

Spring 2013

THE PLEISTOCENE POST

Newsletter of the Ice Age Floods Institute



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PRESIDENT'S MESSAGE

It is spring! This is a good time to start planning your visits to Ice Age Floods areas, both new ones as well as your favorite areas. One of the most enjoyable parts of exploring the many Floods areas is seeing how they change in appearance from season to season.

Along with seasonal changes, we also have some changes on your Board of Directors. President Mark Buser resigned from the Board on January 1. The Board thanks Mark for his many years of service to the Institute, the last two as President. Mark came to the Board with a business background and worked to help us function in a more business-like manner. We are a better organization because of Mark's many contributions.

I am the new President and consider myself fortunate to work with a great group of volunteers who serve on your Board of Directors. We have some new officers: Gary Kleinknecht, former president, is retiring from teaching this spring and has agreed to serve as Vice-President. Certified Public Accountant Monte Nail is again our Treasurer. In another important appointment we have Sylvia Thompson as our Membership Manager (see article in the newsletter).

We hope you enjoy this newsletter. My thanks to Signe White for helping produce it. In addition to learning what our Chapters are doing, we have several feature articles. One of them provides some background information on our new Trail Superintendent, Dan Foster. Another interesting article discusses the Coyote Canyon Mammoth Site. There are many different ways to view Ice Age Floods areas. For example, one article discusses seeing them from a trike.

We hope you all have a great time this summer learning about the Floods and taking advantage of the many opportunities provided by our chapters. To find out about many of these, visit the Events section of the IAFI website.

--Gary Ford

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CHAPTER NEWS

Cheney – Spokane Chapter

In July and August, Cheney Parks and Recreation offered several opportunities to spend a day in the Channeled Scablands. The guided tours, led by Spokane field geologist, Michael Hamilton, were based on the 10 stops outlined in the “Eastern Washington Spillways of the Ice Age Floods” brochures produced by the Cheney-Spokane Chapter. The 30-seat van was filled on each tour. This tour will be offered numerous times in the summer of 2013.

Chapter board members and volunteers set up booths and provided information on the Ice Age Floods story at the Cheney Jubilee and Eastern Washington University’s Neighbor Days.

In September, the Chapter and the Department of Science at Spokane Community College co-sponsored a free public lecture by Dr. Gene Kiver, professor emeritus of geology, Eastern Washington University. He spoke on the “Missoula Floods in the Northern Reaches” at Spokane Community College, Lair Auditorium in the Student Union Building. The timing and pathways in the northern reaches of the Floods were described.

In late September, bikers and railroad enthusiasts participated in “Geology and Railroad History on Bikes” to Rock Lake, south of Cheney, Washington. This lake is the deepest and most rugged of the Ice Age Flood canyons in eastern Washington. By special permit, the now abandoned northern part of the Milwaukee rail bed was explored for the 11-mile roundtrip on relatively easy trail.

On March 7, 2013, an event co-sponsored by the Chapter and the EWU Geology Department, was held on the EWU campus. Chad Pritchard, EWU Geology Professor discussed fracture zones in the Columbia River basalts. Glacial outburst floods during the last Ice Age preferentially plucked out fractured material and exposed the fracture zones resulting in unique lake forms and river

channels. If the fractures extend to the underlying basement they may also act as hydraulic conduits for infiltration to aquifers, as well as mixing of aquifers between basalt flows.

On March 9, before the rattlesnakes began making appearances, hikers were led by Lloyd Stoess and Gene Kiver on a Palouse Canyon eight-mile field trip. The hike included geomorphology, geology, botany, zoology, Ice Age Floods, and early Indian history. The hike followed a combination of established trails, game trails, and bush whacking. There were also some steep ascents and descents but no special equipment or training was required. On a scale of 1 to 10, with 10 being the most difficult, this hike rated a 10. Shuttles were waiting at Dry Falls to return enthused hikers to Lyons Ferry Fish Hatchery, the starting point for the hike.

Activities scheduled for the remainder of spring include a pre-field trip lecture on May 3 to be led by Gene Kiver and titled “Anatomy of the Cheney-Palouse Scabland Tract:With Emphasis on the Rock Creek Floodway.” On May 4, an all-day field trip will be led by Gene Kiver and Bruce Bjornstad via deluxe bus.

A spring bike tour, “Geology and Railroad History on Bikes” will be held on May 5 along the Columbia Plateau Trail and will be led by Gene Kiver and Charlie Mutschler.

The second annual “Floods, Flowers, and Feathers Festival” will be held May 18 at Turnbull National Wildlife Refuge. The Chapter partners with Turnbull for this event and will provide field trips, lectures, and demonstrations of Ice Age Floods curriculum.

--Melanie Bell

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Coeur du Deluge Chapter

It took a while, but the Scenic Byways Kiosk that the Bonner County Museum and Historical Society installed in the Sandpoint Chamber of Commerce Visitor Center along Hwy 95/US 2 is at last complete. Although all of the panels are of interest, one of the panels focuses on the Ice Age Floods and should be of special interest to the IAFI. We were fortunate that Mark Pullen assisted with the development of the panel related to the Ice Age Floods.

Approximately 30 participants took part in our Fall 2012 field trip from Sandpoint to the Cabinet Gorge Dam on September 29. The field trip was a great success especially due to our field trip leader, Roy Breckenridge who continues to be our greatest resource and strong supporter, and the logistical support provided by Julie Bishop and Ann Ferguson.

Tony Lewis gave two presentations entitled "North Idaho: The Heart of the Ice Age Floods" at the Bonner County Library. Originally he was scheduled to give only one talk on February 7, but the 60-person room could not hold all of the people who showed up so the presentation was given twice that afternoon. The presentation was well received and the Friends of the Library asked for a third presentation in the evening to accommodate interested individuals who have to work during the day. SWAC, an athletic club in Sandpoint and an environmental group in Montana have also requested that the presentation be given in April. The talk was a success largely due to the visuals provided by Gene Kiver, Bruce Bjornstad, Gary Ford and the Cheney-Spokane Chapter of IAFI, and Roy Breckenridge.

Preparations are underway for the IAFI Fall Meeting in mid-September 2013 in Sandpoint. The IAFI Board meeting will be on September 13, 2013 followed by a public presentation that evening and a one-day field trip on Saturday, September 14th. Roy Breckenridge, Idaho's State Geologist, has agreed to lead the field trip that will focus on Ice Age Flood features in north Idaho.

Gene Kiver has graciously agreed to come to Sandpoint and give a public talk about the Ice Age Floods and related features in north Idaho. The date has not been set but is tentatively set for the first week in October.

--Tony Lewis

Ellensburg Chapter

Plenty of good stuff happening here in Ellensburg! We average 120 folks per evening lecture and 60 per Sunday field trip. Recent lectures include Terry Swanson's "Causes of Glaciations and Ice Ages", Pat McCutcheon's "Saddle Mountains Archeology", and Brian Atwater's "Cascadia Hazards Inferred from Mud, Sand, Tree Rings, and Brush Strokes." Our field trips lately have travelled to Drumheller Channels, Frenchman Coulee, and the White Bluffs. Details and photos are at our Ellensburg Chapter website (maintained by Tom Foster) <http://www.angelfire.com/hugefloods/Ellensburg.html>

In September, we hosted the Fall Board Meeting for the IAFI. In addition to a Friday board meeting and an evening lecture, Karl Lillquist led a field trip on Saturday to the Kittitas Valley & Vicinity. Karl's trip handouts are at our website (see address above).

Starting this spring, the Dry Falls Visitor Center will be showing a new 15-minute video that showcases the truly remarkable landforms in Sun Lakes-Dry Falls State Park. The video was created by KCWU-TV and Nick Zentner from Central Washington University.

--Nick Zentner

Glacial Lake Missoula Chapter

The highlight of the year was the discovery of four boxes of personal effects left by the relatives of Joseph T. Pardee at the Montana Natural History Center. The MNHC, with whom the Glacial Lake Missoula Chapter partners, turned them over to us. J.T. Pardee is considered to be the primary geologist to document the existence of Glacial Lake

Missoula and in doing so, played a pivotal role in making J Harlan Bretz's story of catastrophic floods acceptable to most geologists. For that reason, we were really pleased to find them.

The boxes contain pictures and documents typical of most families collections; e.g. wedding and baptism certificates, but also journals by Pardee's wife, some original sketches and poems by Pardee, and great family pictures. Through the work of former president of the chapter, Norm Smyers, we've obtained a grant from the Geological Society of America (GSA) to have an archival inventory. We intend to have, at the very least, an interesting presentation and an exhibit as a result. Anne Milbrooke, a professional archivist who has long had an interest in J.T. Pardee has been contracted to do this. The GSA will administer the contract.



J.T. Pardee, on left, on Rock Creek near Philipsburg, MT. in 1904 with his father-in-law Judge Charles Schoonover.

We had our annual Spring Fling in March where we bring in speakers on the subject of Glacial Lake Missoula and provide refreshments donated by the community. Our speakers in 2012 included U of M physics researcher, Jen Fowler, who used low elevation balloons to make a digital map of the giant ripple marks at Camas Praire. In addition, Norm Smyers provided an overview of the Ice Age Floods National Scenic Trail. Dave Alt, author of *Humongous Floods*, was present for questions. Great Harvest provided several loaves of bread for a snack.

In September, the Chapter led a short hike to the 4200' level of Glacial Lake Missoula on Mount Jumbo. We went to Rattlesnake Gardens for a picnic supper following the hike. We had an unusually smoky September. We also hosted a field trip to the geology dept of the University of Montana to view Google Earth views of the Camas Praire ripple marks and follow the path of the Floods through the Clark Fork Valley, e.g., the Alberton Gorge. Marc Hendrix and GLM members provided interpretation. Jen Fowler, whose work was described above, also provided an overlay of her studies.



On September 10, we celebrated the fact that the Highway Department put up a sign about the Camas Ripple marks. A few of us visited the site along with a representative from the National Parks who came to inspect the location as it is one of a few National Natural Landmarks. There are 10 National Natural Landmark sites in Montana, but only this one is in Northwestern Montana. This site, which includes a descriptive sign at a roadway turnout at the 13-mile marker on Montana Highway 382, is the only one in the state dedicated to the Ice Age Flood events that shaped this part of this region. Here, site visitors learn about the remarkable Camas Prairie giant ripple marks, which were the key to unlocking the geological mystery of features noticed downstream, such as the Channeled Scablands of eastern Washington.

-- Lynne Dickman

Lake Lewis Chapter

The Lake Lewis Chapter hosted three seminars and chapter meetings since the last newsletter. On September 11, 2012, our own Bruce Bjornstad presented “Hiking Through Ice Age Floods’ Country” to a crowd of about fifty people. On November 13, 2012, Dr. Stephen Riedel (Washington State University) presented “The Cenozoic Evolution of the Columbia River System” to a crowd of over 65 people, and on January 8, 2013 George Last presented “Mammoth Impacts of the Ice Age Floods” to about 40 participants.

Our members also gave a number of community lectures including one by Gary Kleinknecht to the Master Gardener’s convention, one by George Last for the Community Science and Technology Seminar Series, and several by Bruce Bjornstad to a number of different local and regional groups. George Last also made a presentation to Tapteal Greenway.

Our members were also active in community and regional initiatives. Bruce Bjornstad and George Last participated in the Ice Age Floods National Geologic Trail Partnership Workshop in Wenatchee. Bruce Bjornstad attended a “meet and greet” with the West Richland Parks Commission and Gary Kleinknecht and George Last participated in some Hanford Reach Interpretive Center Education Advisory Committee Meetings. Gary Kleinknecht, George Last, and others actively support the Coyote Canyon Mammoth dig, and continue to support the Ridges to Rivers Open Space Network, and Friends of Badger Mountain. We also recently received approval for a reimbursement grant of up to \$4000 for revision and printing of the “Ice Age Floods Features near Richland, Washington.”

-- George Last

Lower Columbia Chapter

Our February meeting, in partnership with the City of Tualatin and the Tualatin Historical Society, featured Mike Full and David Ellingson. Mike heads up the Willamette Valley Pleistocene Project (www.willamettevalleypleistoceneproject.com) and has been doing underwater paleontology in the Yamhill River in NW Oregon. David is a biology teacher at Woodburn High School and has been supervising students in a paleontological dig on the school grounds.

Both of them brought examples of the Ice Age fossils that they have found. It appears that these fossils are found just above Ice Age Flood sediments. Although it is not impossible, we really don’t expect to find fossils within the Ice Age Flood deposits because of the high-energy nature of the floods. It does seem that there was a large number of Ice Age animals that took advantage of the rich soils brought in by the Floods.

Mike’s team of volunteers which includes cub scouts, high school and college students, and many others, has found mammoth, bison, camelid, beaver, horse, deer and giant sloth fossils in or near the river. One outstanding find this last summer were two molars from a baby mammoth. This indicated that there was a local population of mammoths and not just a few migratory individuals. Baby mammoths did not migrate until they were large enough to travel with the herd; so to find a baby means that it was in residence in the Willamette Valley. Another find was a set of mammoth footprints near the river. Preserved footprints are rare for these large animals and this is certainly a first for our area.

David Ellingson’s students have collected most of a very large Bison Antiquus which is on display at Woodburn High School. An unusual aspect of this bison is that we know, at least in part, how it died. One of the legs shows a large cancer growth which would have hampered the animal’s mobility. Since the fossil bones were found in what appears to be an ancient bog or swamp, it is assumed that the bison simply got stuck in the mud and couldn’t get out. As to be expected, their most numerous finds

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are wetland plants and animals. Most common are what are called “bog beans,” a plant that grew abundantly in marshy areas. They also have found fossils of muskrat, beaver, water shrew, grey squirrel, sandhill crane, pocket gopher, mink, turtle and wood duck.



**David Ellingson & Mike Full
with the Woodburn Bison**

Several students were at the February meeting and presented the Tualatin Historical Society with several display boxes of their finds to be part of the Ice Age collection at the Tualatin Heritage Center. The Heritage Center already has on display a mastodon tusk and molar found about a mile away and a Harlan’s Ground Sloth sacrum found about a mile away in the opposite direction. In May, the Historical Society will be presented on loan a mammoth tusk which is now being restored by Larry Purchase and members of North American Research Group, (NARG).

All of this comes at a time when the City of Tualatin has chosen to brand themselves as an Ice Age destination. In addition to the above mentioned displays, the Heritage Center has three large ice-raftered boulders and at least half a dozen smaller erratics. A mammoth skeleton found in Tualatin is on display at their public library. Downtown Tualatin will have its own “Ice Age Walk” complete with location markers and interpretive signs for where the Ice Age and the Ice Age Floods have left a presence on the countryside.



Recently a 20-mile hiking and biking trail was named the Ice Age Tonquin Trail. This trail will be connecting several towns with Ice Age features and the Tualatin River National Wildlife Refuge. When the Ice Age Floods National Geologic Trail actually becomes a reality, this area will already be on board.

Oregon Public Broadcasting did a program on Mike Full’s under water fossil hunting that may be viewed online at: <http://blogs.opb.org/fieldjournal/tag/fossils>.

-- Rick Thompson

Columbia River Gorge Chapter

Due to popular demand we repeated our April and May field trips on September 22nd and still had 15 people on our waiting list. The trip went from The Dalles to White Salmon on the Washington side of the river and returned to The Dalles on the Oregon side. Most of our chapter members joined us in the spring, leaving room for folks from Seattle, Spokane, Tri-Cities, and Portland on this trip. The next day we were treated to a slide show and book signing by Bruce Bjornstad, author of *On the Trail of the Ice Age Floods, Vol. 2*.

On October 21st we learned about 13,000 years of Northwest Fisheries from Portland State University anthropologist/archaeologist Dr. Virginia Butler.

February saw Scott Burns present his talk on “Cataclysms on the Columbia” twice! Sponsored first by the Columbia Gorge Earth Center’s Sense of Place Lecture Series and a week later by the Hood River Watershed Group. The February 19th talk was attended by 265 people. The February 26th talk had 125 people.

On March 17th at the Columbia Gorge Interpretive Center Museum, Terry Hurd presented a video and slide show titled “Catastrophic Transformation of the West.”

Upcoming events:

April 28, 2:00 -- Hood River County Library, 502 W. State Street, Hood River, John Soennichsen, Washington Channeled Scablands, lecture and book signing.

May 4 -- Field trip beginning in Cascade Locks, OR. Details and registration form may be found at www.gorgefloods.org. Registration is limited to IAFI members until March 15th. As I write this the bus is 2/3 filled so we may repeat it later on in the year.

May 11 -- repeat of above field trip for Friends of the Gorge www.gorgefriends.org

June 22, 1:00 -- White Salmon Public Library, 77 NE Wauna Ave., White Salmon, WA, Rick Thompson, president, Lower Columbia Floods chapter IAFI, “A Birdseye View of the Missoula Floods”. Rick will be showing photos and videos of his air tour over SE Washington.

Last fall I received an email from a couple in Indiana asking when we would be holding our spring field trip. They had just returned home from an Elderhostel Ice Age floods trip in Eastern Washington followed by a flight in a private airplane observing flood features. It looks to me as if they’ve become full-fledged “floodies”. We were able to schedule our field trip the weekend before they will be attending another Elderhostel trip --- Wildflowers of the Gorge. The really exciting news is that they have chartered a private plane to see the gorge from above and invited me to go

along as their guide! I’m really hyped up about this tremendous opportunity.

Last summer I gave three “fireside” talks to campers at Memaloose State Park and fully expect to be asked to do so again this year. I have been happily retired since January 12th!!!

-- Terry Hurd

Puget Lobe Chapter

From its start, in 2008-09, the Puget Lobe Chapter has been able to engage highly qualified, expert speakers to present programs that will interest and enlighten members of the chapter and the general public, and the chapter’s meetings are always free. Most recently, the topics of the meeting programs have been:

March 4 -- “Fire and Frost: Geologic Evolution of the Skagit Watershed” presented by Jon Riedel, glaciologist with North Cascades National Park.

Jan. 7 -- “The Glacial Legacy of Puget Sound: Its Shorelines, Beaches and Bluffs” presented by Hugh Shipman, coastal geologist with the Washington State Dept. of Ecology.

Nov. 5 -- “On the Trail of the Ice Age Floods: The Northern Reaches” a presentation about the topics of this new guidebook by its authors, Bruce Bjornstad and Gene Kiver, well-known specialists in Columbia Basin geology.

Sept. 10 -- “The Rocks Don’t Lie; A Geologist Investigates Noah’s Flood” a program based on this widely-reviewed history of geological explanation, presented by author David Montgomery, geomorphologist at the University of Washington. Unfortunately, a totally unexpected power failure greatly interfered with his presentation, so the program has been rescheduled for this coming Nov. 4.

The generous participation of these speakers and the others who have preceded them is greatly appreciated, and the programs are drawing increasingly large audiences. To improve the meeting situation itself, the chapter has made a

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significant investment in equipment to upgrade the AV setup at its meeting place.

Field activities will soon become more a part of the chapter's agenda. Arrangements are being made for a field trip in May, led by Kathy Troost, focusing on Glacial Lake Puyallup and its history of outburst floods and shifting drainage routes during successive stages of glacial recession. This will be quite similar to a trip she has led for the Northwest Geological Society.

Working with Terry Swanson at the University of Washington, planning is just beginning for an ongoing inventory of significant glacial erratics in the Puget Basin. The very largest erratics in the Pacific Northwest are found in the chapter's territory, and there is a revealing variety of rock types that have been transported for long distances by the Puget Lobe of the continental ice sheet.

-- Dale Middleton

Wenatchee Valley Erratics Chapter

On February 12, Central Washington University Geology lecturer and TV host Nick Zentner discussed "Ellensburg: On the Doorstep of Ice Age Floods Country." After introducing the basics of pre-Pleistocene geology in the Ellensburg area, Zentner presented a unique approach to the Ice Age Floods story, using video clips from recent TV interviews. People interviewed include well-known Ice Age Floods researchers Bruce Bjornstad, Vic Baker, Richard Waitt, and Jim O'Connor, all of whom have been speakers for the Wenatchee Valley Erratics.

Activities planned for Spring and Summer 2013:
April 9 -- Steve Reidel will be giving us an update on the new research that is going on with the Columbia River Basalt Group. There are new scientific findings about the timeframes (shortened) for when and for how long the basalt outpourings lasted.

May -- Sometime later in May there will be the annual Wenatchee Valley Erratics field trip. We have already seen a lot of the Ice Age Floods features within the north-central Washington area, so we will likely head east over to the Cheney-Palouse Scabland Tract. The details on the exact date and trip will come at a future date.

June 6 -- I will be giving a presentation to the Wenatchee Master Naturalist group on the Ice Age Floods story. This will be an introduction to the Floods and the varied features and landscapes of eastern Washington.

June 8 -- I will be leading the same group, the Wenatchee Master Naturalists, on an all day trip of Grand Coulee and the glaciation of the Waterville Plateau. This will be the same trip that Gene Kiver and I led for the IAFI regional trip in 2009.

June 11 -- David Montgomery, who teaches geomorphology at the University of Washington, will be our guest speaker. He has authored several books, *Dirt* and the latest book *The Rocks Don't Lie – A Geologist Investigates Noah's Flood*. It should be an interesting topic and looking forward to David's thoughts about Noah's and the Ice Age Floods stories.

-- Brent Cunderla

MEET YOUR MEMBERSHIP MANAGER – SYLVIA THOMPSON

As the new Ice Age Floods Institute Membership Manager, I want to say thank you for all the support and encouragement that I have received from the many chapters. I have really appreciated that since I came in right at the annual renewal time and things were quite hectic. Fortunately, Melanie Bell, the previous manager had done an excellent job in organizing and standardizing the process. She spent many hours training me and was always available for my questions. I could not have taken on this job without her. Thanks, Melanie. I was an executive secretary for many years and I love doing this kind of work and look forward to continuing to keep the membership part of the organization running smoothly.

My interest in the Ice Age Floods goes back to the 1960's when my family would stop at Palouse Falls each year on our annual trek from Seattle to Spokane and my dad told us about the Bretz Flood or Spokane Flood. We also visited Dry Falls and I remembered seeing Moses Coulee. Just after college I took a few weeks during the summer and drove around Washington State revisiting some of those places. I remember thinking as I drove down into Moses Coulee that I was driving to the bottom of an ocean.

For years, the photograph I took of Palouse Falls when I was 12 years old, hung on our kitchen wall. Finally my husband, Rick, and I drove up and he saw Palouse Falls, Dry Falls, and several other sites. My brother had told him about the floods and seeing these places brought it alive. He then began looking around the Portland area and studying the evidence left in NW Oregon and SW Washington. His almost 15 years of research has turned into almost a second career. If you look at our website: www.Gigaflood.com you will see what I mean. Together

we have researched and led field trips for our IAFI chapter and a couple for other groups. Rick receives many invitations to give his PowerPoint presentation about the floods and I handle the details for these talks and manage the sales table of the many items we have produced. He has appeared in two of Grant McOmie's "Grant's Getaways" television programs and last year I was featured in a short article about the floods in the Oregon AAA Club "VIA" Magazine. It has been an amazing journey. So what do we do for fun and relaxation? We go for a drive and look for erratics or more flood features. What better way to have the thrill of discovery and the joy of sharing it with others.



PRELIMINARY PALEONTOLOGY AND GEOLOGY OF THE COYOTE CANYON MAMMOTH SITE, BENTON COUNTY, WASHINGTON

BY GEORGE V. LAST , BAX R. BARTON , AND GARY C. KLEINKNECHT

Mammoth (*Mammuthus* spp.) subfossils (i.e. remains such as bones whose fossilization process is not complete) are common to Washington State. Barton (1999) stated that several hundred finds have been reported in various publications or donated to local, regional, and national museums or collections. He also noted that where sufficient data exist to assign them to species, the majority have proven to be Columbian mammoths (*M. columbi*) and that none from this state have been substantiated as woolly mammoths (*M. primigenius*) (Barton 1998). On March 25, 1998, a bill designating the Columbian mammoth as the official fossil species of the State of Washington was signed into law (Washington Geology 1998). Barton (1999) indicated that most of the reported remains from Washington are of single skeletal elements (such as molars or tusks) and that notable (multi-element) well-documented finds are far less common.

Columbian Mammoths in Eastern Washington

Barton (1998, 1999) further noted that virtually all of the mammoth finds in eastern Washington are from the Columbia Basin, and that most are found in slackwater fine-grained Ice Age Flood sediments deposited in temporary Lake Lewis. Last and Bjornstad (2009) examined the relationship between mammoth subfossils and Lake Lewis and found that those in flood deposits were located at a mean elevation of about 217 m (711 feet), well below the maximum 380 m (1250 ft) Lake Lewis water level. This is consistent with work by Benito and O'Conner (2003) who found that most last-glacial Missoula flood events were relatively small compared to the largest floods that occurred early in the last-glacial episode.

One of the more significant recent subfossil mammoth finds is at the Coyote Canyon Mammoth Site (CCMS), located on private land in the Horse Heaven Hills, about 5 km (3 miles) south of Kennewick, Washington. This site contains multiple skeletal elements, some of which appear to be in near articulated position (indicating that some soft tissue was present to hold the bones in their proper position at the time of deposition), and is located in slackwater flood deposits at an elevation

of about 293 m (960 ft). Thus, this site provides an excellent opportunity to study a mammoth that may have been washed into Lake Lewis during one of the earlier larger last-glacial Ice Age Floods.

Discovery of the Coyote Canyon Mammoth

The Coyote Canyon mammoth was discovered by the landowner and his coworker in November 1999, after excavating and hauling fine-grained soil for use as topsoil. Rumor has it, that a number of bone fragments were discovered in the backyard of a residence where the topsoil was spread. The landowner and co-worker went back to the excavation site and found more bones in place there, and in July 2000 uncovered the mandible (lower jaw) with molars intact, as well as some vertebrae and ribs (Figure 1). The mandible and other bones were extracted and put into a private collection where they remain today. As with so many mammoth finds, the landowner was concerned that if word about the discovery got out to the general public and/or state authorities, it might jeopardize his operation - so he kept the discovery quiet. He did however; stop further excavation in that area, preserving the rest of the remains for future scientific study.

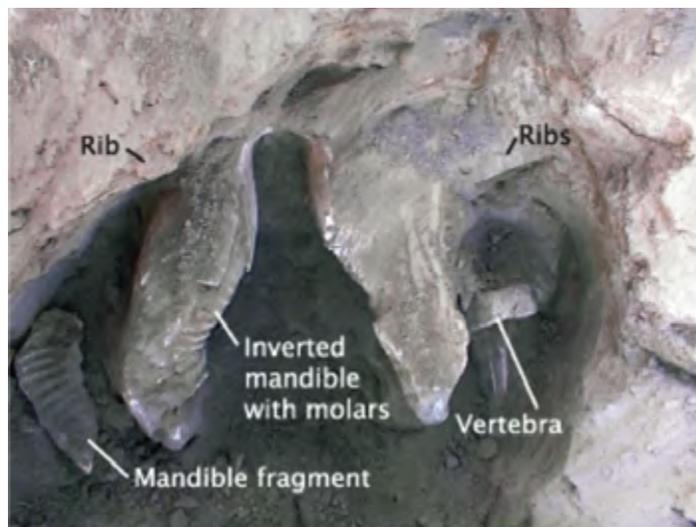


Figure 1. Mandible, vertebrae, and ribs of the Coyote Canyon mammoth uncovered in 2000 (photographer unknown).

Rediscovery

In late 2007, the land went up for sale, and the presence of the mammoth was disclosed to one of the realtors, Cindy House. House then contacted the archeology department at Central Washington University (CWU) to see if they could evaluate this find, initially believed to be in wind-blown loess deposits. Jake Shapely, a graduate student at CWU, and Bax Barton at the University of Washington's Quaternary Research Center and Burke Museum and an Associate Professor at CWU, organized a team of CWU students. Shapely also made contact with Gary Kleinknecht of Kamiakin High School (KaHS) to see if he could organize a group of high school students to help in relocating the site. On May 17, 2008, a pedestrian survey (conducted by CWU and KaHS students) quickly found trace evidence (e.g. bone fragments) that led the investigators to a suspected location of additional remains. George Last joined this initial investigation and quickly found multiple lines of evidence indicating that rather than being in wind-blown loess deposits, the mammoth was actually located within Ice Age Flood deposits.

Follow up test excavations uncovered a number of mammoth-size bones, including a humerus and scapula in near articulated position, confirming the presence of a relatively well preserved and potentially complete skeleton. Excitement soon grew that this site might offer a unique opportunity for students, teachers, and researchers to investigate well-preserved mammoth subfossils in the context of Ice Age Flood deposits. Community volunteers were inspired to seek a landowner that would protect the site and allow it to be studied.

MCBONES is Born

Through the dogged efforts of House, the 27-acre property was purchased in June 2008 by two Tri-Cities brothers (doing business as Horse Heaven Hills LLC) with the hope of turning the site into an educational science-based research facility for students, teachers, scientists and the public. In September 2008, a non-profit organization, the Mid-Columbia Basin Old Natural Education Sciences (MCBONES) Research Center Foundation was registered with the Washington Secretary of State's Charities Program to oversee environmental, paleontological, and geological research and education. MCBONES was later

(September 2011) granted federal tax exempt status as a public charity – exempt from Federal income tax under section 501(c)(3) of the Internal Revenue Code (Employer Identification Number: 26-3474017).

Facility improvements were made, largely through extraordinary efforts of MCBONES Board members House and Glenn Washum and the contributions of many local businesses, to restore electricity, water, and septic system function to the site and to turn an incomplete/abandoned shop into a viable dig house with office, classroom, laboratory, and display space. Efforts also went toward acquiring, building, and setting up field and laboratory equipment and surveying the site to prepare for the careful painstaking scientific research to follow.

Formal Excavation and Analysis

Finally, on September 25, 2010, formal excavation of the Coyote Canyon Mammoth Site began. Excavation has continued yearly for two weekends a month from March through October. At the end of our second full dig season, October 2012, an estimated 8 cubic meters (10.5 cubic yards) of soil and sediment had been removed from three 2 m x 2 m (~6 ft x 6 ft) excavation units. Soil/sediment was excavated in 10 cm layers using archeological techniques and (except that associated with krotovinas [animal burrows]) was wet screened (washed) to remove the clay, silt and fine sand, making it easier to pick out micro-flora and -fauna specimens (such as rodent bones) to yield evidence on the site paleoecology over time. Only two of the excavation units have thus far reached the bone bed, located between 2.1 and 2.6 m (6.9 and 8.5 ft) below the top of the adjoining bluff.

Preliminary Paleontological Findings

Forty-five mammoth-size bones or bone fragments have so far been recovered including many ribs, vertebrae, and metapodials (foot bones). Figure 2 illustrates the in situ arrangement of those bones as well as significant ice-rafted erratic clasts, and other key specimens. A number of these bones show signs of animal gnaw marks. Wahl and Barton (in press) suggest that these were produced by at least two rodents and at most two lagomorph species (i.e. rabbits, hares, and pikas), which typically utilize such bones for nutrition and to sharpen and erode their ever-developing incisor teeth

12 PRELIMINARY PALEONTOLOGY AND GEOLOGY OF THE COYOTE CANYON MAMMOTH SITE, CONTINUED.

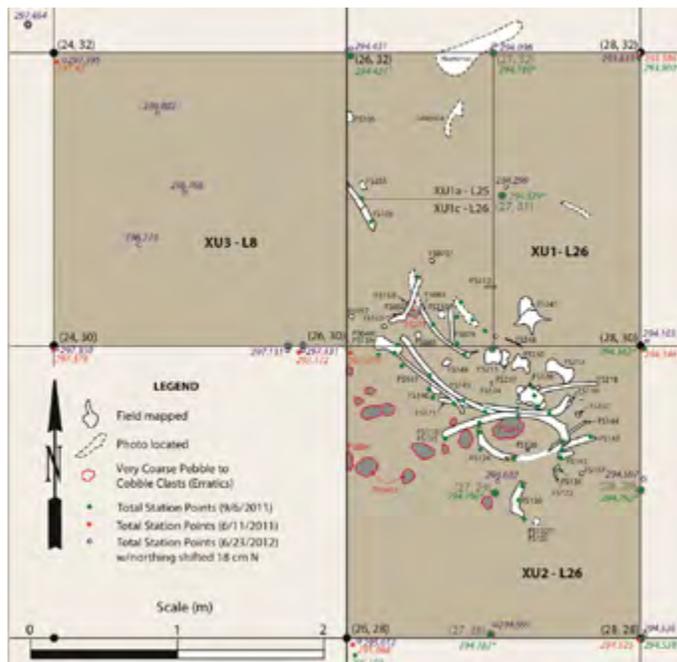


Figure 2. Plan view showing excavation unit 3 (X3) at level 8 (0.8 m below the top of the bluff) and the location of mammoth-size subfossils and erratic clasts discovered in XU1 and XU2 as projected to level 26 (L26) located 2.6 m (8.5 ft) below the top of the bluff.

In the September 2011, the humerus found in 2008 was uncovered to extract two samples for radiocarbon dating (Figure 3). Results (paid for with a \$3,000 contribution from the Lake Lewis Chapter of the Ice Age Floods Institute) were received in March 2012 and yielded a mean calibrated age for the mammoth's death of 17,449 years ago (14,295 14C yr B.P.) (Barton et al. 2012). This places its death coincident with one of the larger Ice Age Floods near the middle of the flooding sequence from the last glacial cycle. Benito and O'Conner (2003) found that earliest and largest floods occurred sometime after about 20,846 years ago (19,015 14C yr B.P.), with the last Floods occurring sometime after about 14,876 years ago (13,695 14C yr B.P.) and perhaps even after about 13,800 years ago (13,000 14C yr B.P.). Similarly, several different erratics up to 310 m (1,020 ft) on Rattlesnake Mountain have exposure ages between 16,000 and 17,000 years ago (Keszthelyi et al. 2009).

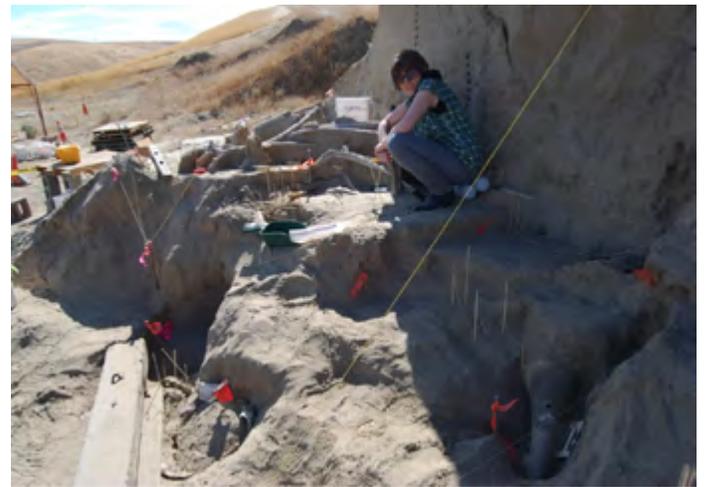


Figure 3. Rheanna Douglas (one of our volunteers) sits on the edge of excavation unit 1 in mid-September 2011. The humerus, showing the location of samples collected for radiocarbon dating is in the lower right hand corner.

Preliminary Geologic Findings

Geologic investigations have confirmed that the bone bed is located within slackwater Ice Age Flood deposits, as evidenced by the presence of angular to subangular felsic (granitic) gravel clasts (ice rafted erratics) (see Figure 2) and weak, rhythmically bedded flood deposits (typical of Touchet Beds). At least six rhythmites have been identified at the site with about four overlying or encompassing the mammoth bone-bed (Guettinger et al. 2010, Last and Barton, 2012). The top of these flood deposits appears to have been pedogenically (soil development) altered, leaving an overprint of calcium carbonate (Figure 4). This surface appears to have been reworked by bioturbation (e.g. disruption and mixing by worms, burrowing animals, etc.) and eolian (wind) processes leaving an irregular surface, overlain by reworked sediments, and a sequence of loess deposits. This, in turn, is locally overlain by a sequence of slopewash (material transported downslope by non-channelized water, sheet erosion).

Ongoing Research

At the CCMS, teams of students, teachers, volunteers, and professional scientists are working together on a number of small integrated-studies. These include: various osteology (the study of the structure and function of bones) and taphonomy (the study of the conditions and processes that affect animal remains as they become fossilized) analyses to characterize

the bones and decipher the events following the mammoth's death; paleoenvironmental studies to identify the flora and fauna species present over time; and calcium carbonate analyses, particle-size analyses, stable-isotope analyses, and lithic (rock fragment) sand counts to better interpret the geologic events. Other projects include development of electronic databases, archiving and curation of specimens, and three-dimensional modeling of the site.

Excavation will begin again in early Spring 2013, and generally be conducted on the second and third weekends of each month through October. These efforts will undoubtedly discover new mammoth bones, and paleoecologic and geologic specimens, to provide new research teams with the specimens and data to support additional studies. To follow our progress and/or get additional information go to our websites: www.mcbones.org or www.coyotecanyonmammothsite.org.



Figure 4. Preliminary stratigraphy overlying the mammoth bone bed. The yellow lines reflect the results of in situ magnetic susceptibility measurements, indicating the degree of magnetization of a material in response to an applied magnetic field. Increased values, to the right, generally reflect the presence of magnetic iron-oxide minerals often linked to buried soils or differences in depositional sequences. The orange line portrays the relative density (weight per unit volume) of 1 mm or larger sediment in the washed samples from each excavation level of excavation unit two.

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VIEWING THE ICE AGE FLOODS FROM A TRIKE

BY TOM TABBERT

Geology has always been a keen interest of mine. I guess it began when I spent 6 months hiking the Pacific Crest Trail. Afterwards, I went on to college and majored in Geology thinking whatever I was going to do with my life, it had to include rocks and the mountains.

So where did that degree lead me? To another keen interest I have - FLYING! With my strong background in math and science, I went on to become a Naval Aviator and spent the next 8 years performing carrier operations in the Pacific on board the USS Nimitz. In a surprising twist of fate, somehow standing on a ledge overlooking majestic vistas gave way to flight deck operations.

Finally after the Navy stint, I found myself settled down in Spokane raising a family and spending nearly all my free time roaming the backcountry of North Central Idaho. Once again I routinely found myself gazing off a mountain top pondering the prospect of flying some type of aircraft off into the yonder. While I thought my flying days were behind me, I still had that burning desire to get back into the sky.

Then on one memorable day years ago at the Spokane Sportsman Show, I came across a booth that had a Trike on display. The gears quickly began turning in my head and an instant connection was made. That day eventually lead to an introductory flight with Denny Reed, owner of trikeschool.com in Cheney WA. Finally, at about the cost of buying a new car, I purchased my own Trike and once again took to the skies.

I carry 18 gal of regular unleaded gasoline (from your local corner station) and cruise between 50 to 90 mph burning about 3 gallons an hour on average. That gives me well over a 350-mile range on one tank of gas! I can cover a lot of ground especially 'as the crow flies', so the range of these things is quite amazing. Trikes have been flown above 20 thousand feet, but FAA limits the elevation to 10 thousand without an oxygen source for the pilot. I've flown at that altitude many times, however I find flying low is much warmer in the cockpit and far more interesting to go exploring. I prefer to see things up close the way that only Trikes

will allow. And yes – I have a ballistic parachute on board that is attached to the whole aircraft.

One other hobby I enjoy is photography and video editing. When I began flying, I started a video 'flight log' that is posted at YouTube.com/ttabbs. Here you can experience the freedom of flying in such videos as 'One October Evening' or 'November Bliss' (just two of my favorites). These days I run 4 cameras positioned at various locations on my Trike to try and capture that elusive perspective of the joy of flying and of course – the effects of the great Ice Age Floods!

Today, I'm applying my interest in geology, flying, and video production to bring you a perspective that only a lucky few ever see. You can also visit <http://hugefloods.com/Trike-Flying.html> to see a variety of places I've visited that explore specifically the effects of the Ice Age Floods. Feel free to pass along my sites to your friends and family so they can preview areas they may wish to visit in the future.

As for me, well I have a lot more flying to do as it relates to the geology of Eastern Washington. I have a new Trike on the way this winter and have big plans for the 2013 season. Go ahead and subscribe to my channel at YouTube.com/ttabbs. In doing so, you'll get a notification each time I post a new video there. I promise I'll help you discover new Flood areas you never thought existed!



FOSTER NAMED AS SUPERINTENDENT FOR LAKE ROOSEVELT NRA AND ICE AGE FLOODS TRAIL

Dan Foster was selected to be the new superintendent for Lake Roosevelt National Recreation Area and Ice Age Floods National Geologic Trail. Foster reported for his new assignment at Grand Coulee, Washington in February.

“Dan’s strong background in managing resources, developing partnerships, and creating innovative programs is ideal,” said Pacific West Regional Director Chris Lehnertz. “His depth of experience working with neighboring communities, multiple agencies, tribal governments, military branches, and the public will serve him well in this new assignment.”

Foster’s experience in the National Park Service over the last 20 years has included positions as a resource management specialist at Bryce Canyon National Park, and chief of resource management at Nez Perce National Historical Park and Wind Cave National Park. He has been superintendent at Niobrara National Scenic River since 2008. Prior to federal service, Foster was a wildlife biologist and geologist for the Utah Department of Natural Resources for eleven years.

Foster was awarded both the National Park Service Director’s and Pacific West Region’s Awards for Resource Management in a Small Park while at Nez Perce. He has authored numerous publications and environmental papers on topics ranging from coal production and oil and gas monitoring to vegetation distribution, geographic information systems, and automated mapping.

Foster received a Bachelor of Science degree in wildlife and range management from Brigham Young University. He and his wife Trena have three children. Among other pursuits, Foster is an avid fly fisherman.

The parks that Foster will oversee are close in proximity, but quite different in nature. Lake Roosevelt National Recreation Area consists largely of a portion of the reservoir behind Grand Coulee Dam on the Columbia River with relatively small land areas adjacent to the lake. It encompasses varied resources, ranging from historic Fort Spokane to numerous native fish and

other wildlife, and even submerged cultural resources beneath the lake’s surface. The park was established in 1946 after the completion of the dam, and receives over a million visitors a year. Ice Age Floods National Geologic Trail was created less than a decade ago, and highlights the significant geologic features of the massive floods that scoured the landscape of the interior Columbia Basin at the end of the last Ice Age. Since multiple agencies and organizations will continue to manage the lands where these features are found, the trail will provide a way to unify the story of how the larger landscape ties those features together.

“I am humbled by the selection to serve as superintendent of Lake Roosevelt National Recreation Area and Ice Age Floods National Geologic Trail,” said Foster. “I look forward to working closely with park staff, partners, and visitors in our stewardship to care for and enjoy these phenomenal resources.”



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ARE YOU LOOKING FOR A GREAT VOLUNTEER OPPORTUNITY?

After 5 years, Nancy Low, our current Store Manager, is ready to move on. We are looking for an outgoing, responsible person to manage the IAFI Store (sales and inventory) from their home or office. Requirements include a strong interest in providing good customer service, good organizational skills, internet access, and access to shipping. Responsibilities include handling IAFI merchandise (books, maps, DVDs etc.), responding to customers, accepting money and shipping purchases, and preparing semi-annual fiscal reports. Although most sales will be handled as mail orders from your home or office, the Store Manager may also interact with IAFI members and other customers at field trips and other IAFI gatherings.

Nancy has agreed to help train the new store manager so there is a smooth transition.

If you think you might be interested in serving as the new IAFI Store Manager and would like to learn more of the details contact Nancy Low at 208-263-4153 or at store@iafi.org. After talking to Nancy if you have additional questions, contact Gary Ford at president@iafi.org.

Please respond by April 15th.
Thank you!