge Geology Field Trips, and other initiatives to help educate about the Ice Age Floods.

In April and June our chapter sponsored, and was rewarded with, fantastic presentations by two great speakers, Ellen Morris Bishop and Ellensburg Chapter President, Nick Zentner, who held their large audiences spellbound with information presented in amazing, interesting, and understandable ways. Our area was also graced in March with a Floods talk by Lower Columbia Chapter President, Rick Thompson, through the Columbia Gorge Discovery Center.

Meanwhile, in addition to launching the new IAFI website, our chapter President, Lloyd DeKay, led two field trips in April and May that exposed and educated another 40 people about Columbia Gorge geology. These full day (7:30 AM to 5:30 PM) bus trips continue to receive rave reviews and word-of-mouth recommendations for the unusual features visited as we tell the geologic story of the past 40 million years in the Gorge, and the next field trip on Sept. 17th is already nearly full. Lloyd also gave a presentation for Oregon State Parks at Memaloose, and we have begun discussing with Oregon State Parks our proposals for Floods interpretive panels at key Gorge locations.

-- Lloyd DeKay
President

Ellensburg Chapter

We continue to enjoy going out in the field on Sunday afternoons throughout the year. Plus, we have regular evening lectures at Central Washington University.

Recent lectures include Mike McCollum's "Glacial Lake Columbia Sediments" and John Stone's "Cosmogenic Dating of Ice Age Boulders." Recent Sunday field trips include Nick Zentner's "Columnar Basalt" and Karl Lillquist's "Geology between Lake Chelan and Moses Coulee." See photos on next page.

-- Nick Zentner, President



April 2016 – Basalt Columns Field Trip, Drumheller Channels



June 2016 Moses Coulee to Lake Chelan Field trip – Columbia River near Chelan



June 2016 Moses Coulee to Lake Chelan Field trip – metamorphic bedrock near Chelan

Lake Lewis Chapter

On May 10th Palouse Falls Chapter president Lloyd Stoess presented a program on Geomorphology of the Channelled Scablands to the Lake Lewis chapter. Lloyd’s many years of hiking and traveling through the scablands around his hometown of Washtucna have provided him with an excellent “classroom” for teaching the geography and geology of the region.



photo by Lloyd Stoess of a hoodoo and Lloyd’s cousin

Summer is a slow time for the Lake Lewis Chapter’s meetings and programs, but field trips abound. We don’t hold a July meeting, but thanks to our partnership with The Reach Interpretive Center in Richland, WA, we have the opportunity to show eastern Washington’s Floods features up close. Bruce Bjornstad is leading 11 field trips this year and Gary Kleinknecht is leading 6. Kleinknecht’s most recent trip of July 23 was into the southern scablands of the Cheney-Palouse Tract. This area consists of a continuous mix of scablands, streamlined loess hills and deep coulees.



Big Cove Coulee by Bruce Bjornstad

On August 13 Bruce Bjornstad lead the chapter’s official annual field trip to The Hanford Reach National Monument. Bruce discussed and showed examples of basalt lava flows, the Yakima folds, the Ringold Formation, Ice Age Floods and sand dunes that have defined the region over the past 17 million years.



Hanford Reach photo by Gary Kleinknecht

-- Gary Kleinknecht
President

Lower Columbia Chapter

Columbia River Gorge Tourism -



Participants put ideas on the wall

All this spring our chapter was representing the Lower Columbia chapter area in a group of meetings to promote tourism and solve some of the problems with tourism in the Gorge. This started a meeting called the Columbia River Gorge Tourism Summit which was then followed by a series of meetings called the Columbia River Gorge Tourism Studio. This area is already Oregon’s number one tourist attraction. However this brings its own problems with traffic congestion, especially at destinations like Multnomah Falls, and others associated with having a lot of people going through an area but not staying there.

This was a unique collaboration with Oregon’s tourism industry, Department of Transportation and the same groups across the Columbia River in Washington. It was great to see the cooperation between the two states and all of those concerned with the Gorge, its tourism, and its livability. A series of plans were started and are being implemented even now that will address the unique problems faced by an area with a river dividing it in two. We created several committees to follow through with the ideas and plans that were developed.



Outdoor discussion of ideas

With the Ice Age Floods National Geologic Trail following the Columbia River Gorge it is bound to add to the congestion and need for lodging, restaurants and tourist facilities etc. With this unique group of people coming together to solve these problems we should see great results.

15-YEAR TOURISM VISION

The Columbia River Gorge region offers our target visitor a world-class experience. Our seamlessly integrated region-wide transportation systems allow visitors to come, travel, explore and connect, all without needing a car. Our trail systems have created a multi-modal web knitting together our communities, attractions and tourism operators. Our world class, intelligent visitor information system has reduced congestion, and spread the benefits to all corners of our region. We have struck the right balance between offering an unforgettable visitor experience and preserving our unique living ecosystem of people, culture and nature.

The Gorge is the ideal destination for the visitor who appreciates nature and culture, is sensitive to their surroundings and enjoys people-powered activities. Local residents live in a harmonic and symbiotic relationship with our environment, and with the people who travel from around the world to experience a slice of life in the Gorge. The 'Gorge Experience' is defined by authentic recreation and cultural experiences, and offers a stunning array of opportunities to dive into the local culinary and beverage scene. Locals and visitors alike can eat what's grown and produced here. Our historic trail system weaves together our layers of history, and whether people are travelling south to north, or west to east, they all gather in the Columbia Gorge for connection.

GORGE TOURISM STUDIO

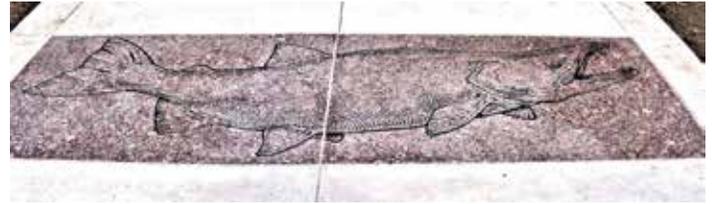
The Tualatin River Greenway Trail: a walk through geologic time -

In April, our chapter witnessed a most exciting thing that we have been working toward for at least six years. As part of the City of Tualatin's effort to become known as an Ice Age destination they opened up a segment of the Tualatin River Greenway Trail as an Ice Age discovery Trail called: "A walk through geologic time." The trail has an Ice Age timeline built into the pavement of the trail with bronze foot print impressions of Ice Age megafauna that was in this area as well as castings of the megafauna fossils and some erratic boulders brought into the area in icebergs during the Ice Age Floods. It was officially dedicated with a ribbon cutting on April 9th.



Tualatin River Greenway Trail portal

One favorite spot for young people is the life-sized etching in granite of a Sabertooth Salmon.



Sabertooth Salmon etching



Yvonne Addington Overlook with a river view

The ceremony started with a tree planting. Tualatin Mayor, Lou Ogden, and local students planted an indigenous tree near the portal to the trail.



Tree planting

Cast of mastodon mandible



Mastadon Footprints in Trail



Human and sloth footprints crossing the trail

Iceberg Erratics





Trail's descriptive signage

Lower Grand Coulee Chapter

At least twice each year, the LGCC does educational outreach at area events. The annual late March event is the Othello Sandhill Crane Festival held at the Othello High School. Another annual event is the Quincy Farmer Consumer Awareness Day held the second Saturday of each September.

On Saturday, September 10, the LGCC is partnering with the Quincy Farmer Consumer Awareness Day committee and the Columbia Basin Development League at the Quincy Farmer Consumer Awareness Day. Our portion of this event is to provide information to the participants throughout the day about the Ice Age Floods and IAFI at the Quincy High School. Utilizing the auditorium, we host speakers and show videos. Ken Lacy of the Erratics Chapter will lead two tours by bus; the morning tour to Moses Coulee is at 9 AM. The afternoon tour to the Potholes Coulee is at 1 PM. Prior to each tour, Ken will talk about glacial Lake Missoula and the Ice Age Floods that resulted with each failure of the ice dam blocking the Purcell Trench. Another of our speakers will be David McWalter, the Interpretive Specialist for the Dry Falls Visitor Center. David will share about some of the noted Ice Age Floods features, define geologic features for children and novices, and share two videos featuring Nick Zentner, Geology Professor at Central Washington University.



Bronze casting of Bison Antiquus skull



Interpretive kiosks

Since this event coincides with our Chapter meeting, LGCC members, friends and guests will meet at 11:30 AM in the auditorium for the business meeting immediately followed by a program by David McWalter. The LGCC outing will be the afternoon talk by Ken Lacy and his tour to the Potholes Coulee area. And, yes, there will be a larger bus used for this year's tour.



Part of the Ice Age timeline in the trail

A special feature at this September's Quincy Farmer Consumer Awareness Day (FCAD) will be the presence of the WSU Raptor Club. Members of the Raptor Club will be showing various raptors in the High School gym to FCAD attendees. These raptors are commonly seen along the Ice Age Floods National Geologic Trail. At 2 PM, the Raptor Club will do an hour-long presentation in the auditorium telling the story of each of the birds of prey that are in their care.

The Lower Grand Coulee Chapter looks to educate the public about the gigantic floods that carved the Grand Coulee and the area’s unique landscapes, including Steamboat Rock, Dry Falls, the Sun Lakes Chain and the alkaline-water Soap Lake; the original plunge pool. The City of Soap Lake is at the crossroads of Washington Highway 28 and Washington Highway 17, the Coulee Corridor National Scenic Byway. This is the place of the healing waters, also known as “Smokiam.”

The following photo was taken in the Potholes Coulee on the north side of the Great Blade, which is visible on the left in the nearer background. This is looking west from Judith Pool and falls during one of our LGCC outings to this area, and Ancient Lake is visible in the left center.



--John R. Moody
President

Palouse Falls Chapter

How Completing an Item on my Bucket List Developed into the Palouse Canyon Hike -

In February of 1987, I parked my car along the highway above Lyon’s Ferry and headed to the Lower Palouse Canyon to explore the canyon that extends between Palouse Falls and Lyons Ferry. You can’t drive to this isolated area. After a short jaunt, I came upon the magnificent canyon. I had grown up only 10 miles from here but had only seen it from both ends. I soon discovered that there was much more to see. I was captivated and had to make my way up the canyon to the falls. There were no roads or paths to follow, only faint game trails.



I found rock shelters once used by the local Palouse Indians as well as humans in the area over 10,000 years earlier. There were cougar tracks in the mud along the river and blocks of ice and debris piled up over 10 feet high along the shores from the recent winter runoff and the breaking of ice on the upper Palouse River. It was truly a wilderness.

I made it to the falls as evening was setting in. Fortunately, I met some nice folks who drove me back to my car. I had successfully checked off one of the items on my bucket list.



Over the next decade, I took family members and friends with me. We would leave one car at the falls for the trip back and drive to Lyons Ferry and hike the entire lower canyon to Palouse Falls – a distance of about 8 miles that feels like 12. We found routes that were easier than some that I had taken on the first hike. Most times there were less than 10 of us and sometimes we would have up to 25. There were a few years when we didn’t do the hike. One time I was driving my youngest son back from Whitworth College for spring break and he said, “Dad, let’s do the canyon hike again.” And so we did.



In 2002, I was introduced to the IAFI at their annual meeting which was held in the Tri-Cities. I had attended EWSC and graduated with a BA in Geography in 1974. Walking into the meeting was a Geology professor I had taken classes from whom I hadn't seen since graduation. Many of you know him as Gene Kiver. We rekindled our friendship and I joined the Cheney-Palouse chapter as it was called then. After that, Gene and my college advisor Dale Stradling and I spent a day exploring some of the attractions in my backyard including the Staircase Rapids, Washtucna Coulee, potholes, and the spillway across the Palouse-Snake River Divide. Later, Gene came along on one of our canyon hikes. The next year this was promoted by the chapter and now we had 40 to 50 hikers. The chapter continued to sponsor it and in the last 10 years we are more likely to have 50 to 70 participants. This year we had a record turnout of 85. In addition to the hike, Gene and I teach the geology and rich human history of the area along the way. This year also marked the first co-sponsoring of the hike by the Cheney-Spokane Chapter and the newly formed Palouse Falls Chapter.



It was much easier in the old days. We might decide less than a few days in advance for a hike. This way we could guarantee good weather. Now we need to plan months in advance, register hikers, and line up numerous shuttle drivers. This year for the first time we had to get and pay for an activity permit from Washington State Parks. We had to go through numerous hoops over two months and it wasn't until four days before the hike that they gave us final approval. Yes, life was much easier years ago. But, there is a lot of joy in sharing this gem with the public and that is why we continue to do it every year. Hopefully we can get through the bureaucracy this year and have another great hike to share with the public.

-- Lloyd Stoess
President

**Wenatchee Valley Erratics Chapter
Mastcam-Z Rover Launch Team Meets the
Channeled Scablands and the Wenatchee
Valley Erratics**

- As many of you know, the Mars exploration Rovers began their examination of Mars in 2004. The main goals for these first three Rovers had to do with looking for evidence of water, and later for looking at other conditions needed to sustain life. The next Mars Rover will be looking for actual signs of past life. This search will be looking for what are called "bio-signatures", which is any evidence found in the rock, that would show life existed on the surface. This next Mars Rover is scheduled to launch in 2020. The Mastcam-Z Rover Launch Team is developing the instruments that will do the searching. These instruments will be attached to a camera mast on this 2020 Rover.



The visiting Rover team that came to our area was composed of thirty individuals from around the world. In addition to those from the United States and Canada, there were individuals from the German

Aerospace Center, University of Copenhagen, and Joanneur Research in Austria. This group came to North Central Washington because this area, with its flood basalts and its history of extensive glacial flooding, provides a model for the Martian land surface which has similar basaltic and flooding features. Members of the Wenatchee Valley Erratics were pleased to show this group dramatic landforms they probably would not get to see, because the best viewing locations are not available to the public, as they are on private property.

At the BBQ held on the evening of June 25th at the Lacy home, the Rover team had an opportunity to learn more about the Ice Age Floods story, as well

as engage their fellow-team members in relaxed conversation. The Wenatchee Valley Erratics were pleased to help make this experience happen.

-- Ken Lacy



MEET SIGNE WHITE

IAFI NEWSLETTER EDITOR

How does a geologist who is an artist wannabe keep her soul fed? Take on jobs that require some artistic flair yet don't require any real artistic talent. Hence my willingness to be the IAFI newsletter editor. It's the perfect blend of my profession and my enjoyment of graphic arts. I also serve as a member of the Board of Directors for the Mid-Columbia Ballet - my other volunteer job that helps feed my soul. I also stay involved in sports by skiing and playing golf and tennis. And my husband and three very busy stepchildren keep me busy too! So I get to watch lots of soccer, basketball, track, and ballet, and listen to fabulous steel drum music in support of them.



I have been employed as a geologist at Pacific Northwest National Laboratory in Richland, WA for almost 27 years now. And as many of you may know, being a geologist means that every vacation can be easily derailed when interesting rocks are in the vicinity. Evidence of this is seen in the photo above, taken when my poor husband was subjected to a hike to see the Hutton Unconformity when we were visiting the Isle of Arran in Scotland this summer, during what was really a golf vacation!

Thanks to Gary Ford for doing the hard part of the newsletter job. He collects the content and I just get to make it pretty. A perfect team!

FLOODS TALK

BY CONSUELO LARRABEE

Please refer to Links under Resources on our web page at www.IAFI.org for more information and photos.

The geologic vocabulary used to explain the Ice Age Floods may be unfamiliar if you are new to the Floods story. Here are some simplified explanations of three commonly used terms. Included are some photos of these features. My thanks to Gene Kiver for helping with the definitions and providing the photographs. We hope these will increase your understanding if you are just learning about the Floods. Other definitions will follow in later newsletters.



RHYTHMITES

Rhythmites are flood-deposited layers that grade upward from coarse to fine, usually found in quiet backwaters of ancient glacial lakes like Lake Lewis near the Tri-Cities and Glacial Lake Columbia impounded by the Okanogan glacial lobe.

VARVE

A varve is a couplet of layers deposited annually, often in glacial lakes. The lower coarser, light-toned zone is deposited during the more energetic conditions of summer runoff. The dark-toned upper layer is deposited during the quieter winter conditions when fine suspended sediment settles out of the water column. Like tree rings, varves are evidence of seasonal activity.



STRANDLINES

Strandlines are wave-cut levels or notches in a lake basin where the lake water meets the land. The highly visible lines on Mt. Sentinel behind the University of Montana are like bathtub rings. Similar strandlines are present locally in the Glacial Lake Columbia basin.



A PHOTO TOUR OF THE FLOODS FEATURES OF NORTHERN IDAHO

BY TONY LEWIS
PRESIDENT, COEUR DU DÉLUGE CHAPTER

The Coeur du Déluge Chapter's contribution to the 2016 IAFI Newsletter is a set of 10 photos taken in North Idaho where the Purcell Lobe moved south from Canada through the Purcell Trench past the present location of Sandpoint, ID and split into four sub-lobes. One sub-lobe went east up the Clark Fork River Valley and formed the ice dam that resulted in Glacial Lake Missoula. Two sub-lobes traveled south: one advanced through an ancestral valley that deepened and steeped the present day Lake Pend Oreille and the other smoothed the landscape and cut a path for Hwy 95. The fourth sub-lobe went west and helped establish the beginnings of the Pend Oreille River. The advance and retreat of the Purcell Lobe corresponded with the formation of Glacial Lake Missoula and the resultant periodic release of the Ice Age Flood waters.

The included photos were taken during a recent field trip organized by Roy Breckenridge and Dean Garwood and the technical information was based on the field guide provided by Roy and Dean.



South end of Purcell Trench from Schweitzer Mt.

The confinement of the Purcell Lobe ended at the southern end of the Purcell Trench where it spread out and divided into four sub-lobes. This photo was taken from Schweitzer Mt. looking east towards the mouth of the Clark Fork River. The Hope Fault and the Cabinet Mts. are on the left side of the photo and the flat topped mountain, Antelope Mt., is barely visible in the center of the photo beneath the cumulus clouds.

Antelope Mt. was an important landmark and was captured in early paintings and sketches, such as the 1860 painting by James Madison Alden.



Southern end of Purcell Trench from Schweitzer Mt. with clouds

Also taken from Schweitzer Mt. but from a slightly different perspective, this photo was taken when low level clouds covered the valley, a not too uncommon condition in Sandpoint during the winter. The photo was intended to be a quasi simulation of the ice from the Purcell Lobe flowing south over Sandpoint and splitting into the sub-lobes. At the time of maximum ice advance the glacial ice filled the valley to a higher elevation and the Cabinet Mts. had a plethora of active alpine glaciers. Antelope Mt. is visible in the center of the photo as it pokes above the cloud layer.



Southern end of Purcell Trench from Schweitzer Mt. and Sandpoint.

This is a slightly telephoto picture taken from Schweitzer Mt. looking east toward the mouth of the Clark Fork River. Sandpoint, ID is off the photo to the right. This is the south end of the Purcell Valley and the flat area at the bottom right of the photo is composed of sand and gravel material from glacial, lacustrine and fluvial processes as the Purcell Lobe retreated. Antelope Mt. is visible in the center upper portion of the photo. As you can see there are a lot of great views from Schweitzer Mt. of where the Ice Age Floods began.



Antelope Mt. near the mouth of the Clark Fork River

The next photo is a close-up of Antelope Mt. from along Hwy. 200 west of the town of Clark Fork. The mouth of the Clark Fork River where it empties into Lake Pend Oreille is to the right. During the days when logging was the primary occupation, this slack water area, called the Clark Fork Drift Yard, was used to store and sort logs prior to milling.



Looking west toward the mouth of the Clark Fork River from bridge

Taken from the bridge over the Clark Fork River, this picture is looking west towards Lake Pend Oreille. The lower section in the skyline of Jakes Mountain to the left of the Clark Fork River is the Pole Creek Spillway.



Looking across Clark Fork River to notch of the Pole Creek Spillway.

Also taken from the bridge over the Clark Fork River, this is a telephoto of the Pole Creek Spillway. Pole Creek Spillway is one of at least five passageways on Jakes Mountain that, depending on the configuration of the ice dam and the structure of the ice, were periodically active paths for floodwater spillovers out of Glacial Lake Missoula.



Castle Rock located 3 miles upstream from Clark Fork, ID on River Road.

After crossing over the bridge to the south-side of the Clark Fork River, River Road heads southeast through some long wavelength Ice Age Flood current ripple marks. Three miles down the road is a dry cataract and an abrupt cliff of Precambrian Belt rocks that exhibits evidence of glacial polish and glacial striations. The steepness and height of this

outcrop attest the depth and power of this glacial sub-lobe that formed the ice dam and Glacial Lake Missoula.



Glacial Striations at Castle Rock.

A close-up of the glacial striations and the polishing effect of the ice sub-lobe as it moved eastward up the present day Clark River Valley. The grooves were scoured where hard rocks carried in and along the edges of the glacier gouged into the bedrock.



Gravel Pit southeast of Castle Rock along Dry Creek Road.

Another three or so miles upstream along River Road is a junction on the right with Dry Creek Road and up Dry Creek Road is the Dry Creek Gravel Pit. This gravel pit is located at the mouth of Dry Creek with the Clark Fork Valley and is about 400 feet above the present floor of the Clark Fork Valley. The materials that make up this Gilbert type delta are slightly rounded and some are striated. Most are clasts from Precambrian Belt metasediments derived from local bedrock, but there are also granitic and diorite material from outcrops in the Purcell Trench. These gravels were probably deposited as ice margin deposits in the latest glacial time.



Pro-glacier deposits of Gilbert type delta at Dry Creek gravel pit.

The bedding layers are forsets and are tens of feet high and dip up river to the east. Most drainages on the south side of the Clark Fork Valley almost to Thompson Falls contain this type of feature, a Gilbert type delta. These are kame like delta features that were formed in contact with the ice and were left as isolated features following the removal of the ice. They are preserved because the preceding floods of the late phases of Glacial Lake Missoula were more quiescent.

Another view of the mystery feature



Photo by Bruce Bjonstad

THANK YOU TO IAFI MEMBER SUPPORTERS

Every member at every membership level is vital to IAFI's continued success. Your support helps us meet our mission of providing the Ice Age Floods story to the public and continuing our work on the Ice Age Floods National Geologic Trail. Every gift—no matter the size—counts. Thank you for making the IAFI what it is today and for helping shape it for the future.

We would like to acknowledge the following people that joined or renewed their membership at the Benefactor or Sustainer levels. (July 2015 – July 2016). We also want to thank the people who made notable donations beyond their membership renewal during this same period.

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