



Friends of the Florissant Fossil Beds eNewsletter

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Newsletter

Every Fossil Needs a Friend

#36—January 2018

Best of 2017: A Note from the Superintendent

January is a time to reflect on the past year and to look ahead to a new one. Here at Florissant Fossil Beds National Monument, as we look back on the past year, we are thankful for the Friends of Florissant Fossil Beds Board of Directors and Friends members, our staff and volunteers, partnering organizations, visitors, and our surrounding communities. We want to let you know how much you mean to us. We thank you for your gift of time, financial support, participation in events, frequent visits, and especially for your friendship.

We appreciate new Friend members who have recently found out about the monument either by visiting, through a friend, attending an event or by finding us online. For those of you who have been members for years, we thank you too.

Each year we strive to protect the monument's natural and cultural resources and to provide meaningful visitor service for the public. In 2017, we welcomed over 70,000 visitors, 3,910 Junior Rangers were inducted, 2,524 students attended ranger guided field trips, 4,058 visited the fossil learning lab (yurt), and 5,481 people were contacted at offsite events.

We could not do all we do to serve the public without the support of dedicated volunteers. In 2017, 457 volunteers donated 3,904 hours of time and service helping the monument staff the front desk and fossil learning lab, facilitate student and youth programs, develop and update content for the monument's website, GIS mapping projects, backcountry patrols, trail maintenance, non-native plant treatments, and the list goes on.....

One of the best ways you can show your support to Florissant Fossil Beds National Monument is to help support the Friends of Florissant Fossil Beds, INC. We would like to invite you to visit frequently and get involved as a member of the Friends of Florissant Fossil Beds or consider becoming a volunteer at Florissant Fossil Beds National Monument. We can make things better by working together!

All of us at Florissant Fossil Beds National Monument hope to see you in the New Year.

Thank you!

Michelle Wheatley

“We thank you for your gift of time, financial support, participation in events, frequent visits, and especially for your friendship.”

A Note from the Paleontologist

I want to thank the Friends for providing funding that helped two of our current paleontology interns to attend the annual meeting of the Geological Society of America (GSA) in Seattle October 22-25. Both Sarah Allen and Ricardo Escobar gave presentations about their work at Florissant to study paleoclimate based on fossil leaves (Sarah) and to develop a new camp-based curriculum for grade school students. There were six presentations that dealt with the Florissant fossil beds, and our attendance at this important meeting of more than 7,000 geoscientists helps to keep Florissant in the spotlight of scientific attention. There were 14 of our past and current Florissant paleontology interns in attendance. Please read on to learn more about Sarah and Ricardo's experience at the meeting.

Herb Meyer



Sarah & Ricardo at the Geological Society of America meeting

Geological Society of America Report — Sarah

I attended the Geological Society of America Annual Meeting in Seattle, WA from October 21st through October 25th. During this engaging conference I attended over 60 talks in 19 different sessions. Session topics where I attended talks included: Citizen Science in Paleontology, Limnogeology, Mass Extinctions, Ancient Environments in South America, and Natural History Museums in the 21st Century. It was a large conference, so it was easy to find sessions and talks of interest. One of the best talks I attended was “Darwin in Galápagos: Then and Now” by Greg Estes. Estes is a naturalist, who along with his wife Talia Grant, retraced Charles Darwin’s journey through the island archipelago and relocated many of the stops made by the HMS Beagle in 1835. I also was able to reconnect with a bunch of my former colleagues from the University of Florida (my graduate alma mater) and other paleobotanists I have met at previous conferences or in the field.

I (in collaboration with former GIP intern Alex Lowe, Associate Professor Dan Peppe [Baylor University], and FLFO Paleontologist Herb Meyer) presented our results of applying Digital Leaf Physiognomy to the Florissant flora in the Cenozoic Paleoclimates and Ecosystems session. Former FLFO interns Erikka Olson and Evan Anderson presented their summer projects in the Geocorps and GIP Internships on Public Lands session. Erikka presented an overview of the work by park paleontology interns (2015 & 2017) to create the trail wayside exhibits on the Geology Trail. Four more wayside panels are being finalized that were created this past summer. Evan presented our work writing descriptions and creating content for the websites <museum.nps.gov> and <idigpaleo.org>. Whereas we are still in the preliminary stages to create educational content for iDigPaleo, Florissant’s page on <museum.nps.gov> is up with close to 300 descriptions all of which have at least one image.

Many of the insect images were annotated by Evan to indicate specific anatomical features he notes in his description. This includes records from almost all of the major organismal groups found at Florissant. We encourage you to visit this virtual museum (at museum.nps.gov) and learn more about Florissant's behind-the-scenes collections. While you are there, explore the collections of some of the other 117 NPS units that have collections material online.

We also had an informal gathering for current and former Florissant interns at a nearby restaurant. It was nice to meet many of the folks whose name I had heard numerous times because of their contributions to various projects. I also met the staff from Environmental Stewards who help coordinate most of the behind-the-scenes paperwork and logistics for the GIP interns.

Overall, it was an exciting and information-rich conference. Thank you to the Friends of Florissant Fossil Beds for providing travel funding for my attendance at GSA 2017!

--Sarah Allen



Florissant *Fagopsis longifolia* (FLFO 6660) leaf prepared for analysis as part of Digital Leaf Physiognomy. The leaves are “cut out” of the rock using Adobe Photoshop. In toothed leaves, the teeth are also removed to so we can calculate tooth area, one of many measurements we take using ImageJ. ImageJ is a free program that can be used to process, edit, and analyze photos. Image: “FLFO_006660Bprepped.jpg”



FLFO Postdoctoral Paleontologist, Sarah Allen, giving her presentation on Digital Leaf Physiognomy. Photo by FLFO GIP intern Ricardo Escobar. Image: “image_6_edited.jpg”

Geological Society of America Report — Ricardo

Thanks to the Friends of the Florissant Fossil Beds financial support, I (Ricardo Escobar) had the privilege of attending the 2017 Geological Society of America (GSA) annual meeting in Seattle, WA from October 22-25, 2017. I presented a poster on the curriculum-based activities I developed for the Geo/Paleo Camp that will take place at Florissant Fossil Beds National Monument (FLFO) in the summer of 2018. The poster I presented focused on the reasons why FLFO believes a camp focusing on the geological and paleontological sciences is necessary for the area. I also discussed the methods I implemented in developing the activities and seeking feedback from educators.

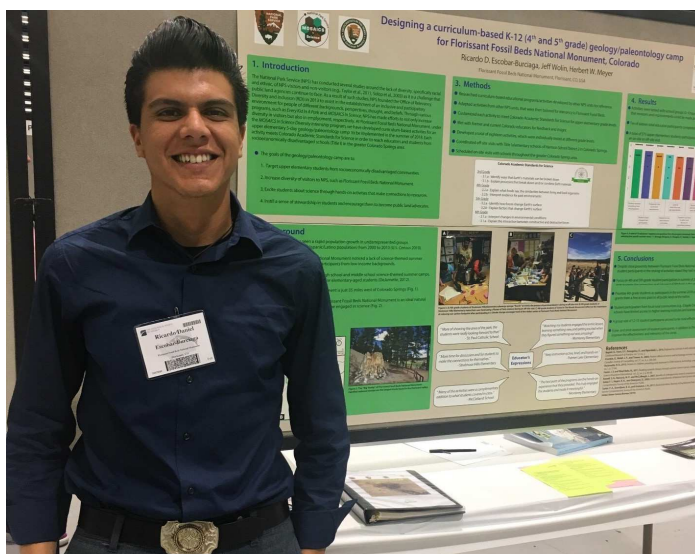
Although this was not my first professional conference, it was by far the most successful and enjoyable one yet. During my poster session, many scientists and educators stopped by and asked many questions and/or gave suggestions. When I wasn't presenting, I walked through the poster exhibit hall and sought other presenters with similar topics. I came across many posters discussing the importance of connecting elementary aged students with hands-on science. It was reassuring to see so many others doing similar work, especially within the paleontological sciences.

One of the most inspiring components of the meeting was seeing how many current and former FLFO paleo interns were present. All 2017 FLFO interns presented at GSA this year. Dr. Evan Anderson gave a talk on getting our specimen collections on the web and making them accessible to the general public. In addition, Dr. Anderson presented a poster on some of the taphonomic experiments he has been working on since graduate school. Dr. Sarah Allen gave her talk on using digital leaf physiognomy (DiLP) to estimate the paleoclimatic conditions of the Florissant valley during the late Eocene. Erikka Olson presented a talk on the process of developing the wayside exhibits for the geologic trail at FLFO. Alex Lowe gave a talk on the research he has been conducting for his Master's thesis on the McAbee Formation in British Columbia, Canada. Former FLFO interns (Lindsay Walker, Emily Thorpe, Ta-Shana Taylor, Lindsey Yann, Ryan Haupt, and Selva Marroquin) presented on research they have been conducting in their current positions.

Networking at the meeting was also a great experience. I had the opportunity to meet many other National Park Service employees/interns conducting research. I was able to attend a talk that Adam Marsh from Petrified Forest National Park gave on some of the current vertebrate fossil research of the Chinle Formation. I also connected with a paleontologist, Dr. Robyn Dahl, who was just recently hired at my alma mater (Western Washington University) that also conducts community outreach. We shared our experiences in geoscience education and outreach and plan to collaborate in the near future.

I want to give a warm thanks to the Friends of the Florissant Fossil Beds for generously funding my, and Dr. Sarah Allen's, trip to the 2017 GSA annual meeting. The experiences and connections made will only help to better represent our research and outreach efforts here at Florissant Fossil Beds National Monument. Thank you so much!

-- Ricardo Escobar



Ricardo standing next to his poster in the exhibit hall at the Geological Society of America meeting

Great Backyard Bird Count 2018 — February 2018

On Saturday, February 17, 2018, the Friends of the Florissant Fossil Beds will hold the Great Backyard Bird Count for the 6th year. The GBBC is an international bird count done this weekend (Friday-Monday) in February every year. It is a citizen science event that helps scientists all over the world recognize the health of bird populations. It helps identify species “in trouble,” migration changes and population changes.

This event is always fun-filled and educational. The schedule for the day remains the same as it has been. We will run 2 separate bird counts between 9 AM and 12 noon. The first count will run from 9:15 AM – 10:30 and the second one from 10:45 – 12 noon. We will meet for both counts in the yurt 15 minutes before the counts begin. We will go out into the field in small groups led by Friends members and members of the Audubon Society (Aiken chapter from Colorado Springs).

During the morning time, there will also be activities for families and the general public to participate in such as making bird feeders and doing bird puzzles.

From 1 PM – 3 PM, we will offer bird scavenger hunts and making bird feeders.

We are also going to be joined for the day by our favorite birder, Debbie Barnes. Debbie will join us for the counts and then at 1 PM will offer a program on “The Birds of Florissant” in the theater followed by a book signing of her book, “The Birds of Florissant and the Surrounding Areas.”

We always hope for good weather. Over the years we have had very cold weather, high winds and beautiful warm days. The “show” always goes on unless we have a huge snowstorm. If any of you would like to help with this event, please contact Sally McCracken-Maertens at 719-687-9204 or sammckind@aol.com . Please join us for a day of fun. Dress appropriately for the weather. If you live in the Colorado Springs area, weather conditions in Florissant maybe very different.

This event is open to the general public. Please pass this info on to friends and family. Thank you!



Friends of the Friends — *TihsreeD* Lodge in Florissant, CO

TihsreeD (Tiz-reed) Lodge (pictured below) is a wedding venue, family reunion site and corporate retreat that accommodates family destination weddings, couples on a weekend get-a-ways, reunions, and companies holding business events.



Owners Toni and Don Moore (pictured below) are longtime supporters of The Friends of the Florissant Fossil Beds, Inc, starting in 2013 when they donated a three day stay and exclusive use of their entire facility for the Friends to auction off. Since that time they have attended numerous Friends events and feature the Fossil Beds prominently on their web page. (<https://sites.google.com/site/tihsreed/Nearby-Fun>)

We greatly appreciate Don & Toni's continued support of the Fossil Beds, the Friends and the Pikes Peak region community! For more information call 719-839-0860 or email tihsreed@gmail.com .



Friends of Florissant Annual Membership Meeting Minutes — November 11, 2017

The meeting was called to order 11 am in the Florissant Fossil Beds Media Room

Patty Glatfelter, President offered introductory remarks regarding successes of the 2017 year with the help of Friends efforts at the Fossil Beds.

These included:

- Great Backyard Bird Count – to be repeated this coming February 18, 2018 from 9 am to noon
- Yoga hikes- instructor fee supported by the Friends
- Information table at the Cripple Creek Ice Festival in conjunction with Newmont Mines at their visitor center in February. Hand lenses were distributed to over 500 youth.
- Purchase of shale from Florissant Fossil Quarry for use in the fossil learning lab and with school groups
- Summer seminar series for the education of school teachers and community members totaling 75 attendees
- Friends anniversary celebration and intern lecture at the Fossil Brewery in Colorado Springs in August which raised \$350
- 2nd Annual Arts Festival which raised \$2,319
- Annual passes were given away to Teller County and Cripple Creek and Victor employees in drawings at their annual picnics
- “Swag” gear of the Friends distributed at the Western Paleontological Society symposium at Colorado School of Mines, the Woodland Park Chamber 100th anniversary dinner, and the “ Preserve America Youth Summit”
- Participation at the Monument’s information table at the Woodland Park Farmer’s markets
- Fundraising through memberships, individual earmarked donations and general fundraising activities will financially support the restoration of the septic system for the Fowler Education building which can be used to house Friend’s activities and supplies, host educational events and paleo intern educational activities

Michelle Wheatley, Superintendent gave a slide presentation regarding the Monument’s activities throughout the 2017 year and expressed her and the staff’s sincere appreciation for all the contributions of time and talents the Friends offer throughout the year. She presented a few ideas regarding future Monument needs for the general membership and the board’s consideration for 2018.

Financial review for 2017 was distributed for the general membership’s review-see attached

The 2018 slate of candidates for board membership for a two year term was presented for membership approval. The candidates included:

Gary Censoplano

Katie Dehlin

Patty Glatfelter

Wayne Johnston

Sally McCracken-Maertens

Robyn Proper

Troy Ruiz

John Schwabe

Wendie Warner

There being no additional nominations from the floor, the entire slate was unanimously approved by the membership in attendance.

A proposed addendum to the Friends By-Laws was presented as follows:

The position of Board Member Emeritus will be elected by a quorum of the existing board members to serve to advise the active board members. The position does not include voting privileges on board policies. There is no requirement of attendance at board meetings or events. The position of Board Member Emeritus will be nominated by any current serving board member at the times of the Friends Board Annual Meeting.

The addendum was unanimously approved by the membership in attendance. Jean Rodeck is the first individual proposed by multiple board members to be nominated to the position of Board Member Emeritus.

There being no further business the meeting was adjourned at 12:20 pm for a potluck luncheon held in the library conference room in the administration building.

Respectfully submitted,
Patty Glatfelter, President

Summer Seminars – 2018

In 2018, the Friends will be planning and hosting the 24th Summer Seminar series. We started the seminars in 1994 when we were celebrating the 25th Anniversary of the establishment of the Florissant Fossil Beds NM. (That means that we will be celebrating the 50th Anniversary of the establishment of Florissant Fossil Beds NM in 2019!!!)

We look forward to offering provocative and educational seminars this coming summer. We have begun planning this year's offerings. Some of the topics we are exploring are bears, spiders, water and bees. These may change according to whether we can find just the right presenters who are knowledgeable and interesting in their presentations.

We welcome your input on any aspect of the seminars, but especially what topics we offer. Do you have a suggestion for a seminar. Have you attended some event, course or program that was of interest to you that might be a great offering for others through our seminars? Please consider making a suggestion by e-mailing or calling Sally McCracken-Maertens at 719-687-9204 or sammckind@aol.com.

We thank you all for your interest in our seminars and hope that you will join us for at least one this year.



Fee Increase



National Park Service
U.S. Department of the Interior

Florissant Fossil Beds National Monument
15807 Teller County Road 1
Florissant, CO 80816

Release date: Immediate
Contact: Jeff Wolin
Phone number: (719) 748 – 3253 ext. 202
Date 12/19/2017

Florissant Fossil Beds National Monument News Release

Florissant Fossil Beds National Monument Fees to Increase in 2018

Florissant, CO – In the fall of 2014, the National Park Service (NPS) began a review of entrance fees charged throughout the National Park System, in part, to bring greater consistency to fees being charged at parks of similar size and complexity. At that time, Florissant Fossil Beds engaged the public and stakeholders about the proposed changes and impacts. Based on the feedback, the monument developed a two-year phased fee increase implementation strategy to meet the needs of the community based on the public comments. The strategy was to phase entrance fee increases over a two-year period. Phase one of the strategy began in the summer of 2015 and the second and final increase will begin January 2, 2018. Florissant Fossil Beds National Monument’s weekly fee will increase from \$5.00 to \$7.00 per person and the annual park pass will increase from \$20.00 to \$30.00.

Entrance fees are not charged to persons under 16 years of age or to holders of the America the Beautiful National Parks and Federal Recreational Lands Pass, Annual Pass (for frequent park visitors), Senior Pass (age 62 or older), Active Duty Military Pass (free annually), Access Pass (permanently disabled), and Volunteer Pass. These passes are available at Florissant Fossil Beds National Monument.

“We are committed to keeping Florissant Fossil Beds National Monument affordable, and we also want to provide visitors with the best possible experience” said Superintendent Michelle Wheatley. “While basic operations of the park are funded by direct appropriations from Congress, the fee program is intended to provide for various enhancements to facilities and visitor services. We feel that our fee changes are appropriate and necessary, as they will supply a critical source of funding for Florissant Fossil Beds National Monument as we move forward into the future.” One hundred percent of fees collected stay right here in the park and are put to work improving facilities and enhancing visitor services important to visitors. Entrance fees have supported a wide range of projects that improve park conditions and visitor experience, including renovating the Hornbek Historic Homestead, rehabilitating trails, developing and installing new exhibits, and providing ranger programs.

There are no additional fees for any park programs beyond the daily entrance fee of \$7.00 per adult (15 and younger are free). Florissant Fossil Beds National Monument offers 15 miles of beautiful, yet lesser known, hiking trails to explore, a free Junior Ranger Program, three short self-guided trails, a park video and museum exhibits, and bookstore. For additional information, please call (719) 748-3253 or visit our website: www.nps.gov/flfo or on Facebook at /FlorissantNPS.

About the National Park Service. More than 20,000 National Park Service employees care for America’s 417 national parks and work with communities across the nation to help preserve local history and create close-to-home recreational opportunities. Learn more at www.nps.gov

January 2018 Activities & Events



National Park Service
U.S. Department of the Interior

Florissant Fossil Beds National Monument
15807 Teller County Road 1
Florissant, CO 80816

Release date: Immediate
Contact: Jeff Wolin
Phone number: (719) 748 – 3253 ext. 202
Date 12/29/2017

Florissant Fossil Beds National Monument News Release

Activities Planned at Florissant Fossil Beds National Monument in January

Florissant Fossil Beds National Monument is open year round. During January, the Monument is open every day of the week from 9:00 AM – 4:30 PM. Here are some of the activities taking place this month.

Friday, January 12, Night Sky Program, 7:00 PM – 9:30 PM. Join park staff and members of the Colorado Springs Astronomical Society to gaze at the dark skies above Florissant Fossil Beds in search of planets, galaxies, nebulas, and more. Meet at the Visitor Center.

Monday, January 15, Fee Free Day and a Hike for Your Health, 1:00 PM – 3:00 PM. Enjoy a fee free day at Florissant Fossil Beds in celebration of Martin Luther King Jr. Day. Start out the New Year on a healthy note with a “Hike for Your Health.” Park staff will lead up to a 3 mile hike on one of the park’s loop trails. Dress in layers and make sure everyone in your group is up for a three mile, moderate hike.

Saturday, January 20, Winter Track Detectives! 11:00 AM – 12:30 PM. Join an interpretive park ranger for a guided hike (up to 2 miles) to discover the clues left behind by the Monument’s wildlife. As a track detective you might encounter tracks, scat, feathers, rubs, burrows, and much more left behind by birds, coyotes, elk, badgers or perhaps even see some of the wildlife in person. Dress in layers and be ready to walk on uneven ground and possibly snow. Meet at the visitor center.

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A Flash from the Past — 1989 Hornbeck Homestead Newsletter Article

Florissant Fossil Beds

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Permit #G-83

WILLIAM FOWLER
2924 MARILYN ROAD
COLORADO SPRINGS, CO 80909

JULY 1989
NEWSLETTER

THE HORNBEK HOMESTEAD — THEN & NOW ...

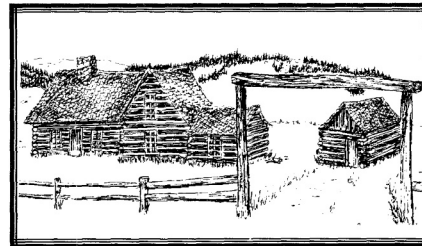
The homestead main house is the only building original to this site on the Florissant Fossil Beds National Monument, one mile south of Florissant off Highway 24 on Teller 1 Road. All of the buildings except the new privy are constructed of logs. The remaining structures have been moved onto the site within recent years. The visible portions of the foundations of the main house are made of stone; however, when the National Park Service began its restoration after acquiring the house as an historical site, the full determination of depth and configuration was not possible since not all of the foundation was visible.

The main house is constructed of hewn logs, and consists of the original homestead cabin, the two-story main cabin which was built at a later time and a pumphouse which was brought in and placed against the north side of the main cabin. The main cabin was interconnected with the homestead cabin by removal of the east wall of the homestead cabin, and laying new logs to the north and south from the corners. These logs utilized the same space and notches as did the old east wall of the homestead cabin.

The kitchen floor was badly humped when the NPS began restoration. The reason was that the floor had settled and the walls had not. Beneath the floor are spaced logs running in the same direction as the floor boards. Beneath these are wider spaced logs called "sleepers" that run in the opposite direction.

In order to lower the hump, several inches had to be shaved off of the sleeper that ran through the center of the kitchen floor. The floor was then thoroughly saturated with water and the stove was moved onto the hump to weight it down. In the course of a winter, the weight of the stove forced the swelling down. The hump is still noticeable, but is not nearly as bad as it once was.

The pumphouse or wellhouse is not interconnected to the main cabin. It was placed against the north side of the main cabin, spiked into place, and kept from splaying outward at the top of its walls by a "Spanish windlass" turnbuckle arrangement.



The bunkhouse, carriage shed, and barn came from other locations on the Monument and are constructed of hewn logs, as well as round natural logs. The root cellar was rebuilt according to 1878 design and dimensions. Some of the authentic timbers can be seen in the walls.

The log and notch types vary including dovetail, square, "V", and eastern saddle styles. Chinking is sawn wood lath, and daubing is cementitious for all log construction. Gable ends are typically board and batten, and some board and board. Roofs are of cedar shingles with sawn-wood ridge boards.

AND SOON ...

Did you ever wonder what skills it would take to build a log home? or say you had a chance to renovate a hundred year old house, what would your first priority be?

The Hornbek Homestead has been undergoing a "preservation plan" and now is the time to act on some desperately needed restoration work.

Adeline Hornbek (the original homesteader) most likely had a few modern building supplies, so little things like poured concrete for a foundation was left out of the construction plan. That's where we'll begin. Starting with the base or foundation we need to start over by jacking the whole structure up so that excavation can begin. The new foundation will be poured concrete, but the facing finish will be native rock, most likely Pikes Peak granite.

Our next step will be replacing the "sill" logs. These logs have been settling on wet ground for over 100 years and have rotted away. This work is scheduled to start September 5, 1989 and may be ongoing for some time. We plan on progressively working our way up the structure to restore it like the original. More information can be obtained about log building from Foxfire, a "how to" reading series.

—Tom Snoke
Chief of Maintenance

This is our twentieth anniversary year as a National Monument, so our summer activities at the Hornbek Homestead will be varied — educational, interesting and fun. Come to see more about the lifestyle and history of homesteaders. Refer to the calendar on back for July 28-30. See you there!

Number 3 of the Geologic Bulletin Series, 2017 – Page 1

Florissant Fossil Beds Road Guide to Florissant's Volcanic Past

National Park Service
U.S. Department of the Interior

Florissant Fossil Beds
National Monument
Colorado



Eroded remnants of the ancient Guffey volcano are visible from a scenic overlook 13–14 miles (21–22 km) from Florissant Fossil Beds National Monument (map on back). This volcano had an enormous impact on the Florissant valley 34–36 million years ago. Volcanic debris flows entombed giant redwood stumps along the stream valley and later dammed the stream to form Lake Florissant. Eruptions of volcanic ash fell into the lake and led to the formation of delicate shale that preserved fossil leaves and insects.

Deep History of the Rocky Mountain Region

The modern Rocky Mountains formed between 70 and 40 million years ago, beginning at the end of the Cretaceous Period and continuing into the Eocene Epoch. This mountain uplift, known as the Laramide Orogeny, is thought to have originated as the angle of plate tectonic subduction of the ancient Farallon Plate along the Pacific Coast became shallower, more horizontal in orientation, and extended eastward into the continental interior. Volcanoes formed in association with this plate tectonic subduction. Following this period of uplift, the surface was beveled by erosion into an undulating landscape dissected by streams such as the one that formed the ancient Florissant valley.

Colorado Volcanoes

Beginning 37 million years ago, eruptions from large collapsing calderas caused hot ash flows to race across the eroded landscape like volcanic hurricanes. Volcanic activity intensified as the subducting tectonic plate began to steepen again and move westward. About 34–36 million years ago, a stratovolcano similar to the Cascade Range mountains formed near Florissant. Eruptions from this stratovolcano produced ash, lahars (volcanic mudflows), and rocks including pumice, andesite, and breccias. One of these lahars, and the eroded remnant of the stratovolcano itself, can be observed along the route shown on the map at back. Volcanic activity continued in southwestern Colorado until 23 million years ago. It was one of the most significant volcanic periods in Earth's history. In more recent geologic times, volcanic activity continued in Colorado with more subdued eruptions of basalt flows.

Eruptions from the stratovolcano form the Thirtynine Mile volcanic area of the central Colorado volcanic field. Within this area is the Guffey volcanic center, which is the core of the Guffey volcano. At its base, the volcano was about 12 miles (20 km) in diameter and may have had more than one summit. Today, most of the Guffey volcano has eroded away.

How did the Guffey volcano change Florissant?

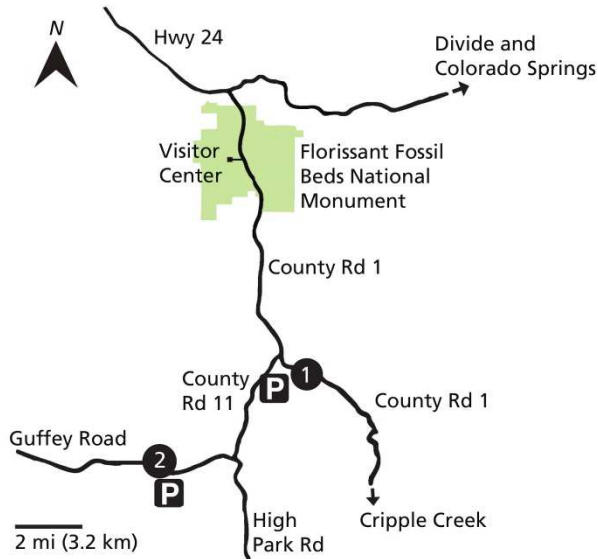
The Guffey volcano erupted multiple times, sending ash and lahars down into the Florissant valley. One lahar flowed eastward from the slopes of the Guffey volcanic center and dammed the stream in the ancient Florissant valley, forming Lake Florissant. This lahar can be seen at stop 1 (see back). Another lahar later flooded the valley with volcanic debris that enveloped and preserved the redwood stumps. Later still, another lahar flowed



into Lake Florissant and churned up sediment that is visible today as the caprock conglomerate. Ash from the volcano fell into Lake Florissant. Ash, clay, and single-celled algae called diatoms formed paper-thin layers of lake shale, which preserve many fossil plants and insects. The youngest rock unit in the Florissant Formation contains pumice, which is evidence of a large eruption that ended the existence of the lake.

An artistic reconstruction of the Guffey volcano 34 million years ago depicts fresh volcanic debris spilling into Lake Florissant. In the background, the valley stream erodes through a dam of older volcanic material.

Number 3 of the Geologic Bulletin Series, 2017 – Page 2



Artistic reconstruction of a lahar as it dammed the stream. Note the mixed size of debris throughout the volcanic mudflow.



The rock breccia that formed from a lahar is exposed at stop 1.

1 Stop One — Lahar that Dammed Lake Florissant

Turn right on Teller County Rd 1 out of the Florissant Fossil Beds visitor center parking lot. Drive 6.7 miles (10.8 km) and *turn right onto County Rd 11*. Turn immediately left into a parking lot past the intersection. Walk about 300 yards (about 300 m) diagonally south across a field to county Road 1 and continue to the roadcut. Be aware that there are no parking or turnaround areas if you try to drive to the roadcut. This is a dangerous area for pedestrians. *Use extreme caution!*

On both sides of the roadcut you can see the lahar that originated from the Guffey volcanic center to the west. This lahar dammed the stream that flowed through the ancient Florissant valley, thus forming Lake Florissant. The lake was about 1 mile (1–2 km) wide and extended 12 miles (19 km) northwards. The debris carried by the flow contained rock fragments of different compositions, shapes, and sizes (sand grains to boulders), which is typical for lahars. The dark fragments are pieces of Thirtynine Mile andesite (a dark, fine-grained volcanic rock). The lighter, pinkish fragments are pieces of 1.4-billion-year-old Cripple Creek Granite. Notice that some rocks are rounded, indicating that they were picked up from the streambed by the lahar. In the roadcut on the east side, you can see a light-colored clastic dike of sediment that squeezed up from the streambed as the lahar settled.

2 Stop Two — Guffey Volcanic Center Viewpoint

Turn left out of the parking lot (going southwest) onto County Rd 11. Proceed 4.0 miles (6.3 km) and *go right at the fork, onto Guffey Road (County Rd 112)*. Continue for 2.7 miles (4.4 km), until you see a large turnout on the left, at the crest of the hill (just past mile marker 14). There is also parking on the right. Park on the left and cross the road. *Use caution when crossing, as this is a blind hill!* Walk 200 feet (60 m) north, pass the sign, and continue another 100 feet (30 m) veering slightly to the right, off the trail (do not go down!). This will lead you to a rocky overlook.

You are standing on 1.4-billion-year-old Cripple Creek Granite. Looking west across the valley, you can view the remnants of the ancient Guffey volcanic center in the Thirtynine Mile volcanic area. From left to right (south to north), some of the peaks that remain are Witcher, McIntyre, Castle, Saddle, and Thirtynine Mile Mountains (see labeled picture at top of front page). These modern mountains formed the slopes surrounding the ancient volcanic center. The layered volcanic flows in each peak dip in different directions around the volcano's summit.

The lahars that flowed from the Guffey volcanic center once filled this valley to a level far above the point on which you are standing. The valley of modern West Four Mile Creek below you formed as erosion cut through the lahars and exhumed the surface of the ancient valley. As it did so, the creek became entrenched, or trapped, in its path and was not able to change direction when it encountered the much harder Cripple Creek Granite beneath it. This is how the canyon to your right (north) was formed.



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Florissant Fossil Beds Petrified Forest

National Park Service
U.S. Department of the Interior

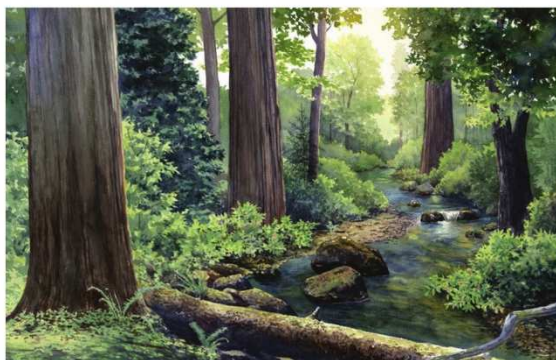
Florissant Fossil Beds
National Monument
Colorado



A tall forest grew in the Florissant valley 34 million years ago. Some of the trees survived as fossils that are visible on trails today. Scientists have studied Florissant's fossil wood to understand changes in climate and forest composition and the process of petrification—turning wood into rock.

Why are only stumps left?

Heavy rain or rapid snowmelt can sweep rock and ash from volcanos into thick mudflows called lahars. Lahars can rush downslope at up to 120 miles/hour (190 km/hr). One lahar from the ancient Guffey volcano flowed through the Florissant stream valley 34 million years ago. This flow buried the forest there under more than 16 feet (5 m) of debris and killed the trees by preventing oxygen from reaching their roots. The lahar encased and protected the lower trunks, which are preserved as fossil stumps. The roots and treetops decayed or broke off.



Artistic reconstruction of the Eocene forest at Florissant.

What kinds of trees lived in Eocene Florissant?

Most Florissant fossil stumps are redwoods similar to the coastal redwoods now living in California and Oregon. Other petrified wood comes from hardwoods, including *Hovenia* (related to Japanese raisin trees), *Koelreuteria* (golden rain tree), *Robinia* (locust), *Zelkova* (related to elms), and *Chadronoxylon* (extinct).

Are there more stumps underground?

Researchers have searched for undiscovered stumps at Florissant in several ways. Ground-penetrating radar, which measures reflections from electromagnetic pulses, has not been effective because the upper soil of the park is rich in clay. A recent study shows promise for detecting stumps with a magnetometer instead. This is because the local magnetic field is weaker above the silica-rich stumps than above the surrounding volcanic rock, which contains the magnetic mineral magnetite.

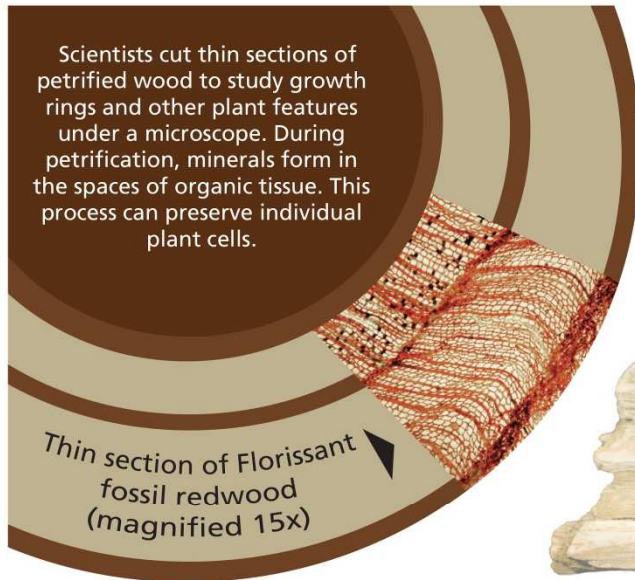
How does a tree petrify?

When mineral-rich water penetrates wood, it deposits silica on the plant cells. As the wood decays and water continues to seep in, more silica minerals (opal, quartz, and a quartz with microscopic crystals called chalcedony) form inside the cells. Most of the silica in the stumps at Florissant probably came from volcanic rock and ash. Certain types of wood, like redwood trunks, are more durable than others, which may make them more likely to petrify. Experiments show that wood can petrify in tens to hundreds of years in ideal conditions, but it likely took much longer for the stumps at Florissant to turn into rock. Some plant tissue remains after wood petrifies, which helps preserve the tree anatomy in cellular detail.



A section of fossil wood from *Koelreuteria* (golden rain tree) shows vessels. Magnified 20x.

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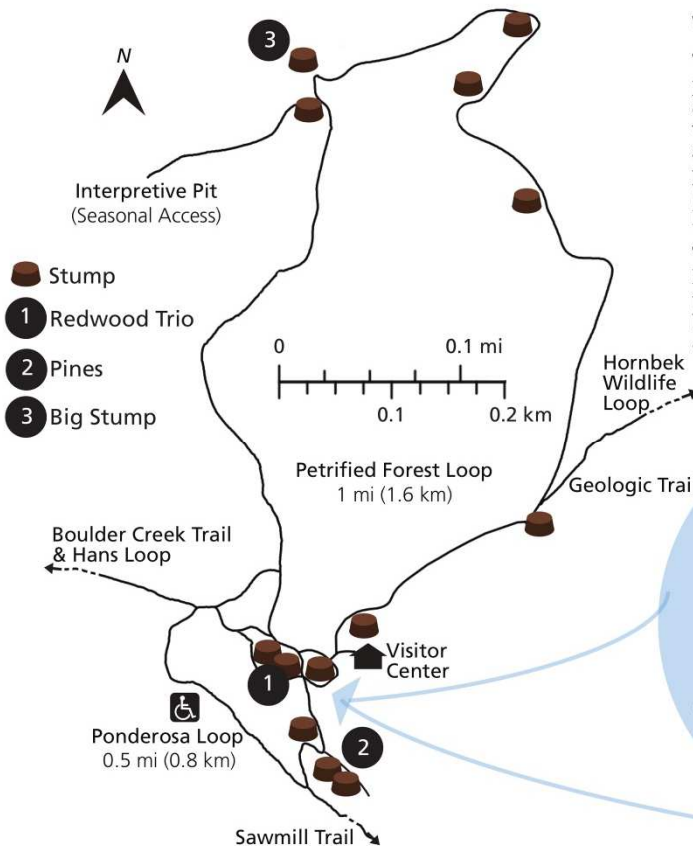


Do the stumps have growth rings?

Some of the petrified redwood stumps at Florissant show clear growth rings, while others are hollow in the center. The Florissant fossil tree rings are wider than those of living coastal redwoods, indicating a better growing season in the past. A technique called tree ring cross-dating matches the patterns of thin and thick rings among different trunks to see if the trees lived through any of the same drought or wet periods. Petrified Florissant trees have the same patterns, so it is likely that all the trees in the forest died at the same time. A single lahar probably covered the entire valley in a day.

Colorful Petrified Wood

You can see many colors in the petrified stumps. Cream-colored fossil wood usually contains quartz. Dark brown or gray indicates organic material, often in opal. Iron minerals make other colors, including black and dull red.



Where can I see petrified stumps?

The Ponderosa Loop and Petrified Forest Loop trails pass more than a dozen petrified stumps (map at left). Some of the **best stumps lie right behind the visitor center (stop 1)**. On the Ponderosa Loop trail, a modern forest surrounds the fossil one, and **living pines grow directly on top of petrified stumps (stop 2)**! The **Big Stump (stop 3)** on the Petrified Forest Loop trail is completely excavated.

The petrified stumps are the largest fossils at Florissant and are some of the largest diameter fossil trees in the world. Please help protect them by staying behind railings. Federal law prohibits disturbing or collecting fossils in the national monument.

Explosive Excavations

Early settlers knew of the stumps near Florissant, and tourists arrived with the railroad in 1887. Collectors removed dozens of exposed stumps by the turn of the century, sometimes by wagon loads. In the 1920s, two commercial sites excavated stumps on the land. One of these private operations used dynamite, which likely contributed to the cracks visible in the stumps under the shelters by the visitor center.



How many birds will you find?

21st Annual Great Backyard Bird Count
February 16-19, 2018

Join in! Count birds in your backyard, local park, or wherever you spot a bird, and submit your observations online.

birdcount.org

Saturday, February 17, 2018

Florissant Fossil Beds National Monument

1st Count 9:15 AM – 10:30
2nd Count 10:45 – 12 noon

Cedar Waxwing
Photo: Jane Tomer/GBBC



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