

Winter 2011

THE PLEISTOCENE POST

Newsletter of the Ice Age Floods Institute



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See our website for more information
www.iafi.org

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PRESIDENT'S MESSAGE

I am honored to have been elected by the Board to serve as President of the Ice Age Floods Institute. I have been a member of the organization since 2004. I am the founder and former President of the Lower Columbia (Willamette Valley) Chapter, and past Vice President of the Institute. I care deeply about our mission to be the recognized advocate, educator and marketer of the Ice Age Floods experience as a significant international natural and cultural heritage phenomenon and will bring purpose, vision, and enthusiasm to the organization.

Over the past 15 years, the Ice Age Floods Institute has built an impressive record of accomplishments. The vision to accomplish these goals came from our Past Presidents and their respective Board of Directors. As we enter a new era of Institute leadership, it is natural to look back at our accomplishments and forward to the future.

Since its inception in 1995, the Institute has a long record of achievement. Foremost, we are recognized as a depository and clearinghouse for key information materials, including videos, publications and scientific advice on the Ice Age Floods story. In governmental affairs, we are the prime advocate of the Ice Age Floods National Geologic Trail, a regional system of travel routes linking significant sites and interpretive facilities, with Federal designation legislation having been passed in 2009. Our outreach and education programs have touched thousands of people and students in U.S. school systems. Our most important accomplishment was to become a four state coordinating organization with 10 chapters in Montana, Idaho, Washington and Oregon - providing venues for networking, lectures and field trips.

Going forward we will focus on four primary goals: providing timely, effective programs and networking opportunities to increase member recruitment, participation, and retention; partnering with governments, businesses and regional communities in the marketing and development of the Ice Age Floods National Geologic Trail; providing educational, advisory and promotional services about the Floods to target audiences and operating a fiscally responsible organization with diverse funding sources and measurable results.

I look forward to seeing you at the Fall membership meeting and field trip scheduled for Saturday October 8th in the Cheney Spokane area.

-- Mark Buser

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POTHOLES COULEE

BY BRUCE BJORNSTAD

The following is an excerpt from volume 1 of “On the Trail of the Ice Age Floods” for the mid-Columbia Basin of southeastern Washington. Volume 2, titled “On the Trail of the Ice Age Floods: A geological field guide to Northern Idaho and the Channeled Scabland” by Bruce Bjornstad and Gene Kiver is in preparation. It is expected to be available in the first half of 2011 from Keokee Books.

“The Potholes’ are the best example mapped of a receding waterfall over lava flows known to the writer.

J Harlan Bretz (1923)

Features: Flood coulees, recessional cataracts, plunge pools, giant flood bars, fosses, giant current ripples, mesas, buttes, rock basins, benches, potholes, pinnacles and pillars

Best Observation Points:

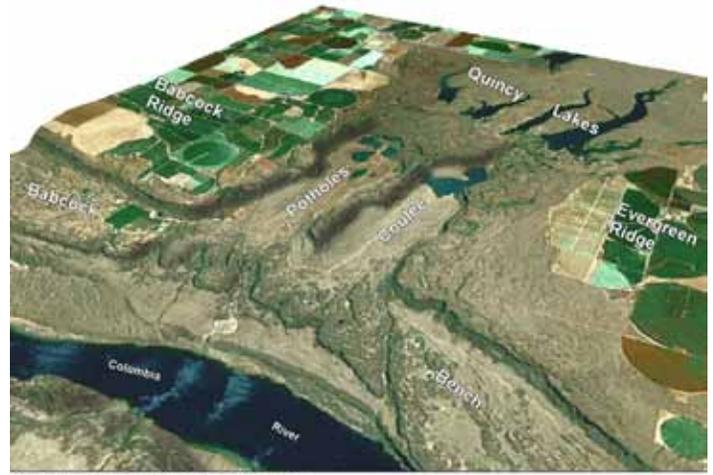
Automobile: From Quincy Lakes Road (closed in winter): Five miles north of George, turn left (west) off of SR 281 onto White Trail Road. After 3 miles, turn left (south) onto Quincy Lakes Road at “Public Fishing” sign. Drive south. After 2.5 miles, pull off into one of several spectacular overlooks that peer down into the deep throat of upper Potholes Coulee at the west end of Evergreen Reservoir. Coordinates: N47.1318, W119.9323

Non-motorized trail: From geocache site along Upper Ancient Lake Trail (see directions below).

Elevation: 800-1,300 feet

Potholes Coulee is one of the most dramatic features left behind by the Missoula Floods. The drainage divide into Potholes Coulee (1200 feet) is the lowest of three coulees that steeply descend into the Columbia Valley from the Quincy Basin. Potholes Coulee and its neighbors, Crater Coulee and Frenchman Coulee, are spectacular horseshoe-shaped, tiered, cataract canyons that developed when floodwaters quickly rose up to 1425 feet elevation and overtopped several divides across Evergreen and Babcock ridges. When this happened, an incredible drop of over 850 feet was created over a distance of less than 3 miles between the Quincy Basin and the Columbia River valley to the west! With this difference in water level over such a short distance, floodwaters furiously ate away at the underlying basalt layers, in their vain attempt to establish hydraulic equilibrium across the divide. Any topsoil present was completely stripped away, along

with hundreds of feet of basalt bedrock, carving a deep chasm between Babcock and Evergreen ridges (Figure 1).



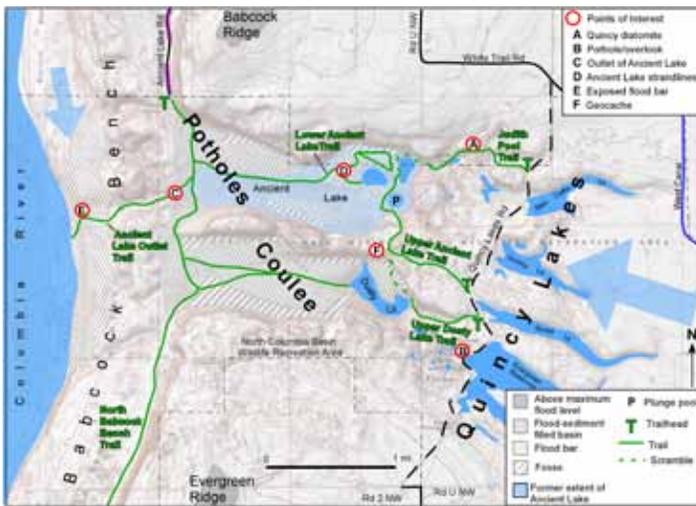
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Figure 1. Aerial view of Potholes Coulee. Potholes Coulee consists of two cataract canyons separated by a tall, rib-like ridge of basalt. The flood-scoured area is well defined by scabland where all the crop-supporting topsoil was removed. Looking northeast.

Potholes Coulee consists of two, parallel, amphitheater-shaped, cataract-lined alcoves. Separating the two alcoves in Bretz’s words is “a great blade of rock a mile and half long, 1,000 feet wide and 375 feet in maximum height between them.” The upper ends of these alcoves form the Ancient Lake Basin on the north and Dusty Lake Basin on the south (Figure 2). An upper cataract steps up from these alcoves, forming a wild maze of butte-and-basin scabland all the way up to Quincy Lakes. Deep plunge pools lie at the bases of some cataracts. Beyond the cataracts are huge bars of coarse-grained flood deposits, which blanket the bottom of both alcoves westward to Babcock Bench. Many of the bars, rising up like the backs of giant whales, are covered with giant current ripples. Elongated depressions (fosses) developed between flood bars and the coulee walls.

Three sets of recessional cataracts are preserved in 2-mile-wide Potholes Coulee. The upper cataract developed across the Roza Member of Columbia River basalt and in places receded as much as 3 miles - all the way to Quincy Lakes. One characteristic of the Roza Member is its especially massive basalt columns that

can be several feet wide. A middle cataract developed across the Frenchman Springs Member, the next oldest basalt member. In some places, these two cataracts are stacked on top of each other, forming a single cataract up to 400 feet tall! This stacking is visible immediately above Dusty and Ancient lakes and where the basalt rib separates the north and south alcoves. A lower cataract stepped down into the next oldest basalt member (Sentinel Bluffs) near the mouth of Potholes Coulee along the west side of Babcock Bench. The lower cataract appears to have begun to retreat up the coulee when the last scabland floods occurred and prematurely cut off its development. During the next cataclysmic flood, thousands of years from now, these cataracts will likely resume their retreat up the coulee, lengthening it eastward.



Basemap created with TOPO!© www.nationalgeographic.com/topo.

Figure 2. Map of Potholes Coulee and Quincy Lakes area.

Upper Ancient Lake Trail

This is just one of many public, non-motorized trails within Washington State's Columbia Basin Wildlife Recreation Area that encompasses Potholes Coulee.

Geologic Highlights: Flood-swept basalt mesa, channels, rock basins, potholes, benches, buttes, abandoned spillways, hanging coulees, cataracts and plunge pools of upper Potholes Coulee above Ancient Lakes. Flood bars, fosses, giant current ripples and modern strandlines within the Ancient Lakes basin. Huge Roza basalt columns.

Length: 3.2 miles round-trip

Elevation along trail: 830-1,210 feet

Difficulty: Moderate

Best Modes of Travel: Hike or horse

Management / Ownership: Washington Department of Fish and Wildlife

Geocache: Located in saddle along basalt rib separating north and south alcoves (see Figure 2). Coordinates: N47.14248, W119.94652; Elevation: 1,140 feet.

Warnings: No shade or potable water. Drop offs. The

Quincy Lakes access road is closed in winter. A WDFW parking permit is required.

Directions: The turnoff to the Upper Ancient Lake Trail is 5 miles south of Quincy on SR 28. Turn west here off SR 28 onto White Trail Road and continue 3 miles. Turn left (south) onto gravel road toward Quincy Lakes (Figure 2). The trailhead is located along Quincy Lakes Road (closed in winter), 1.8 miles south of the intersection with White Trail Road. Park next to outhouses across from west end of Burke Lake.



Figure 3. Looking into Dusty Lake Basin from the basalt blade that bisects the coulee.

Trail Log

0.0 Start (N47.1384, W119.9309). Follow single-track trail (unmarked) that heads northwest from the outhouses across flood-swept and pockmarked basalt plateau.

0.2 Trail crosses circular, 100-ft-wide, basalt-rimmed pothole.

0.7 Cross elongated rock basin at top of upper cataract of Potholes Coulee. Start descent into gully that cuts across the cataract.

0.8 Trail flattens out onto next lower basalt bench (Frenchman Springs Member). Note huge basalt columns in canyon walls just descended; these are characteristic for basalt of the Roza Member. White, powdery material along the trail here is volcanic ash from the May 1980 eruption of Mount St. Helens. Follow trail as it bends around to the northeast.

Note: A side trail splits off to the left (west) and eventually gains the saddle in the basalt ridge that separates the north and south alcoves (see Figure 2). One-way distance to the saddle is 0.15 mile and well worth the extra effort for the fantastic view down on to Dusty Lake. Also, for those equipped with a GPS unit, the Potholes Coulee geocache is hidden here (www.geocaching.com; codename: GCKT9Z).

1.0 Through a notch in the basalt bench, you can see gently undulating giant current ripples atop a flood bar in valley below.

1.2 Trail begins descent across the middle cataract of Potholes Coulee. Notice plunge pools and huge flood bars etched with strandlines. Strandlines indicate successively lower lake levels as Ancient Lake slowly and steadily dissipated, probably from evaporation, since the mid 1950s. The height of the discolored rock walls also reveals the former maximum level (950 feet) of Ancient Lake.

1.3 Broader view of the Ancient Lake basin.

1.4 Trail flattens out once again onto rolling flood bars at base of grade. Pass by round, emerald green plunge-pool lake.

1.6 Overview from flood bar in center of lakes basin. Retrace route back to start, or connect with one of the other Potholes Coulee trails (Figure 2).

ANNUAL MEMBERSHIP MEETING FALL 2010

The annual IAFI membership meeting was held on Friday evening, September 4, 2010 in the Discovery Center in the Dalles, Oregon.

One of the highlights of the evening was the opportunity to recognize two IAFI Board members who have made significant contributions to the IAFI and the advancement of the Floods story. Gary Kleinknecht, our President for the last six years, decided it was time to turn the leadership reins over to a new person. Gary considers his most significant achievement to have been leading the IAFI during the time when the Ice Age Floods National Geologic Trail finally became a reality. We are pleased that Gary will continue to serve on our Board of Directors and share his experience and valuable insights.

Dean Ladd, who was one of our longest serving Board members, also decided it was time to step down. Dean is from Spokane, Washington and has been involved in the Floods story and the work to create the Trail for many years. He was one of the Study Team Participants and the Chairperson for the Idaho Panhandle and East Central Washington area for the Ice Age Floods Study of Alternatives and Environmental Assessment that was completed in February 2001.

We were pleased to honor both Gary and Dean with paintings of Ice Age events by Stev Ominski (see photo at right). Mark Buser introduced Stev who was having an exhibit at the Discovery Center during the meeting. Many of us had previously seen examples of his fine work but had not met him. It was a real treat to be able to put a face and great personality with the name and work.

During the membership meeting four members of the Board of Directors were elected to new three year terms. This included Gene Kiver, Melanie Bell, Monte Nail and Gary Kleinknecht.

Mark Buser, former President of the Lower Columbia Chapter in Oregon, was elected to serve as the new IAFI

President. Mark acknowledged the many contributions of Gary Kleinknecht and is grateful that Gary will continue to serve on the Board and provide counsel while he gets his feet on the ground. One of Mark's first observations as President was that Gary did a lot of things to keep things moving forward that only a new president can appreciate!

Also elected were Gary Ford as Vice President, Melanie Bell as Secretary, and Monte Nail as Treasurer. Gene Kiver and Gary Kleinknecht were elected to serve on the Executive Committee.

The final highlight of the evening was the opportunity to hear a lively and extremely interesting presentation on the Ice Age Floods by Dr. Scott Burns, Professor of Geology from Portland State University. He is one of the authors of *Cataclysms on the Columbia: The Great Missoula Floods*. Scott is an accomplished speaker who presented the Floods story in an extremely interesting manner that was enjoyed and appreciated by all the members who attended the meeting.



IAFI Board Members from left to right: Melanie Bell, Gary Ford, Dean Ladd, Norm Smyers, Scott Waichler, Mark Buser, Consuelo Larabee, Gary Kleinknecht, Terry Hurd, Brent Cunderla, Ken Lacy

IAFI FALL 2010 FIELD TRIP

On September 24th and 25th the Columbia Gorge and Lower Columbia chapters had the pleasure of hosting the 2010 annual meeting and field trip. The field trip was a huge success with about 125 people attending. Our tour guides were Dr. Scott Burns of Portland State University and Drs. Richard Waitt and Jim O'Connor with the USGS.

At our first stop we viewed pillow basalts that were formed when flows of Priest Rapids basalt (15-14.5 mya) encountered water at the east side of The Dalles, OR. We then saw evidence of floods much earlier than the Missoula floods in a roadcut just south of The Dalles. Here we saw a series of "paleosols", or ancient soils. The middle layer of these dated to 600,000 years old. This site is currently being studied by Dr. Burns and one of his grad students.

We then headed eastward up the valley of Fifteenmile Creek which parallels the Columbia River for about 15 km. Flow from the Missoula floods overtopped the ridge between the Columbia River and Fifteenmile Creek and spilled south into the valley of Fifteenmile Creek at two locations, forming two large "flood deltas". At the first of these, Petersburg bar, boulders, gravel, and sand were deposited in steeply dipping foresets, apparently as this "flood delta" prograded southward. There may have been 6-10 floods here. The present altitude of the divide crossing is about 180 m (600 ft). According to modeling, a discharge of at least 3 million m^3/sec would be required to overtop this divide.

About 5 km up Fifteenmile Creek, another large bar was deposited by flow diverging from the valley of the Columbia River across the divide through Fairbanks Gap. This bar has large crescentic dunes on its surface. The upper limit of erosion here is about at altitude 300 m (1000 ft). The col of the Fairbanks Gap divide is at altitude 250 m (820 ft), some 70 m higher than the Petersburg divide, requiring a minimum discharge of about 5 million m^3/sec for overtopping.

We then travelled about 2 km east to the Celilo Falls overlook. Before closure of The Dalles Dam in 1956, one had a good view of Celilo Falls here. Topography clearly related to the Missoula floods can be seen across the river above the town of Wishram, where Columbia River Basalt Group (CRBG) flows have been stripped of their surface cover and eroded into butte-and-basin "scabland" topography. Continuing east before descending into the valley of the Deschutes River a prominent trimline cut into the slopes above indicates that maximum flood stage exceeded altitude 315 m (1040 ft).

We then proceeded to Heritage Landing at the mouth of the Deschutes River where we enjoyed a delicious lunch prepared by Four C's Catering in The Dalles. From here we followed the frontage road to Biggs Junction and entered Interstate 84 eastbound. We continued 19 miles east passing John Day Dam (my office) and the mouth of the John Day River, exiting at Philippi Canyon (exit 123). We ascended Philippi Canyon, where a large eddy bar has been deposited along the eastern valley margin. Near the road junction is the col of a major divide crossing between the Columbia and John Day River valleys. J Harlen Bretz described this region in detail, using it as a cornerstone in building a case for huge flows down the Columbia.

We then turned west at the first intersection and followed the private road that flanks the north edge of a channel and cataract complex that has been eroded through the CRBG and overlying Tertiary gravel. To the west, a large flood entering the John Day valley from the Columbia deposited an immense bar, 150 m (500 ft) high and mantled with rounded boulders 2-3 m in diameter.

Just to the west of this bar is a superb view of the valley of the Columbia River at elevation 1020 ft. Some 50-100 ft above maximum flood stage, this site would have been a good if somewhat frightening place to watch the largest Missoula Floods.

--Terry Hurd



Dr. Jim O'Connor, USGS, in Columbia River Gorge. Fall 2010 field trip.

Photo by Rick Thompson

CHAPTER NEWS

Cheney-Spokane Chapter – Spokane, WA

Chapter President: Dave Daugharty
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The Cheney-Spokane Chapter has named the Columbian Mammoth as a mascot. A “Name the Mammoth Contest” was held last fall and “Latah”, submitted by Glen Leitz of Latah, WA was the winner. The name was voted upon by our chapter membership at the October 11 Annual Membership Meeting. Here is the connection of “Latah” to the Columbian Mammoth. In May 1876, Benjamin Copen (1842-1912), a homesteader on Latah Creek south of Spokane, discovered huge, mysterious bones in a bog near his spring. These fossils and others unearthed by neighbors were eventually identified as those of the Columbian mammoth. They soon begin circuitous journeys that end in major museums in Chicago and New York. Latah is a Nez Perce word meaning “fish” or “stream where little fish are caught”, “place of pines and pestles” or “place where we get food”. Plush stuffed Columbian Mammoths are being sold as a fundraiser to help with educational activities of the Chapter and they sell for \$10 to IAFI members and \$12 to nonmembers.



A “Geology and Railroad History on Bikes” field trip to Rock Lake was led by Dr. Gene Kiver and Dr. Charles Mutschler on October 10. Rock Lake,

south of Cheney, Washington. Rock Lake, south of Cheney, Washington, is the deepest and most rugged of the Missoula Flood canyons in eastern Washington. The history of the now defunct Milwaukee Railroad and the origin of the deepest lake and canyon in eastern Washington was highlighted. The Milwaukee was the last of the transcontinental railroads completed to the Pacific Northwest. Engineered for heavy traffic, it was completed as a combination of economic forces reduced the need for it. Transportation routes across

the Inland Empire were shaped by the flood formed geography. The Milwaukee Road was no different than other routes, but the advances in construction technology made the route feasible in a way that had not been possible when the first railroad crossed the Channeled Scablands. The now abandoned rail bed is mostly owned by Washington State Parks and will eventually be opened to the public. By special permit, the bikers explored the northern part of the rail grade for an 11-mile roundtrip on relatively easy trail. Along the trail were steep cliffs, rockslides, and a trestle requiring extreme caution. Bikers were required to be physically able to ride a mountain bike or other wide-tired bike for four or more hours on a crushed gravel/dirt surface with occasional larger rocks.

Charles T. Luttrell, Washington State Parks Archaeologist, lectured on “Some Springs and Fossil Discoveries in Washington Territory” at Spokane Community College on October 11. A large crowd enjoyed his remarks and learning more about the Columbian mammoths that are the best known fossil specimens.

--Melanie Bell

Lake Lewis Chapter - Tri-Cities, WA

Chapter President: George Last
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This fall we held three chapter meetings, with our September program by Bruce Bjornstad on “Exploring the Channeled Scabland”, a prelude to a new book he is coauthoring with Gene Kiver. In November, we had Dr. Robert (Bob) J. Carson talk about some of his field research east of Yellowstone National Park. Our January program by Gary Kleinknecht presented a summary of efforts by teachers, students, and scientists to begin excavating the Coyote Canyon Mammoth Site. We also elected new officers and committee chairpersons at our January meeting, with Gary Kleinknecht assuming the Vice-President duties.

In October, Ken and Donna Hoopingarner manned an information booth at the Hells Canyon Gem and Mineral Show in Lewiston, ID. Our members also gave a number of talks, led field trips, and/or provided

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support to a number of organizations including the Ice Age Floods National Geologic Trail Interagency Coordination Committee, the Ridges to Rivers Open Space Network, and the Mid-Columbia Basin Old Nature Sciences (MCBONES) Research Center Foundation. Our members also presented three posters at the Geological Society of America Annual Meeting in Denver, CO.

--George Last

Lower Columbia Chapter - Portland, OR
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In May of 2010, the Lower Columbia Chapter led a field trip through Clark County, Washington. "Ripple Marks, Flood Channels, History and Birds." The all-day trip covered virtually all the major flood evidence in and around Vancouver, Washington in the elbow bend of the Columbia River between the Columbia Gorge and Kalama Gap. As a special feature we had Bill Montgomery give us inside tours of two rock pits where Lake Missoula Flood gravels are mined. It was a great trip.

In September 2010 we had a large turn out at the Tualatin library for Rick Thompson's program on Portland area Flood features. This was a kick-off meeting for our partnership with the City of Tualatin, Oregon and the Tualatin Historical Society. Tualatin sits in one of the major flood channels that fed water from the Portland basin into the Tualatin, Willamette and Yamhill valleys during the largest of the Ice Age Floods.

Our January 13th meeting, held at the Tualatin Heritage Center was called "Elephants in our Backyard" and featured Mike Full, Yamhill fossil hunter, and David Ellingson, science teacher at Woodburn high school whose students are excavating the skeleton of an ancient bison. Oregon Public Broadcasting covered their work in November 2010 and may be viewed at <http://blogs.opb.org/fieldjournal/2010/11/24/fossil-hunters-find-more-big-bones-of-mastodon-sloth-bison/>. The fossils they are finding are definitely Ice Age mega fauna, but whether they are victims of the floods is not firmly established. The research continues.

-- Rick Thompson

NEW ICE HARBOR DAM VISITORS DISPLAY

Over the last few years, the Ice Age Floods Team Battelle Project has been working with the Lake Lewis Chapter of the Ice Age Floods Institute to develop a new display for the U.S. Army Corps of Engineers Ice Harbor Dam Visitor Center. What started in late 2007 as a desire by Jeanne Newton, then with the Corps of Engineers, to incorporate some geology into an update of the Ice Harbor Dam Visitors Center, finally came to fruition this last summer. Those Team Battelle members assisting with this project include Bruce Bjornstad, Kelsey Winsor, Aaron Last, and George Last.



Figure 1. The New Geologic Display at the Ice Harbor Dam Visitor Center, taken 11/26/2010. Shown from the left are George Last, Jeanne Newton, and Anthony Ames. Photographs for the display were taken by Aaron Last, a professional photographer in Seattle, WA. Interpretation and text were prepared by George Last and Bruce Bjornstad (PNNL's Geoscience Group). Final printing and preparation of the display panels were performed by Signs by Sue of Pasco, WA.

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SOMETHING GREAT FOR KIDS NOW AT THE IAFI STORE

This new graphic novel *Terra Tempo: ICE AGE CATAclysm!*, takes kids of all ages on a fantastic journey in a time machine to witness the Great Missoula Floods, the largest floods to have ever washed over the face of the earth. Experience the world in the not so distant past when giant mammoths and saber-toothed cats roamed the Pacific Northwest. Ride along with the time travel kids as they tour the changing landscapes from the back of a mythic Thunderbird and work together to survive the dangers of the Ice Age Cataclysm! This is a great way to introduce kids to the Ice Age Floods and to join three kids on an incredible science adventure.

This is a wonderful graphic art novel. This is the first fiction offering from the IAFI Store. We recommend it for all children of all ages, especially 7-14.

Terra Tempo: Ice Age Cataclysm! A NEW Graphic novel by David Shapiro, Erica Melville, Christopher Herndon; published by Craigmere Creations \$15.00

ORDER IT NOW ONLINE AT iafi.org/store or get your order form on line to order it by snail mail. Remember members get free shipping if you order by US Mail.

Call 208-263-4153 or email store [@iafi.org](mailto:store@iafi.org) with any questions.

