

# Contributions by Paleontology GeoCorps™ America Interns to Scientific Research, Resource Protection, and Public Outreach at Florissant Fossil Beds National Monument

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Herb Meyer

Paleontologist  
National Park Service



# Background

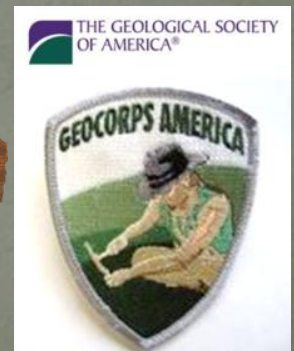
- Located in the center of Colorado
- Late Eocene
- Petrified “stumps” preserved in volcanic lahar
- 1700 species of leaves, insects, and spiders preserved in delicate lake shale





# Background

- Monument established internal Paleo intern program in 1997
- More recent organizational sponsorship
  - GIP Program (NPS - Geologists in the Parks)
  - GSA GeoCorps America
- Funding support
  - NPS funding for park projects
  - NPS Mosaic, Diversity, and Youth Internship programs
  - The Friends of the Florissant Fossil Beds, Inc.
  - Association for Women Geoscientists (AWG)
- 38 interns through 2013 (50% through GeoCorps program)
- Largest paleontology intern program in NPS
- Mostly undergraduates, some graduate projects
- Purpose of talk: To emphasize the diversity of projects and show what's possible with GeoCorps



# Inventory and Monitoring of Paleo Sites

- Inventory
  - Detailed GPS mapping of sites
  - Designation of photo points
  - Baseline photos
- Monitoring
  - Annual assessment of site condition by scoring established criteria
  - Photograph changing conditions



Bret Buskirk  
2008 GeoCorps



Adrian Maxwell  
2011 GeoCorps

## Site photos through time





# Inventory and Monitoring of Paleo Sites

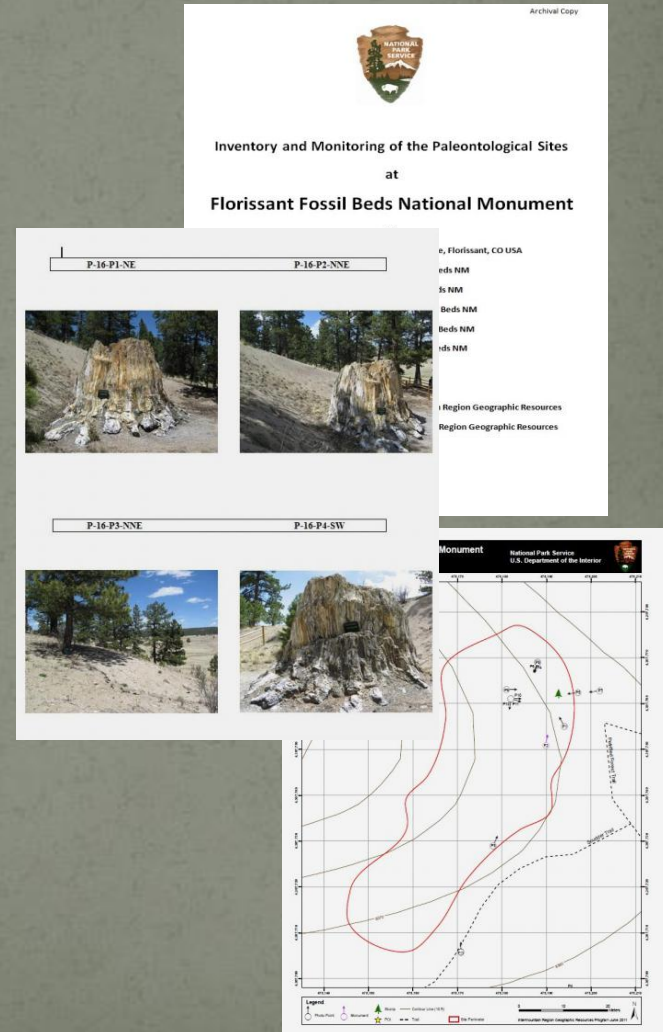
- Prepare I&M Manual
- Develop similar projects for other sites beyond Florissant
  - Fossil forest in Sexi, Peru
  - Indian Springs Trace Fossil National Natural Landmark
- Assess fire risk potential
  - Poster presentation by Selva Marroquin (Session 240)



Selva Marroquin  
2013 GeoCorps



Ashley Ferguson  
2012 GeoCorps

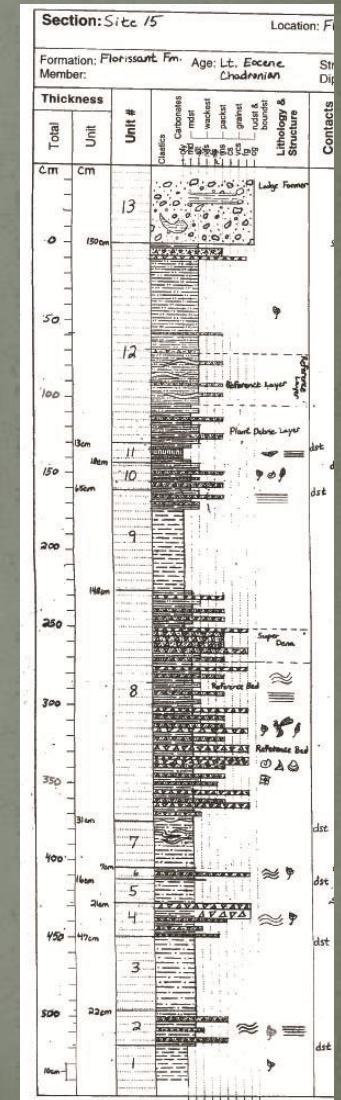




# Fossil Excavations

- Assist with defined research projects
- Apply methods of excavation
- Measure stratigraphy

April Kinchloe  
TaShana Taylor  
1998 park-sponsored  
interns



Jamie Fearon  
2010 GeoCorps



Katie Card  
2010 AWG intern





# Developing Conservation Strategies

- Develop methods to stabilize fossils
  - Petrified stumps (2004)
  - Delicate paper shale (2013)
- Test consolidants and adhesives



Jennifer Young  
2004 AWG intern



Heather Falkner  
Kelly Hattori  
2013 GeoCorps

# Collections Management

- Prepare, catalog, and organize fossil collections
- Move our collection of 10,000+ fossil specimens into the new facility in 2013



Ariel Demarest  
2011 GeoCorps



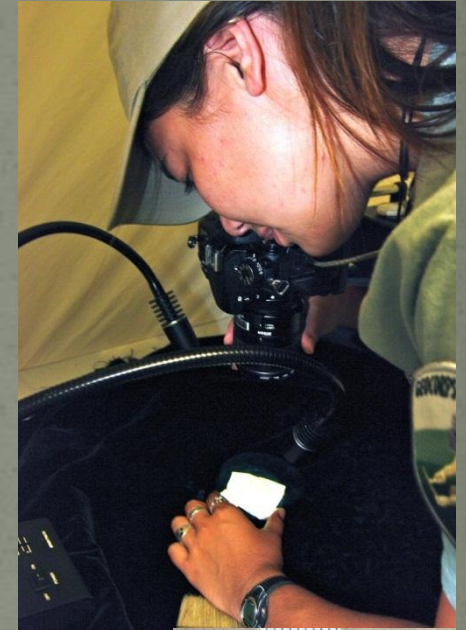
Alison Dernbach  
2012-current GeoCorps





# Digitize Collections

- Create digital images of the Monument's fossil collection
- Funded by visitor fee program
- Provides photos for public
- Provides photos for our collection database



Kelly Hattori  
2012-13 GeoCorps



# Database Development

- Develop Inventory and Monitoring Database
  - Site documentation and monitoring history
  - Site photographs
  - Interns assisted in design, and routinely complete annual updates
- Develop database of Florissant fossils at non-NPS museums

Microsoft Access - [Site List]

File Edit View Insert Format Records Tools Window Help

Type a question for help: ?

7

Anal

### Paleontology Monitoring Sites

Monitoring Site	Next Monitor Date	Monitor Cycle	Fossil Content:	Condition:	
P-61	2009	1	Invertebrates and plants.	Good	Detail
P-62	2012	5	Invertebrates and plants.	Good	Detail
P-63	2009	1	Plants.	Good	Detail
P-64	2009	1	Plants.	Marginal/Good	Detail
P-65	2009	2	Plants and insects.	Good	Detail
P-66	2009	2	Vertebrates and plants, maybe a fish.	Good	Detail
P-67	2009	2	Vertebrates and petrified wood.	Marginal/Good	Detail
P-68	2011	3	Vertebrates and petrified wood.	Good	Detail
P-69	2009	2	Plants.	Good	Detail
P-10	2009	5	No fossils.	Good	Detail
P-11	2011	3	Plants.	Good	Detail
P-12	2009	2	Petrified stumps.	Good	Detail
P-13	2009	2	Petrified stumps.	Good	Detail
P-14	2013	5	Invertebrates (molluscs).	Good	Detail
P-15	2009	1	Plants and insects.	Good	Detail
P-16	2009	1	Invertebrates, plants, and petrified wood.	Good	Detail
P-17	2009	1	Plants and insects.	Marginal	Detail
P-18	2010	3	Invertebrates and plants.	Good	Detail
P-19	2010	2	Plants, insects, and fish scales.	Fair	Detail
P-20	2009	1	Petrified sequoia stumps (the "trio").	Marginal	Detail
P-21	2013	5	No fossils.	Good	Detail
P-22	2013	5	No obvious fossils.	Good	Detail
P-23	2013	5	No fossils.	Marginal/Good	Detail
P-24	2010	3	Petrified stumps.	Good	Detail
P-25	2010	2	Plants.	Marginal	Detail
P-26	2009	1	Plants.	Good	Detail
P-27	2009	6	No fossils.	Good	Detail
P-28	2010	2	Insects and plants.	Good	Detail

Form View

start

Monitor Site: **P-43**

Site Description and Location | History and Observations | Photo Points | Site Evaluations | Utilities

Other Numbers:   
Collection Site:   
Accession Number:   
Original Record: R.A. Cushman Jr. (9/29/92).  
UTM: 13 N 4307739 475348  
Latitude/Longitude:   
Air Photo: USDA 9-25-75 F16 08119 77  
Map Coordinates: SE1/4 NE1/4 SW1/4 Sec.13,

Formation:   
Stratigraphic Unit:   
Lithology:   
Fossil Content:   
Specimens Observed:   
Specimens Collected:   
Rating:   
Monitor Frequency:   
Next Monitor Date:

Location: Third stump, second fenced north of the Visitor's Center on east side of Petrified Forest Loop.

Excavation Potential:

Monitor Site: **P-43**

Evaluation Date: 6/18/2008  
Evaluator: B. Buskirk  
Disturbance: 20  
Disturbance Mitigation: 0  
Fragility: 15

Fragility Mitigation: 10  
Fossil Abundance: 0  
Actual Loss: 20  
Loss Mitigation: 10  
Site Access: 0  
Access Mitigation: 20

Total: 95  
Condition: Good

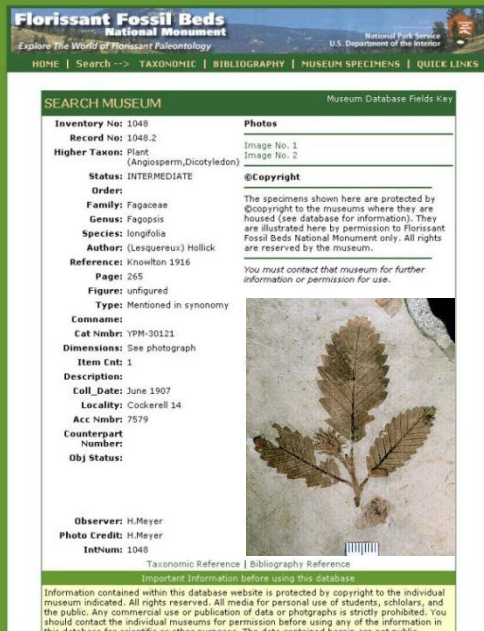
Evaluation Notes:

No observable changes.  
Animals burrowing under stump.  
Unidentifiable brown fibrous material on the base of the north side of the stump.  
Small amount of vegetation on top of the stump.



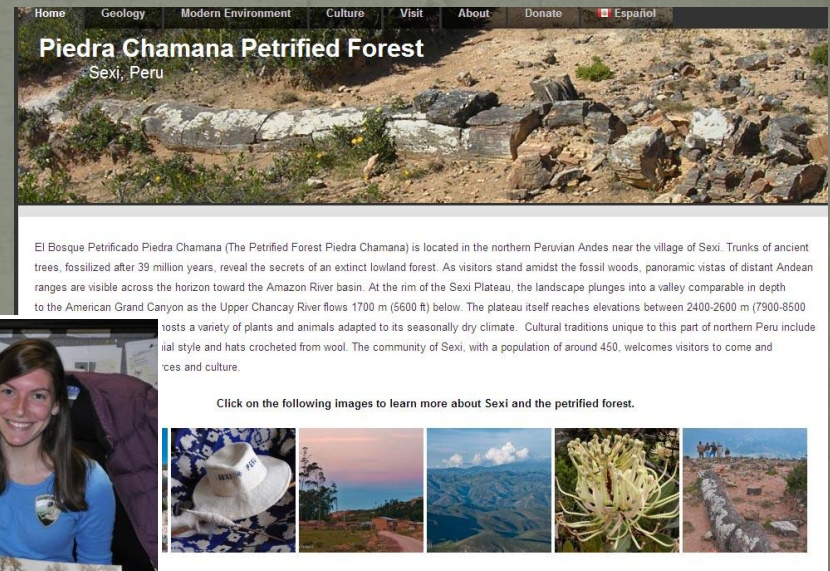
# Website Development

- Website for database of fossils at non-NPS museums
- Website for the monument's "sister park" in Sexi, Peru
- Expand paleontology section of monument's website



Fossil database website  
[planning.nps.gov/flfo](http://planning.nps.gov/flfo)

Peru website  
[peru.fossilbeds.org](http://peru.fossilbeds.org)



Lindsay Walker  
 2011-12 GeoCorps



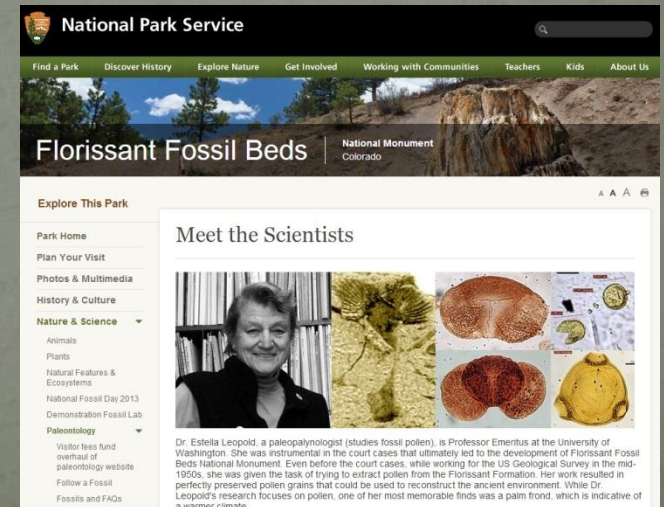
# Public Outreach

- Create paleontology section for the monument's website
- New video production about our paleontology program
- Interview scientific researchers
- Stay tuned for the next talk by Lindsey Yann!



Lindsey Yann  
2013 GeoCorps

[nps.gov/flfo](http://nps.gov/flfo)





# Curriculum Development

- Develop undergraduate curriculum
- Geology, fossils, and climate

Florissant Fossil Beds National Monument

Online College Curriculum

Introduction → Geology → Fossilization → Identification → Ancient Climate → Fossil Database

Identification [Text Only Site Map](#)

Leaves are good indicators for terrestrial environments. Their shape and the patterns that their veins and edges form provide important information about the environment in which they lived. Let's take a moment to familiarize ourselves with leaf identification. You can also download a printable [PDF version](#) of each of these identification guide pages to help you complete the exercise.

**Basic Leaf Terminology:**

- the expanded, flat part of a leaf or leaflet.
- usually the upper ~25% of the lamina.
- usually the lower ~25% of the lamina.
- the edge of the lamina.
- the stalk of the leaf.
- the widest vein of the leaf
- the next veins after the primary, originating from the primary or
- the next widest after the secondary or primary veins, originating from the
- the next narrowest after the tertiary veins, originating from the

**Basic morphology of an aspen leaf - click on Tertiary & Higher Order Veins to see an enlargement.**

**Seeds**

Abies (fir): Cellular pattern of wing directed toward admedial edge of wing, intersecting edge at an angle. Proximal end of seed is blunt. Seed is oblong, oval, or triangular.

Picea (spruce): Cellular pattern of wing parallel to long axis of wing with no wrinkles. Wing is widest at distal half.

Pinus (pine): Cellular pattern of wing directed toward admedial edge of wing, intersecting edge at an angle. Proximal end of seed is blunt. Seed is oblong, oval, or triangular.

Abies rigida

Picea lahontense

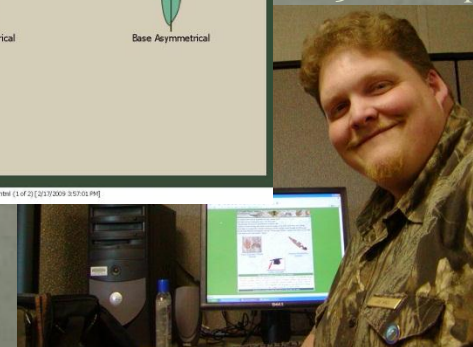
Picea lahontense

Pinus wheeleri

Pinus wheeleri

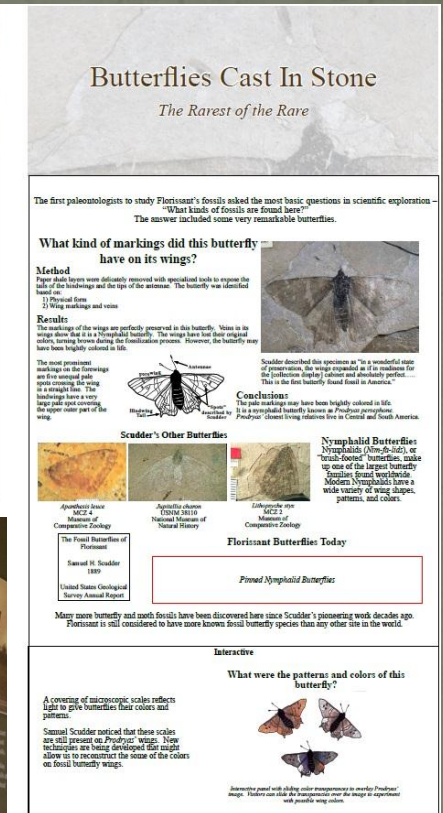
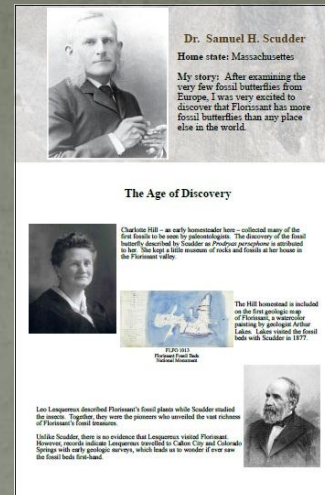
Pinus sp.

Joe Hall  
2005 GeoCorps



# Exhibit Design

- Draft concept designs for new exhibits about scientific research
- Work in consultation with scientists, interpreters, and exhibit designers



Lindsay Walker  
2011-12 GeoCorps



Finished exhibit

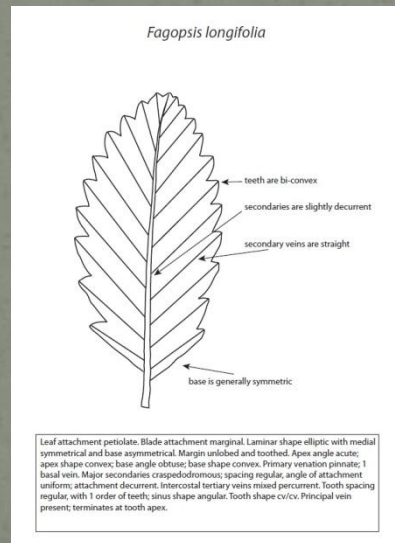
Draft



# Fossil Identification Aids

- Score characters of fossil leaves as an aid for identification
- Create new illustrations

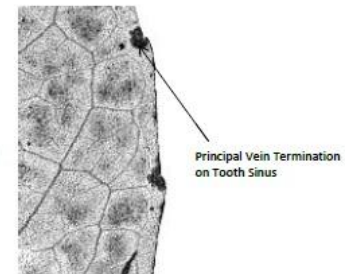
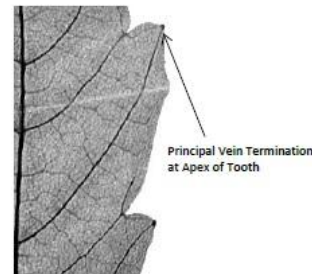
Cassi Knight  
2012 GeoCorps



## 31. Principal Vein Termination-

**At Apex of Tooth-** The tooth principal vein terminates in the apex of the tooth.

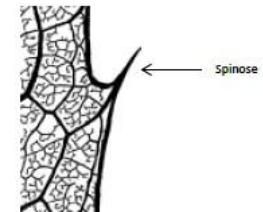
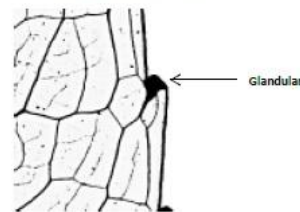
**On Sinus-** The tooth principal vein terminates in the tooth sinus.



## 32. Tooth Apex Features-

**Glandular-** There is a gland (opaque, round or peglike feature) at the tooth apex.

**Spinose-** The tooth principal vein extends beyond the tooth apex, creating a sharp spine. It may be long or short.

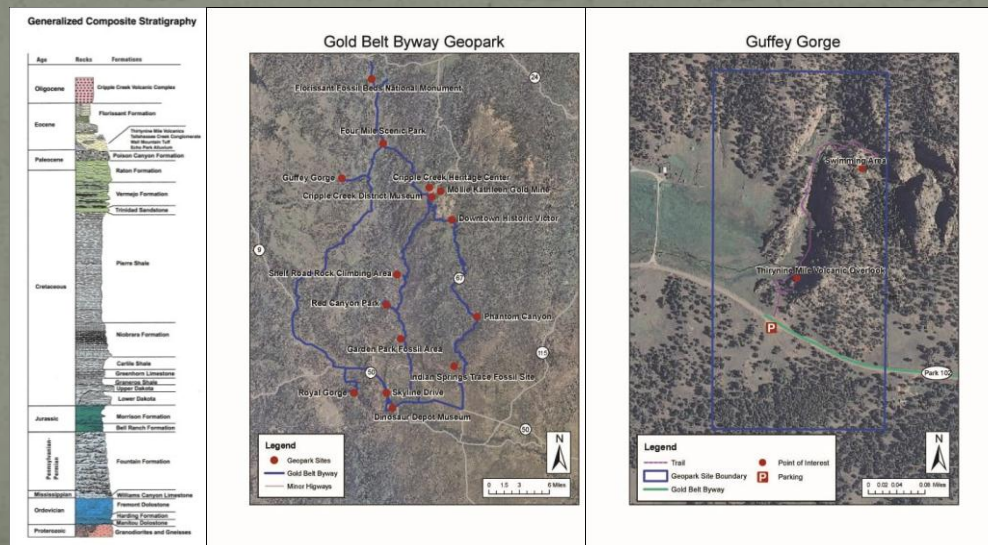


# Proposal for GeoPark Designation

- Identify sites along the Gold Belt Byway for inclusion in potential GeoPark
- Prepare draft proposal with maps
- UNESCO program, new for USA
- Currently moving toward U.S. GeoHeritage designation



Elizabeth Waite  
2010 GeoCorps





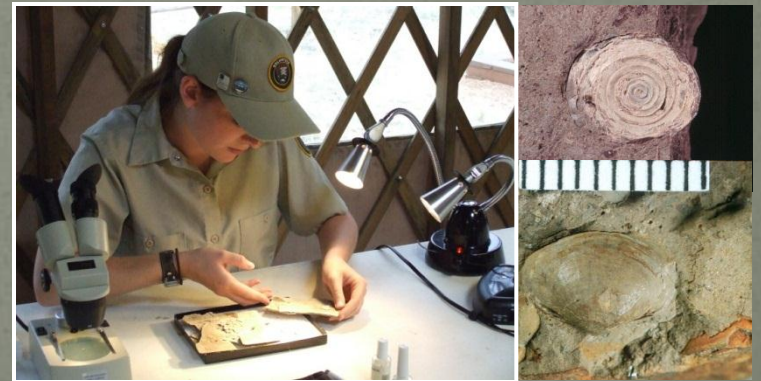
# Graduate Student Research

- Fossil Mammals
  - Screen sediments to find small mammals
  - More than doubled the faunal list
  - Project during internship
  - Masters thesis at University of Colorado by Marie Worley, 2004



Marie Worley  
2003 GeoCorps

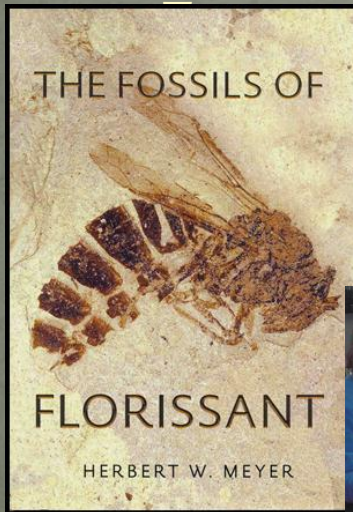
- Geochemistry of mollusks
  - Examine chemical controls of carbonate preservation in mollusks
  - Project following internship
  - Doctoral research in progress at University of Washington by Bret Buskirk
  - GSA poster presentation (Session 145)



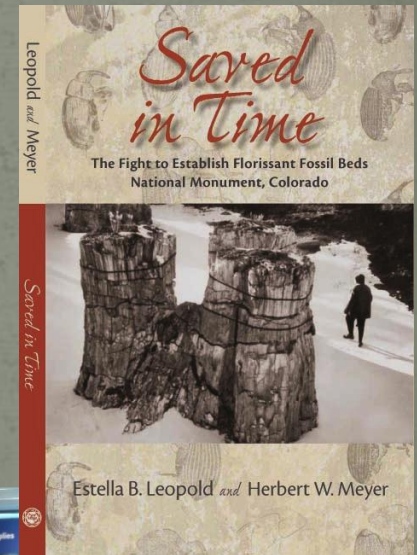
Bret Buskirk  
2008 GeoCorps

# Assisting in Preparation of Books

- Organize figures
- Tabulate data, format text, and request permissions
- Proofread and edit selections of text
- Original photography for figures
- Assist during times of panic as deadlines loom!



Michelle Dooley  
2001 park-sponsored intern



Lindsay Walker  
2011-12 GeoCorps



# Published Contributions

## ***The Chadronian mammalian fauna of the Florissant Formation, Florissant Fossil Beds National Monument, Colorado***

Karen J. Lloyd  
Marie P. Worley-Georg  
Jaelyn J. Eberle\*

Department of Geological Sciences and University of Colorado Museum of Natural History, University of Colorado at Boulder,  
265 UCB, Boulder, Colorado 80309, USA

## ***An outline morphometric approach to identifying fossil spiders: A preliminary examination from the Florissant Formation***

April Kinchloe Roberts

Department of Geological Sciences, University of Colorado, Boulder, Colorado 80309-0399, USA

Dena M. Smith\*

University of Colorado Museum of Natural History—Paleontology and Department of Geological Sciences,  
University of Colorado, Boulder, Colorado 80309-0265, USA

## ***Conservation of an Eocene petrified forest at Florissant Fossil Beds National Monument: Investigation of strategies and techniques for stabilizing in situ fossil stumps***

Jennifer L. Young\*

Department of Paleobiology, Smithsonian Institution, P.O. Box 37012, Washington, D.C. 20013, USA

Herbert W. Meyer

National Park Service, Florissant Fossil Beds National Monument, P.O. Box 185, Florissant, Colorado 80816, USA

## ***Development of an integrated paleontological database and Web site of Florissant collections, taxonomy, and publications***

Herbert W. Meyer\*

National Park Service, Florissant Fossil Beds National Monument, P.O. Box 185, Florissant, Colorado 80816, USA

Matthew S. Wasson

Chevron North America Exploration and Production Company, 15 Smith Road, Midland, Texas 79705, USA

Brent J. Frakes

National Park Service, Inventory and Monitoring Program, 1201 Oakridge Drive, Fort Collins, Colorado 80525, USA

Edited by H.W. Meyer & D.M. Smith

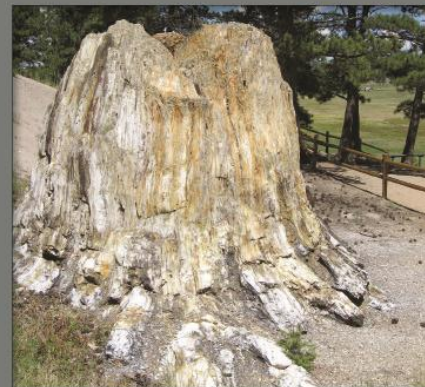
Paleontology of the Upper Eocene Florissant Formation, Colorado

Special  
Paper  
415

Special Paper 415

THE GEOLOGICAL SOCIETY  
OF AMERICA

## PALEONTOLOGY OF THE UPPER EOCENE FLORISSANT FORMATION, COLORADO



edited by

Herbert W. Meyer and  
Dena M. Smith

# Benefits to Monument

- Excellent recruitment of qualified students, especially through the GSA GeoCorps™ America program
- Cost-effective
- Enables projects that otherwise could not be done with the monument's base staff support
- Prompts students to continue research on Florissant
- Some projects are continued through later support by CESU funding
- Paleontologist can continue involvement as thesis committee member (University of Colorado at Boulder)
- Provides diversity on the monument's staff



# Opportunities and Benefits for Interns

- Field Experience
  - Practical experience in resource management
  - Learn methods of scientific excavation
- Museum Collections Experience
- Experience the process of publishing
- Networking to create professional connections
  - Meet visiting researchers
  - Connections for graduate school opportunities
- Discover true interests in geology and paleontology
- Becoming a part of the monument's history
  - Discovery of the first *Ginkgo* at Florissant
- Develop special relationships with the fossils themselves







# Acknowledgements to the FLFO Interns

■	1997	Melissa Hicks	■	2008	Bret Buskirk (GSA)
■	1997	Trudy Kernan	■	2009	Jamie Fearon (GSA)
■	1997	John Fraser	■	2009	Katherine Card (AWG)
■	1998	April Kinchloe (and 1999-2000)	■	2009	Genesis Machek (CU)
■	1998	TaShana Taylor	■	2010	Ariel Demarest (GSA)
■	1999	Amanda Cook (and 2000-2001)	■	2010	Elizabeth Waite (GSA)
■	2000	Owen Callahan	■	2010	Allison Platsky (GSA)
■	2000	Jessica DeBusk (and into 2001)	■	2010	Kerry Petrie (CU)
■	2000	Cayce Lillesve	■	2011	Lindsay Walker (through 2012; GSA)
■	2001	Rebecca Lincoln (GSA)	■	2011	Laura Clarke (GSA)
■	2001	Michelle Dooley (and 2002)	■	2011	Adrian Maxwell (GSA)
■	2002	Matt Wasson	■	2012	Cassi Knight (GSA)
■	2003	Marie Worley (GSA)	■	2012	Ashley Ferguson (GSA)
■	2004	Jennifer Young (AWG)	■	2012	Kelly Hattori (GSA; returned 2013)
■	2005	Melissa Barton (and 2006)	■	2012	Alison Dernbach (GSA, returned 2013)
■	2005	Joseph Hall (GSA)	■	2012	Brenda Kessenich (CU)
■	2006	Yinan Wang	■	2013	Lindsey Yann (GSA)
■	2007	Eva Lyon (GSA)	■	2013	Selva Marroquin (GSA)
■	2007	Kathy Martinez	■	2013	Heather Falkner (GSA)

(GSA GeoCorps program participants in yellow)



