



Friends of the Florissant Fossil Beds Newsletter

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Inside this issue:

- Sexi—Our Sister Park in Peru 2
- A Sexi Adventure 3
- Troy Fuhrman receives Award 4
- Founders' Fund Created 4
- Bristlecone Pines 5
- 2009 Seminars 6
- Thanks 7
- Peru Seminar Planned for 2010 8
- Sexi Brochure 9

40th Anniversary of the Fossil Beds Celebrated

On August 22nd, Florissant Fossil Beds National Monument celebrated the landmark environmental law case that



resulted in the creation of the Monument 40 years ago.

In the summer of 1969, the area

that is now Florissant Fossil Beds National Monument nearly be-

came an A-frame housing subdivision. The Monument was saved by a

grassroots group called the Defenders of Florissant and a precedent-setting legal team. Together, they succeeded in convincing a federal court to file an injunction to stop the developers' bulldozers long enough for a bill to be passed and the president to sign it.



Estella Leopold—Originally fought for founding of the Monument

“How can a group of citizens take on the real estate establishment? Well...it's love and sci-

(Continued on page 14)



Keith Payne—Superintendent (All 40th photos by Steve Wilkinson and Jeff Brandt)

Letter from the Superintendent—New Visitor Center

by **Keith Payne**-Superintendent, Florissant Fossil Beds National Monument

Visitor Education and Museum/Research Facility On Track For 2011

The quest for the new Visitor Education and Museum/Research Facility continues at Florissant Fossil Beds – and we have never been closer. We have

held our position in the NPS construction program and are optimistic that construction will begin in 2011, barring any unforeseen setbacks. This means that we have to get the design and construction drawings done in 2010, so things may start to happen quickly.

Most of you have probably not seen the newest concept for the

visitor facility, so I want to describe it for you. It is a “green” building that will use sustainable materials, employ alternative energy sources, and be energy efficient and water conserving. The spatial organization is almost identical to the previous concept, as you can see from the floor plan on page 13.

(Continued on page 13)

Sexi—Our Sister Park in Peru

By **Herb Meyer**, Florissant Fossil Beds Paleontologist

In May 2009, a new international partnership between the *Friends of the Florissant Fossil Beds* and *Asociacion de Preservacion y Defensa de los Restos Paleontologicos del Distrito de Sexi* finally became a reality. The Friends president, Steven Veatch, signed the document authenticating the partnership agreement during the May 7th, 2009 board meeting. Representing the Monument and the Friends I carried it to Sexi, Peru later that month, where it was presented to the local nonprofit group, along with a framed photograph of the Friends board members. The new agreement will help to provide assistance to the local community for conserving and understanding the important middle Eocene petrified forest, El Bosque Petrificado Piedra Chamana, which is located along the rim of the canyon of the Rio Chancay just a short distance from Sexi.

The trip to Peru also included Dr. Deborah Woodcock of Clark University, who has been involved in the research of the fossil woods, and Christina Whitmore, who is the monument's museum technician. Besides presenting the new agreement, the purpose of the trip was to mark the route for a new interpretive trail, and to provide the local community with a new interpretive brochure (See pages 9 and 10 below) and five exhibit panels about the site. These materials were printed using funds that had been raised by

the Friends to help support the project in Peru.

The exhibit panels will be placed in the village's small museum, which was constructed using funding provided by the National Science Foundation in a grant to Deborah Woodcock and myself. This museum has remained empty since it was built about four years ago. Many more exhibits are needed in the future to help fill the museum with information about the fossils, the geology, the biological setting, and the culture of the local people. The museum is located next to the school in Sexi, and it will help educate the young students in the village as well as visitors who are expected to start coming to the site in the future. In the meantime, Sexi remains a tranquil, remote little village that is seldom visited by outsiders.

Another new advance in our project is the publication of a scientific paper describing the geology of the area and its fossils. This paper, by Woodcock, Meyer, and others, appeared in the July/August issue of the *Geological Society of America Bulletin*.

We are currently planning to offer a trip to Sexi as one of the Friends accredited seminars in June 2010. It is hoped that this will provide a chance for American teachers and others to see and understand the petrified forest at Sexi, and also to provide inter-

(Continued on page 8)

Las Piedras y Fósiles de Piedra Chamana

Estratos o Capas de Rocas

Diferentes tipos de rocas pueden observarse cerca de Sexi. Los de más abajo son los más viejos, los de más arriba los más jóvenes. Cerca del fondo de la secuencia hay un suelo muy antiguo, cubierto de cenizas volcánicas. Algunos de los árboles antiguos están atrapados en este paleosuelo. Aluviones de cenizas crearon gruesos estratos de piedra, los que forman la mayoría de las colinas en los alrededores de Sexi.

Rock Layers

Several different layers of rock can be seen around Sexi. The rocks on the bottom are the oldest, and the ones on the top are the youngest. Near the bottom, there is a layer of ancient soil, covered by a layer of volcanic ash. Some of the ancient trees were rooted in this soil layer. The volcanic mudflows created thick layers of rock, and these are the rocks that make up most of the hills around Sexi.

Rocks and Fossils of Piedra Chamana

Que son los Fósiles?

Los fósiles de Piedra Chamana son de la época del Eoceno. El estudio de las maderas y hojas fosilizadas demuestra que el bosque que existió aquí hace 39 millones de años era tropical y muy diferente a la vegetación actual. Es evidente que el clima ha cambiado en el tiempo y que la región se elevó por la formación de los Andes.

What Do Fossils Tell Us?

The Piedra Chamana fossils date from the Eocene epoch. Study of these fossil woods and leaves shows that the forest that lived here 39 million years ago was tropical. The ancient forest was very different than the vegetation at Sexi today. This shows that the climate has changed through time, and that the region has been uplifted because of the rise of the Andes Mountains.

Hojas Fosilizadas

Delicadas impresiones de hojas fosilizadas se encuentran en las cenizas volcánicas. Las hojas de los árboles cayeron sobre una capa de ceniza fina producto de las erupciones volcánicas y fueron enterradas por las cenizas. Con el tiempo los detalles de las hojas quedaron grabados en la roca endurecida.

Fossil Leaves

Delicate fossil leaf impressions are found in the layers of volcanic ash. The blasts from volcanic eruptions stripped leaves from the trees. As the ash from these eruptions settled to the ground, the detail of the fallen leaves were imprinted into the hardened layers of rock.

Maderas Fósiles

Los troncos y ramas fueron enterrados en los aluviones y cenizas volcánicas. Estos aluviones fueron de material volcánico que fluyó desde el volcán como concreto mojado, enterrando los grandes árboles del bosque.

Fossil Wood

Petrified wood was buried in the layers of volcanic mudflows and ash. These mudflows are made of volcanic debris that flowed like wet concrete off the volcano, burying large tree trunks as they flowed into the forest.

Rocks and Fossils—New exhibit poster for the museum in Sexi

A Sexi Adventure

by **Christina Whitmore**, Florissant Fossil Beds Museum Technician

In May, I traveled to Peru with Dr. Herb Meyer in order to see



Herb, Deborah, Christina with new exhibits in the museum

and experience The Bosque Petrificado Piedra Chamana in Sexi, Peru. This was my first trip to South America and I was eager for the journey. Of course, part of the adventure is actually getting to your destination.

Our drive into the Andes Mountains and to the village of Sexi led us through villages with children playing in the streets as well as young men bringing in crops from the field. As night came, we found ourselves travelling in the rain along muddy mountain roads with just the lights from the truck to lead us. I am assuming most of you reading this live in Colorado and know the meaning of a mountain road. You know...one and a half lanes of dirt and gravel with a 500-foot wall on one side and what seems like a 5000-foot drop on the other. Well, that was us driving unassumingly through the Andes Mountains until we noticed something odd in the head lights. At first, I could not quite figure out what was in our way until I noticed boulders coming down the slope and landing in the roadway. A landslide had just taken place moments before we arrived! Now what are we going to do, I thought? Here we are perched on the ledge of a mountain, in the pitch dark, the road is blocked, and another landslide could happen at any moment. We soon noticed that there were vehicles stopped in the road on the opposite side of the landslide as well. While I was wondering how long it would take the Peruvian Department of Transportation to show up, these men were removing the rocks from the roadway by hand. They removed enough of the rubble that we were able to make it through and drive on to Sexi.

I found the village of Sexi to be a beautiful and remote place that is home to the most wonderful and kind people. The accommodations were simplistic where four of us shared an adobe room with a dirt floor in the local "hotel." The privy was out back through the courtyard and I feel I must mention there was no

toilet seat. Our hosts fixed us very delicious and filling meals. On our last night in Sexi they prepared the Peruvian delicacy cuy (AKA guinea pig). I sat looking at these little boney legs standing straight up on the plate thinking "Is this the cousin of my sister's pet guinea pig Ralph?" Well it was actually pretty tasty but just for the record...cuy is very chewy.

In Sexi, I met Elba who is always eager to help in the field. This visit she helped Herb and me flag a hiking trail. Although I speak little Spanish and Elba speaks no English, we were able to communicate with very little difficulty. Herb and I also performed inventory and monitoring of the fossil sites. The first time I saw the Bosque Petrificado Piedra Chamana I was amazed. I just kept turning around in circles because petrified wood was everywhere. No matter what direction I looked there were fossils all over the ground. The back drop to this is the most amazing view into the lush green canyon of the Rio Chancay. For a geologist and someone who loves science this was such a beautiful and almost incomprehensible site.

The village of Sexi built a museum in order to share these treasures with visitors who come to their village. We brought large laminated posters to the museum that explained the geology of the landscape and the significance of the paleontological re-



Truck travelling up the muddy road to Sexi after several days of rain

sources in the area. These posters are the first exhibits to be displayed in the new museum. We also visited the school which was a small adobe building with the students neatly dressed in navy uniforms. Here we handed out the brochures we brought for the Bosque Petrificado Piedra Chamana and the children look on with anticipation as they were shown the new museum exhibits.

For me this trip was an amazing adventure. I was able to travel to a beautiful remote village in the Andes Mountains where few people will ever go. It was refreshing to experience Peru far away from tourists who limit themselves to the other well known

(Continued on page 11)

Founders' Fund Established

At the October Board Meeting of the Friends, we voted to establish the Founder's Fund. It was established in honor of all those who were responsible for the founding of the Florissant Fossil Beds NM in 1969. From those who fought the legal battle to those who would lay down in front of the bulldozers and the members of Defenders of Florissant, the fight was a long one but well fought and won!!

The establishment of this fund was spurred by a generous donation from John Wright, Vim Wright's son. Vim was a member of the Defenders of Florissant. John's donation came very shortly after the 40th Anniversary celebration of the founding of the Monument. Although he put no restrictions on the use of his donation, it was felt by the Board that John's donation should be used as the seed funding for a permanent account whose purpose would be to provide long-term benefits and enduring projects to enable and/or enhance preservation, interpretation, and education at the Monument.

The Founders Fund is a means by which we can recognize the work of so many who worked so hard to establish the Monument, and build upon their work by helping the Monument meet its mission goals for the future: "... *conduct scientific research and interpretation of the fossils; and to protect, preserve, and interpret the natural and cultural resources of the Monument.*"

To that end, the Board proposes that the Founders Fund's initial

goal be to support the production and installation of furnishings and exhibits for the new visitor center. The Monument is optimistic that the new visitor center will begin construction in 2011, but due to the congressionally-imposed funding cap on the project, the cost of the structure alone is likely to use most of the available funds. The furnishings and exhibits may have to remain initially incomplete. It is therefore proposed to dedicate the Founders Fund toward covering all or part of any funding shortfall to enable the acquisition and installation of the complete exhibit and furnishings packages called for in the plan at the soonest date possible. Using the fund for this purpose is a fitting way to recognize and pay tribute to the Founders, and at the same time help the Monument realize its goal to interpret the natural and cultural resources of the Monument. Should the project bids permit the entire development package – structure, exhibits, and furnishings – to be realized within available NPS funds, the Founders Fund could be redirected toward other, related goals for resource protection, interpretation, education, and visitor service.

The Board encourages you to make a donation to this fund by sending a check to the Friends of Florissant Fossil Beds, P.O. Box 851, Florissant, CO 80863. We thank you in advance for consideration of this request. Please remember that all donations are tax deductible. Please specify that the donation is for the Founders' Fund.

Visitor Service Award—2009—Congratulations Troy

At the Friends' Annual Pot Luck meeting in September, the Visitor Service Award for 2009 was presented to Troy Fuhrman, the Facilities Manager (Chief of Maintenance) at the Florissant Fossil Beds National Monument.

Troy is well-known for his support of everything that goes on at the Monument. His dedicated staff is always in high gear for any event. The Monument "shows its best face" with Troy in charge. His ability to stretch federal funds to get what we need is amazing. With a smile always on his face and a cheery greeting to everyone, he gives his best every day to ensure that every visitor has a great experience.

Troy joined the Minnesota National Guard on his 17th birthday as an Infantryman and completed basic training between his Jr. and Sr. year of high school. Upon graduation from high school in 1985, Troy joined the U.S. Army and served until 2005. His service included duty with the 10th Mountain Division, the 101st Airborne Division, the 3rd Armored Cavalry Regiment and others.

His awards include the Meritorious Service Medal, Army Commendation Medal, Army Achievement Medal, Humanitarian Service Medal and many others. He also held many leadership positions throughout his military career.

In May of 2005, Troy began his career with the National Park Service in Yellowstone National Park. He served as Administrative Clerk for numerous divisions within the headquarters at the

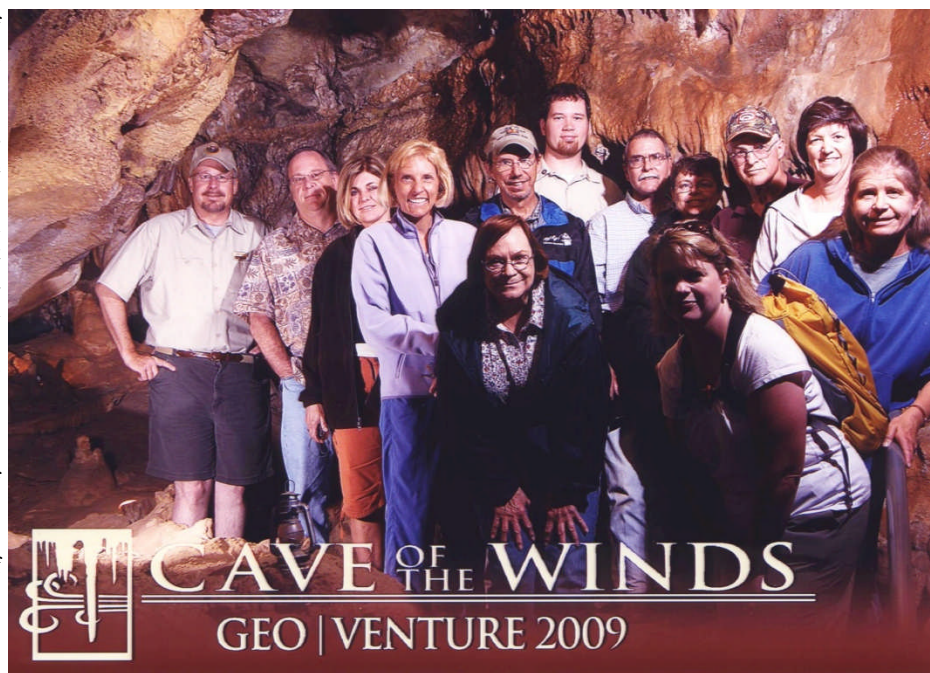
Mammoth Springs area. While there, he received numerous awards for the development of several data bases including Fleet Maintenance and Human Resources which aided in streamlining hiring of seasonal personnel.

In April of 2007, Troy joined the staff at Florissant Fossil Beds NM. He is married to Allison Elwood of Bozeman, Montana. Troy loves fishing, kayaking, camping and rock hounding. He and Allison have had a home in Cascade since 1998. We congratulate Troy for receiving the Visitor Service Award for 2009. How fortunate we are to Troy at the Florissant Fossil Beds NM!



Cool Caves & Red Rocks

Cool Caves and Red Rocks was one of many new summer seminars offered by the Friends of the Florissant Fossil Beds in 2009. This is the first time the Friends have had a seminar in an urban setting. This seminar explored the Cave of the Winds, Garden of the Gods, and Red Rock Canyon Open Space (RRCOS). During the last part of the seminar participants made a hike up a Dakota Sandstone Hogback to look at dinosaur tracks left during the Cretaceous Period. Attendees received a draft of a new field guide to Garden of the Gods and RRCOS being worked on by the instructors, a specimen of amethyst, and a full day of fun. Steven Veatch and Gregory Kats were the instructors for this new seminar. . Look for an exciting schedule of new summer seminars in 2010.



Silent Witness of the Past—The Bristlecone Pines

by **William Dexter**

What was it like here in central Colorado some two thousand years ago, about the time of the first Christmas? Was the weather and climate the same then as it is now? The answer to this question may be recorded in the tree rings of our local bristlecone pine trees.

From a windblown ridge above the summit of Wilkerson Pass one can find a variety of craggy, gnarled and twisted remnants of bygone days, recorded for us, like pages in a book, the environment of the past. The bristlecone pine tree (*Pinus aristata*) is an evergreen found exclusively between 9,000 and 11,000 feet elevation. They grow to a height of 50 feet and are known to have life spans upwards to 6,000 years! Some represent the oldest known living organisms! Bristlecone pines are easily recognized then by clumps of needle-like bundles, found in groups of five. These are bluish-green in color and are normally covered with specks of resin. Their dense pine bows or foliage heads resemble the tail of a fox - hence they are popularly called foxtail pines.

The annual precipitation where modern bristlecones grow, averages only 10-13 inches per year, slightly above desert conditions. Since present day situations are indicative of the past, we must assume that the same living requirements for those trees living thousands of years ago were the same as now. Bristlecone pines grow on the windward sides of hills and ridges here in Teller and Park counties, where the wind itself reflects its greatest effect. Here, trees tend to lean toward the direction of the primary solar

rays and toward the prevailing winds.

The majority of our weather and winds come from the north and the west - and from the slopes of the continental divide. Here, from higher elevations, dense cold air rushes down slope to the south and to the east. Wind is the actual displacement of air from a region of high concentration, or high density, to one of low concentration or low density. Air, then, moves from higher pressure to lower pressure and from lower temperatures to higher temperatures. A response to this fundamental cause of wind can be seen in the irregular growth characteristics of the bristlecone pine trees. Inconsistent wind speeds and gravity response also strongly affect the crooked nature of their structures.

Bristlecones, like all plants, respond to the direction of prominent sun's rays and tend to bend in that direction. It has been long said that "plants need sunlight", hence bend toward the sun! This sounds like a good answer, but it's utter nonsense! We cannot give any inanimate object the power to reason!! There is a response though, to sunlight stimulus called phototropism - meaning turning toward light. There is also an acceptable explanation for why this happens. Within the system of green plants there is a chemical substance called auxin, a growth hormone which stimulates the length of cell growth. There is a natural increase in cell elongation on the dark sides of any plant (the side away from the sun's rays). The side facing the sun is growth retarded. This is very evident in the bristlecone pine trees, as

(Continued on page 12)

2009 Summer Seminars

The summer of 2009 was quite an amazing summer at the Florissant Fossil Beds NM. The Friends' Summer Seminars were dedicated to the 40th Anniversary of the founding of the Monument.

The two seminars held on August 22-23 were part of the 40th Anniversary celebration and focused on the history of the founding of the Monument and the history of Paleontology and Tourism of the Monument. Both were well attended. Estella Leopold addressed the Saturday



seminar attendees in the Florissant Library. During the Saturday afternoon segment of the seminar, we heard many inspiring speakers relate the steps taken by lawyers, the Defenders of Florissant and neighbors of the Monument.

Altogether, 9 seminars were held this summer that included Storytelling, Insects of Colorado, Red Rocks and Cool Caves, Sustainability, the Ecology of the Flammulated Owl, Flora of the Fossil Beds and the two seminars during the 40th Anniversary

We have already begun preliminary work on the 2010 seminars that will include the trip to Sexi, Peru next June. Note the articles in this newsletter that outline the trip that will be offered for credit.



New Book—History of the Cripple Creek & Victor Gold Rush

New Book Outlines History of the Cripple Creek & Victor Gold Rush

A ranch hand named Bob Womack discovered gold in 1890 in a gully in what was to become Poverty Gulch and Cripple Creek. Soon after gold was found in nearby Victor by Winfield Scott Stratton and the world was abuzz with the news of gold fever on the west side of Pike Peak.

The rest is history – Cripple Creek & Victor became known as The World's Greatest Gold Camp. Still producing gold today, the district is well known for its boomtown days and there are several stories recounted of the gold rush that put the gold camp on the map, statewide and nationally.

A new book published by the Western Museum of Mining & Industry (WMMI) in Colorado Springs includes a dozen articles on the gold rush – from geology to secret codebooks used by mine owners like Stratton to communicate their treasured information.

The World's Greatest Gold Camp, An Introduction to the History of the Cripple Creek & Victor Mining District was released July 8, 2009 and is the second of a series of Mining History & Technology books produced by the WMMI.

Authors include Victor resident, and retired mining engineer Ed Hunter, Paul Mogensen of Montana and Steven Veatch of Florissant.

Hunter worked in the metal mining industry, underground and surface, from Arizona to Alaska and from miner to manager for over 50 years. He is an avid mining historian and has been active in the WMMI.

Mogensen's professional career started in 1954 as a geologist in the Gas Hills uranium field of Wyoming. His retirement 50 years later allowed him to indulge in his lifelong interest in mining history. He resides in Hamilton, MT.

Veatch is a geologist, historian and author. Veatch's great grandfather worked at the Elkton Mine between Cripple Creek & Victor for 30 years.

The printing of the book was made possible by the WMMI Cherry Hunter Art Fund and all proceeds from the sale of the book assist the WMMI with their operations.

The Western Museum of Mining and Industry brings the history of Mining to life for you through a variety of exhibits complete, with daily guided tours included with admission. Exhibits include mining equipment such as steam engines, drills, and pumps in actual operation. The WMMI is located at 225 North Gate Blvd. in Colorado Springs. The hours of operation are Monday - Saturday from 9:00 a.m. - 4:00 p.m. with tours at 10 a.m. & 1 p.m. For more information, visit wmmi.org.

Both volumes of the Mining History & Technology Series are available by contacting the WMMI.

Thanks for a Great 2009 Summer Internship

Dear Friends of the Florissant Fossil Beds:

Thank you for sponsoring the Geocorp America internship position at Florissant Fossil Beds National Monument, through which I was able to experience a summer at this wonderful monument. I have desired to be a paleontologist since elementary school, and this summer has provided me with invaluable work experience in the field of paleontology. This summer I worked on two major projects, the reopening of Samuel Scudder's excavation site and the inventory and monitoring of many of the fossil sites within the monument.

The site that was excavated this summer is speculated to be the site where Charlotte Hill found several of her most beautiful specimens, including the butterfly *Prodryas persephone*, and where Samuel Scudder did some of his collecting. Following their legacy, our excavation uncovered two *Florissantia sperii* flowers (one very well preserved), a beautifully preserved wasp, a few spiders, and several other amazing leaves and insects. Aside from the rare and spectacular finds, we found many other leaves and insects that will be used to conduct diversity analyses to estimate exactly how diverse the plants and insects of the late Eocene were. This research is very important in understanding the impact of the global cooling at the end of the Eocene. By

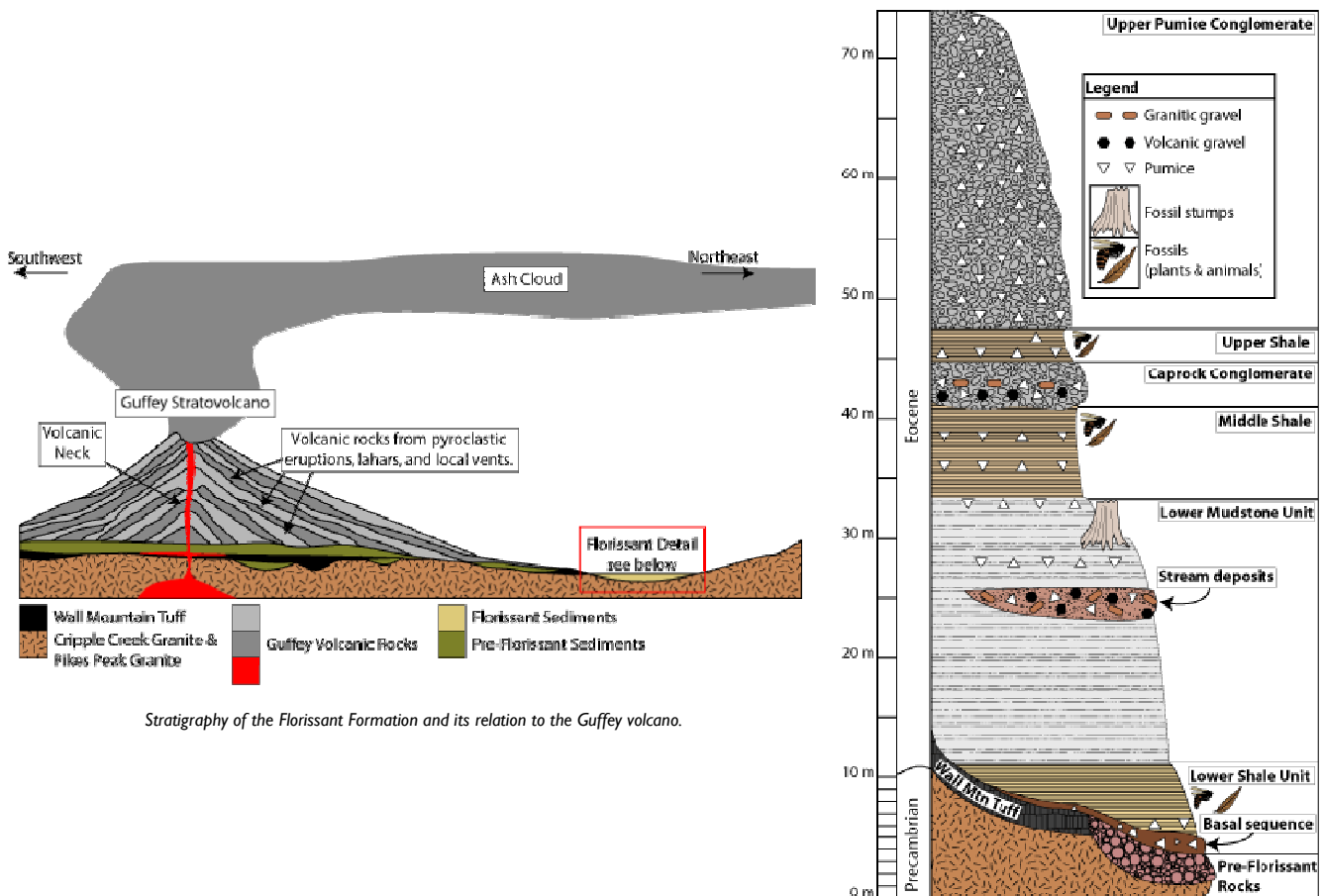
comparing the diversity of Florissant with other similar fossil sites in the late Eocene and Early Oligocene, scientists may be able to better understand the dynamics and impacts of climate change.

I also worked on the inventory and monitoring of fossil sites within the park, including both shale exposures and petrified stumps. I photographed sites from specific locations and angles and also noted changing rates of erosion or signs of theft. The data and photographs collected can then be used to observe the changes of a site over time. As a fossil park, it is important to maintain and protect the fossil sites, and through inventory and monitoring, the monument can learn which sites must be better protected for the benefit of future generations.

This summer has been a truly wonderful experience. I have learned a lot about both paleontology and the National Park Service, and I wanted to express my sincere gratitude for making this opportunity possible for me.

Sincerely,

Jamie Fearon
 Jfearon1@olivet.edu



Sexi (Continued)

(Continued from page 2)

action with the local school there. Anyone who is interested in going should contact Herb Meyer at the Monument (719-748-3253).



Steven Veatch and Sally Maertens sign the agreement for a new partnership between the Friends and Asociacion de Preservacion y Defensa de los Resots Paleontologicos del Distrito de Sexi

Peru Seminar Course Planned for June 2010

The Friends are now beginning to plan for a new seminar next June, which will visit the petrified forest El Bosque Petrificado Piedra Chamana at Sexi, Peru. The site is similar to Florissant in having Eocene petrified trees, but it is in a much more primitive condition, perhaps similar to Florissant during the 1870s. The course will be offered for teacher's continuing education credit, accredited by Adams State College. The instructors will be Dr. Herb Meyer and Dr. Deborah Woodcock, who have been doing scientific research at the site during the past ten years and are familiar with the local community.

This will be the first seminar that the Friends have offered abroad. As far as we know, the Friends of Florissant is the only national park Friends group that has developed an international partnership with a foreign nonprofit organization, in this case the Asociacion de Preservacion y Defensa de los Restos Paleontologicos del Distrito de Sexi. Participation in the seminar will provide pioneering opportunities in geotourism, to help set the tone for future tourism, conservation, and education at the site. To date, very few foreigners have been to Sexi.



The Museum building in Sexi

We hope to be able provide interaction with the local school in this remote little Andean village, providing an opportunity for international exchange of ideas between science teachers. There will be continuous opportunities for Spanish-language immersion, although the ability to speak Spanish is not required for participation. The seminar will be open to all who are interested, either for credit or non-credit, but the number of participants will be limited and you should sign up early. Participants must be fit and capable of hiking at high elevation.



Members of the local non-profit organization in Sexi, along with Deborah Woodcock, Herb Meyer, and Christina Whitmore

The estimated cost will be about US\$3500, including airfare which participants will need to arrange independently. The seminar will be about six days in duration, not including travel to and from Peru. The specific dates during June 2010 will be announced soon. The primary focus will be on the geology and paleontology of the petrified forest and its application to the education and development of the local community in Sexi. Secondary topics will include the natural history, physical geography and climate of this part of South America, and the archaeology of the ancient Moche culture. We will be working closely with the local community to help them develop educational interpretation and conservation of this important fossil site. If you want to join us, please contact Dr. Herb Meyer (Herb_Meyer@nps.gov, phone 719-748-3253).

Sexi Brochure (in English)

El Bosque Petrificado Piedra Chamana

Sexi, Peru



El Bosque Petrificado Piedra Chamana is a petrified forest near the village of Sexi, Peru, located about 100 kilometers east of the city of Chiclayo. The site is protected by the government of Peru through the National Institute of Culture, and by the Association for the Preservation and Defense of the Fossils of the District of Sexi (the APDFS), located in Sexi. The fossil forest is open for the public to visit. Upon arrival, visitors need to contact the APDFS to arrange for a guide.

Volcanoes, Rocks and Fossils

As you stand at the site of the fossil forest, looking across the dramatic landscape of the Rio Chancay canyon toward the Continental Divide, it is hard to imagine explosive volcanoes erupting and producing large plumes of ash that rise high into the air. Before human beings existed on Earth — before the modern Andes Mountains rose up to their high elevations — volcanoes were active in this area.

The eruptions produced volcanic ash that was carried by the wind and eventually settled to the ground, trapping leaves that had fallen from the trees and covering the earth to a depth of about a meter. Some of the volcanic ash combined with rainfall to create small balls of ash that fell from the sky like hail stones. Rain falling on the loose ash created volcanic mudflows called *lahars* that flowed downhill like wet cement, knocking over trees, covering the ash layer, and burying the forest.



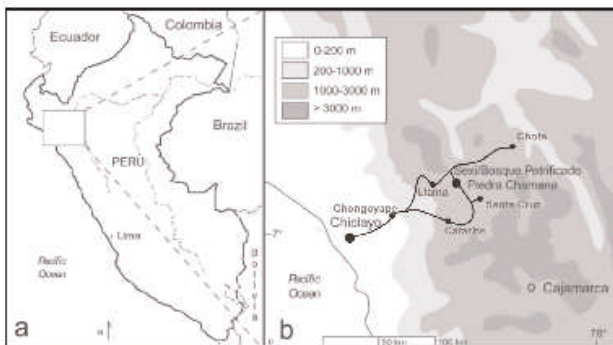
Large petrified logs such as "Pdo Tendido" are preserved in volcanic mudflows.

Gradually the ash and the mudflow hardened to form rock, and much of the plant material trapped within the rock began the process of fossilization. The leaves buried in the ashfall decayed, and fossil impressions in the rock are all that remain. Little by little, water permeated through the ash that surrounded the trees, transporting some of the ash's minerals as it filtered through the rock. This solution deposited mineral matter within the

cells of the wood, replacing most of the organic matter with stone. This form of fossilization, petrification, is the process that preserved the finely detailed anatomical structure of these trees. Today, we find some of the tree stumps preserved in their original vertical growth positions, and others that were moved by the ancient mudflows to form horizontal "log jams" with many uprooted trees preserved together.

Scientists come to Sexi to study these ancient plants and the processes of fossilization. They prepare the fossil specimens in laboratories and use microscopes to identify the various tree species. This type of scientific exploration helps researchers to begin to understand what the forest was like when it was growing here about 39 million years ago, during the Eocene epoch of Earth's history. The fossils at Sexi are especially important scientifically because they date from a time when the South American continent and Earth's climate were very different from today. Scientific analysis of the fossils and their characteristics can also tell us about how environments and climates have changed over time.

Sexi is located in the Huancabamba-Amotape Biogeographic Zone, an area between the Northern and Central Andes with a great diversity of plants and animals. Today the area around Sexi is a mosaic of pastureland, eucalyptus plantations, bare soil and intact patches of native forest that show the effects of human activities. Native plants form a dense evergreen forest or shrubland. Many trees have bromeliads and orchids growing on them. These plants obtain water from



Map of the area from Chiclayo to Sexi

(Continued on page 10)

Sexi Brochure (Continued)

Continued from page 9



The village of Sexi is located a short distance from the petrified forest.



Weaving is a tradition for the women of Sexi.



Unusual plants such as bromeliads are common in the area.

fog that is common in this area. One of the most abundant plants is the Chamana (*Dodonaea*), an evergreen shrub that gives its name to the fossil forest — Piedra Chamana, or Stones of Chamana.

The ancient forest was clearly very different from the present-day vegetation found here. The high-elevation, seasonally dry environment of today is a striking contrast to the tropical environment that is reflected in the fossil record. In the past there was a diverse array of trees, some very tall, including several species of palm trees. The tropical forests that we see in South America today occur at much lower elevations. The ancient forests grew at a time when the world's climate was much warmer. Some scientists think that the ancient forest here was at a lower elevation and that the forces that raised the Andes Mountains pushed this area up to its present elevation.

HUMAN ASPECTS

Although the town of Sexi was founded as recently as 1942, it has a distinct culture. The townsfolk are pioneers who settled in the area after land reforms brought an end to the Hacienda system. The new residents developed pasture lands for ranching. As a result of long-term drought conditions beginning in the 1970s, the once thriving population of several thousand has decreased to about 400. Nevertheless, residents have met such challenges with resourcefulness and ingenuity.

An interesting feature of life in Sexi is that many women are weavers. A number of artisans have attained great mastery in spinning and dyeing wool and using several different weaving techniques. They weave

mainly for their own households — blankets, ponchos, tablecloths, chair covers, "alforjas" (typical shoulder bags), saddle blankets and a unique and distinctive style of crocheted hat. The people also have considerable knowledge of the uses and medicinal properties of plants in the area. Cultural celebrations include many religious holidays as well as "rodeos," which are round-ups held twice a year to bring in all the free-range domestic stock to be marked and counted.



Fossil leaf impressions are preserved in volcanic ash.

The main economic activities of the town are semi-subsistence agriculture and animal husbandry. Primary crops are maize, potatoes, peas and wheat. People raise chickens, pigs, sheep, goats, donkeys, horses, cattle and guinea pigs. Because Sexi is close to the coastal valleys, people have traditionally migrated seasonally in search of jobs, first in the sugar cane haciendas and later in the rice estates of the Chancay Valley. The limited availability of water and lack of local economic opportunity are always a concern for

the people and continue to influence migration to the cities along the coast.

CONSERVATION ISSUES

The environment of Sexi is sensitive to change and, unless cared for, many fragile resources could disappear. Conservation efforts for the fossil forest and its protection as a resource for science, education and tourism have been an important concern for the community. Researchers from Peru and the United States support the community in its effort to preserve these resources for all local residents and visitors to enjoy.

The native vegetation, growing on poor soils in a highly seasonal climate, is being affected by the intensity of human use. Many local residents recognize the environmental changes that have occurred over their lifetimes and welcome efforts to protect their beautiful native forest and its many unique plants and animals, including plants people rely on for medicines, dyes and other uses.

WARNING

El Bosque Petrificado Piedra Chamana, specifically designated by the National Patrimony of Peru, is protected by Peruvian Law 28296 and falls under the jurisdiction of the National Institute of Culture. Peruvian law protects the site and the fossils and prohibits the removal of fossils from the site and the buying and selling of fossil materials. Local authorities are charged with upholding the laws protecting the site and bringing offenders to justice. The cooperation of everyone is required in order that the site and its fossils remain as a resource for the town, its citizens and future researchers.

Fossil collecting prohibited.



Sexi Adventure (Continued)

(Continued from page 3)

areas of the country. I feel privileged to have been exposed to the beauty of the Bosque Petrificado Piedra Chamana, the peacefulness of the Sexi culture, and the wonderful people I met along the way. Future trips to Sexi have been planned and if you are able, I recommend you go because I know you will have the experience of a lifetime.



Museum exhibits being presented to students at the school



Elba and Christina marking the new hiking trail

Bristlecone Pine (Continued)

(Continued from page 5)

they also bend and twist in the direction of the greatest solar radiation. By examining large stands of bristlecone pines, we can witness various stages of intense solar direction, during the life cycles of many of these old trees.

Bristlecones are extremely slow growers and some have life spans of more than 5,000 years! In the 1950's, Professor Edmund Schulman, a dendrochronologist, (a tree ring specialist) was instrumental in tree ring chronology associated with bristlecone pines. He identified 17 of these trees that he judged to be more than 4,000 years old! He further analyzed preserved wood from long since dead trees and developed a tree ring scale of 8,700 years! There are some preserved bristlecone logs and stumps from the Colorado high country assumed to have been dead for over 500 years and some of these were 2,000 years old when they died! The rates of decomposition for the dense bristlecone wood is extremely slow!

Ages are determined primarily by dendrochronology, (growth ring count) using an increment borer (core drill) where a core of growth can be microscopically examined to determine the number of annual growth rings and their widths. These widths are used to decipher other environmental conditions during a year's growth. They imply times of low or high temperatures and precipitation. Essentially tree growth rings are wide in wet years and narrow in dry years. Other factors affecting the nature and character of growth rings include the solar constant, sunspot cycle, available carbon dioxide, soil moisture, snow, ice and even times of turbulent activity, including forest fires, volcanoes and earthquakes!

The formation of each annual growth ring is caused by cell division in the growth tissues under the tree bark. This region, known as the cambium layer, produces groupings of thin walled cells, called earlywood. The dense wood on the outside of the tree ring is called latewood. Each ring boundary is identified by a distinct structural change between these layers. Continued statistical studies confirm that ring widths are directly correlated with temperature and precipitation patterns, along with other climatological factors. The woody tissue, especially in the root systems show color variations and differential wood densities. These factors reflect available soil chemistry and nutrients, during growth stages. Studies on the bristlecone's wood chemistry will and have extended our knowledge of past climates, and other environmental conditions.

When studying the paleoecology (ancient environments) of the bristlecone pines, it is important to gather as great a volume of data as possible, in order to re-create a complete picture of the primitive environment. This will serve to ascertain a birds eye view of continuous local conditions for perhaps thousands of years. Contemporary matching of specific tree rings from tree to tree will provide information for "cross dating" at the same site. This will confirm the relative time for certain past events and provide an insight as to exactly how all trees in the same locality were affected. Here, in the Colorado high country are a variety of

bristlecone pines, both living and dead, which provide us with an absolute dating technique and local environmental conditions, past and present.

By studying "fossil" tree ring chronology, we have determined that about 5,000 years ago, there were times that were distinctly warmer and drier than today. About the time of the first Christmas 2,000 years ago, conditions were warmer and wetter, a period which lasted over 100 years! It was further recognized that a thousand years ago, there was a 250 year period of time when our area was dramatically wetter and cooler. During recent times, between 1870 and 1940, the bristlecones indicate local warming. We can confirm these recent bristlecones' records by comparing them with weather bureau recorded data. Another fact is that finer degrees of climatic variations are recognizable within the growth rings of younger and more modern bristlecone trees.

Bristlecones have been subjected to Carbon 14 dating too, which have confirmed information measured from the tree ring dating techniques. The Carbon 14 method uses the unstable isotope of Carbon, which deteriorates (decays) at a known rate. This rate, called the half-life period, and is 5,730 years. Any organism, when alive, has absorbed all of the Carbon 14 that it can accumulate. Half of this 100% of Carbon 14 will then be available in 5,730 years. Comparing the ratio of the Carbon 14 to the more stable form of Carbon 12 will provide a good estimate for the age of the bristlecone wood.

At high altitudes in Park and Teller Counties, bristlecone trees have been living, growing and dying here for thousands of years. What else but possibly a few local bristlecone pines were alive and witnessed the times of the first Christmas!?! Their longevity in some cases is greater than Christianity itself; we must preserve these silent witnesses of the past. Future generations could examine the bristlecone trees of today and formulate conclusions about the climate and weather conditions of the 21st Century!



Visitor Center (Continued)

(Continued from page 1)

The floor plan was straightened and re-oriented to take maximum advantage of passive solar energy and natural day lighting. This had spatial advantages for construction, too, by eliminating awkward angles that produced un-square, inefficient spaces that are difficult to use effectively. It is more open and airy than the previous concept, and provides a larger entrance lobby, sales area, and information/orientation desk area. The rendering below shows the approach to the proposed visitor facility and many of the features we hope to include.

The entrance “tower” is the most prominent feature of the building. It provides light to the entrance lobby and gives it an open, airy feeling as well as providing natural ventilation with its operable upper windows. This feature allows us to eliminate air conditioning and reduce costs. You can see solar collectors mounted on the roof. These provide solar energy in the form of photovoltaic electricity and solar hot water, and are expected to substantially reduce our costs for electricity and propane. The building will have dyed concrete floors with integrated radiant floor heating. The floor heating system will circulate solar and propane heated water (the two systems will work together to heat the water as required) through tubes in the concrete floor and give the space an even and comfortable temperature. You can see that the south facing walls are black. That is because they are solar walls. They stand off from the structure wall about 4” to 6”, and their function is to gather or disperse heat from the sun as the season dictates is needed. Black absorbs heat more readily than any other color, and the air entering the black wall is ducted beneath the floor slab to heat/cool it from the underside. That air never enters the occupied space, but continues through the slab to solar chimneys on the north side which exhaust the air -- and any radon gas that might be present -- to the atmosphere. This further reduces heating and cooling costs. To avoid impacting the buried fossil resources that may be present, the entire structure will be placed on a pad of up to three feet of fill material -- and the fill material will act as a thermal mass to hold any of the heat (or cold) transferred by the air from the solar wall.



As designed, the building will exceed NPS guidelines for energy efficiency. The Green Building Council’s standards for Leadership in Energy and Environmental Design (LEED) rate this building as “Platinum”, their highest category. The NPS requires all new buildings to rate at least “Silver”, the lowest LEED rating.

As currently estimated, this building can be constructed within the limits of the funding cap for this project. We will likely face a shortfall in funding for furnishings and exhibits, but have elected to proceed with the building as designed and get that accomplished. We will then dedicate other funding from visitor fees and other sources to complete any unmet exhibit and furnishing needs in the following couple of years.

Thanks to all of the Friends for their patience and support over the decades of effort to achieve this new facility. We aren’t there yet, but we’re closer than we have ever been to having the facility we have all dreamed about.



Anniversary (Continued)

(Continued from page 1)

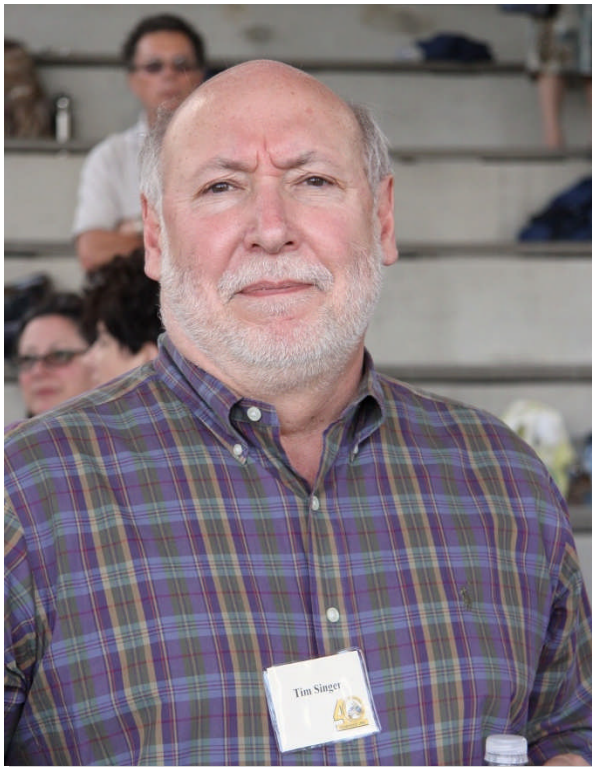
ence and good lawyers,” said Estella Leopold, Professor Emeritus at the University of Washington, daughter of famed conservationist Aldo Leopold, and instrumental in organizing the Defenders of Florissant. Dr. Leopold recalled how the grassroots group of women was prepared to stand in front of bulldozers to save the fossils. Leopold is co-authoring a new book with Dr. Herb Meyer

and John Stansfield about the establishment of the Monument which is scheduled for publication in 2010.

Members of the legal team were also present at the celebration, including brothers Tom and Dick Lamm. Dick Lamm was a state legislator at the time and went on to become the longest-serving Governor of Colorado. Tom Lamm shared the stories of the innovative legal arguments presented in court and how the judge gave them a big break to save the Florissant Fossil Beds.

The last speaker of the day was Victor Yannacone Jr., who was recognized by all as the heart and soul of the legal team and whose brilliant arguments won the case. Mr. Yannacone was awarded the National Distinguished Service Conservation Award by the National Wildlife Federation in recognition of his efforts with Florissant, and for his role in founding the field of environmental law.

In the legal effort to protect Florissant, Mr. Yannacone established the “public trust doctrine” as the foundation of environmental common law. That doctrine states that *the public has a right to stop private development that threatens natural resources*. That doctrine has been applied successfully numerous times since the Florissant



Tim Singer—Original landowner of Monument Property



Toby Wells—Original landowner of Monument Property



Victor Yannacone—Attorney and early legal strategist



Tom Lamm and Gov. Dick Lamm —Attorneys that fought for the Monument

Anniversary (Continued)

(Continued from page 14)

case. According to Mr. Yannacone, the most important result of the Florissant case was that it proved that our system works just as the Founding Fathers had designed it.



Carolyn Forster—The Ute Nation

Besides Florissant, Mr. Yannacone brought a series of court actions that ultimately got DDT banned in the U.S., waged a successful court battle on behalf of Vietnam Veterans affected by Agent Orange, stopped a jetport from being built in the Everglades, fought to establish Fire Island NRA, and wrote the first treatise on environmental law. He was first to recognize the courts as the primary avenue for protecting the environment. He said, "The time has come for you who are committed to the preservation of our environment to... enter the courtroom to protect our natural resources...." He is still an active lawyer and is a strong advocate of early childhood education in the natural sciences.



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You may submit advertisements to: Steven Veatch, P.O. Box 5938, Woodland Park, CO 80866 or via email: sveatch@fossilbeds.org.

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Email Addresses Wanted

Please send feedback on the newsletter or any topic you are interested in to Melissa Barton (webmaster@fossilbeds.org). If you are interested in serving on various committees or the Board, please contact Sally Maertens at the address to the left or email (smaertens@fossilbeds.org).

Please provide us with feedback on the newsletter or any topic you are interested in to Melissa Barton (webmaster@fossilbeds.org). We would also like to know who is interested in serving on various committees or on the Board contact us by email to sammckind@aol.com.

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The Friends of the Florissant Fossil Beds newsletter is published quarterly by the Friends of the Florissant Fossil Beds and is governed by the by-laws of the Friends. Articles appearing in the newsletter do not

About Our Organization....

In 1987, the Friends of the Florissant Fossil Beds, Inc. was organized by a group of dedicated individuals interested in assisting the National Park Service in its mission to preserve and protect our national treasures. As a non-profit organization, the Friend's mission is to secure resources to help preserve the fossils and promote programs and activities that enhance the Monument's education, research, and scientific objectives.

Membership fees and donations to the Friends of Florissant Fossil Beds are used for:

- Environmental education programs
- Field seminars
- Year-round interpretive programs
- Jr. Ranger programs
- Paleontological and geological resources
- Natural history resources
- Publications

Past accomplishments and ongoing support by the Friends of Florissant Fossil Beds includes:

- Major funding of the yurt shelters
- Travel and research funding for the Monument's paleontologist
- Assistance in the purchase of an all-terrain wheelchair for handicapped visitors
- Financial support for the University of Denver's (fossil data) Digitization Project
- Purchase of furniture for the seasonal rangers and intern housing
- Funding for other special Monument related celebrations and special events (such as the dedication of the new stump exhibit area May 11, 2002)
- Planning, funding, and coordinating the Monument's 30th Anniversary Celebration (1999), 35th Anniversary Celebration (2004), and 40th Anniversary (2009)
- Funding and coordination of annual Summer Educational Seminars Program

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