



# NARG NEWSLETTER

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## NARG's Croc is Published in the Journal of Vertebrate Paleontology



A new metriorhynchid (Crocodylomorpha, Thalattosuchia) from the Middle Jurassic of Oregon and the evolutionary timing of marine adaptations in thalattosuchian crocodylomorphs Eric W. Wilberg Department of Geoscience, University of Iowa, Iowa City, Iowa 52242, U.S.A.

**ABSTRACT**—Metriorhynchid thalattosuchians represent the most extreme archosaurian adaptation to the marine realm. Metriorhynchids possess aquatic adaptations throughout the skeleton. These adaptations were so extensive that some have suggested that they lost the ability to move on land, yet their evolutionary timing remains unresolved. The closest relatives of the metriorhynchoids, the teleosauroids, lack these aquatic adaptations, and the earliest metriorhynchoids are known exclusively from cranial material. Here I describe a partial skull with associated forelimb elements of a new marine crocodylomorph,

*Zoneait nargorum*, gen. et sp. nov., of Aalenian–Bajocian age from the Snowshoe Formation of east-central Oregon. Phylogenetic analysis identifies *Zoneait* as the sister taxon to Metriorhynchidae. It possesses a derived skull with orbits that are more laterally directed and prefrontals that are more expanded than in other basal metriorhynchoids. The preserved forelimb elements are less derived. The humerus is elongate in comparison with that of other metriorhynchoids. The ulna is slightly reduced in length and flattened but resembles the teleosauroid condition more so than the plate-like element of metriorhynchids. This suggests that marine adaptations in metriorhynchoids were acquired in mosaic fashion, with modifications of the skull preceding forelimb reduction, with this forelimb reduction occurring first in the zeugopodial elements, prior to reduction of the humerus. This evolutionary timing has important implications for the transition from nearshore ambush predation to pelagic open-marine predation in Thalattosuchia, suggesting that adaptations related to prey detection and capture preceded the locomotor adaptations that allowed these organisms to fully invade the oceans. <http://zoobank.org/urn:lsid:zoobank.org>.

# Leaves of Change

## A Case Study on the Climate of the Lyons Flora

By Aaron Currier

And 8<sup>th</sup> Grade Science Students at

Talmadge Middle School



### Preface

The following research project (lesson plan) was developed from participation in a teacher workshop through the FOSSIL Project. I was awarded a grant in the summer of 2014 to join teachers from Colorado at the Florissant National Monument. A report about the trip was published in the Fall 2014 NARG Newsletter. I altered the lesson plan that was taught to the teachers at the workshop from one focused on the supporting evidence for climate change using fossil leaves from Colorado to those of Oregon using local material.

I then taught the lesson to my eighth grade student. We collected data, and this is the initial outcome.

The leaf material chosen is from Phil Knutsen's collection of leaves from the Lyons Flora. We estimate the age of the flora to be around 34 million years old. It is similar to the flora of Bridge Creek. Of further note, Dr. Herb Myer (Director of Florissant National Monument) was not only involved in the teacher workshop providing a tour of the grounds and facility at Florissant, but also providing reference material he published on the Lyons locality as a high school/OMSI project back

in the early 1960s. He published a description of the flora from collections he had made as a teenager. No other known documents exist on the prehistoric nature of this formation.

What follows is the lesson plan and the results from my students' research. This lesson plan will be revised, improved, and taught again this Winter. A lesson plan that will be appropriate for middle school teachers will be finalized and submitted to both the Oregon Science Teachers Association (OSTA) as well as a part of a pending FOSSIL Project presentation at the National Science Teachers' Association (NSTA) Conference in Portland in the Fall of 2016.

**Note: The students worksheets are not included in this article. If you would like a copy please contact Aaron at [fossils@curriergraphics.com](mailto:fossils@curriergraphics.com)**

## Leaves of Change

### Learning Targets

- I can use evidence to show how climate changes over time.
- I can explain how plants (and fossil plants) can tell us about the climates in which they live.
- I can use leaf edges and size to estimate past temperatures and precipitation levels.

## Purpose

In this activity we will look at a part of the fossil record from Oregon and see what it can tell us about past climates. Also, to share in the spirit of authentic research.

## Question

Can we estimate the average annual precipitation and temperature for the Western Cascade foothills 34 million years ago?

## Background & Research

Weather is defined as ? Climate is defined as?

### Leaves and Climate

Paleontologists use plants to learn about past climates, by looking at where plants like those found in a particular fossil deposit are found today and what climates they prefer. This is a “qualitative” assessment. In other words, scientists use comparisons and inferences, not measurements (numbers).

Paleontologists can also get a “quantitative” estimate of past temperatures and precipitation rates using leaves.

Leaf edges (or margins) can be measured to estimate past temperatures

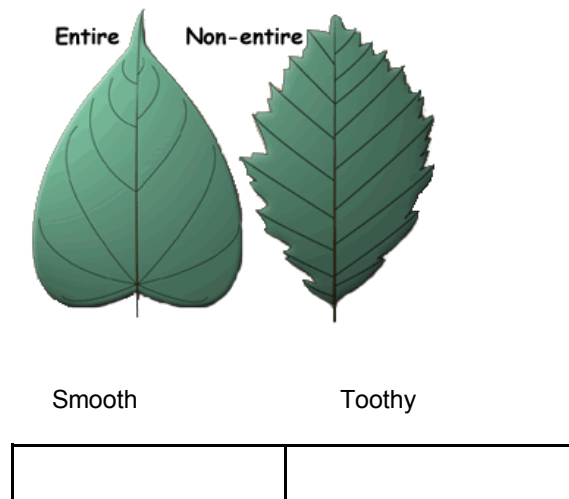
Leaf size (average leaf area) can be measured to estimate past precipitation

### Leaf margins and temperature:

Based on looking at forests around the world today, we know that the warmer the temperatures in which a forest is growing, the more leaves with smooth edges (relative to rough or toothy edges) it will have. So if you pick up a bunch of leaves from the forest floor in Costa Rica there will be relatively more kinds of leaves with smooth edges than you would find if you picked up a bunch of leaves from the forest floor in Oregon.

### Modern Leaves

To get used to looking at leaf margins, look at the poster of North American leaves from trees, many of which grow in Oregon today. In the table below, record the number of “smooth” on one side and “toothy” on the other.

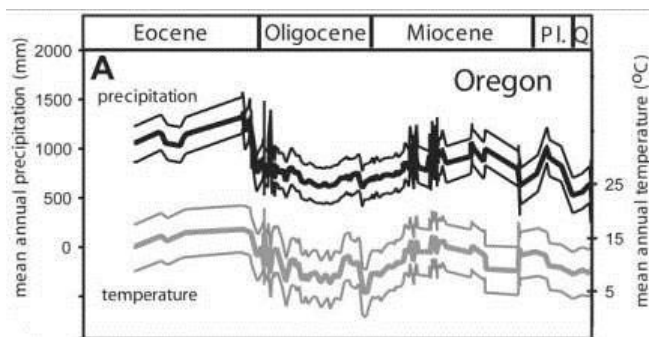


It can be concluded that there are more toothy leaves than smooth on the leaf poster. Based on this, and the fact that more toothy leaves correlate with cooler temperatures, perhaps North America is mostly cool temperate.





What about Oregon in the past? Much research has been done on the Bridge Creek Flora of the John Day Formation in Central Oregon. Using leaf margins along with other forms of evidence, it has been concluded by scientists that the climate during the Oligocene (34 million years ago) was a time of cooling, much like it is today.



alder



hornbeam



elm

### **Fossil leaves and temperature:**

We can examine fossil leaves from two lakes in Colorado to see an example. Fossils from the Green River Formation represent a series of huge lakes that covered Colorado, Utah and Wyoming about 45 million years ago (Eocene). Fossil Lake Florissant is a lake that existed about 35 million years ago (Oligocene) up near Pike's Peak. Lakes are good for preserving leaves, because they float in and get buried quickly by fine-grained sediments that seal out decay, and that lots of things live next to lakes, so there's lots of potential fossil material.

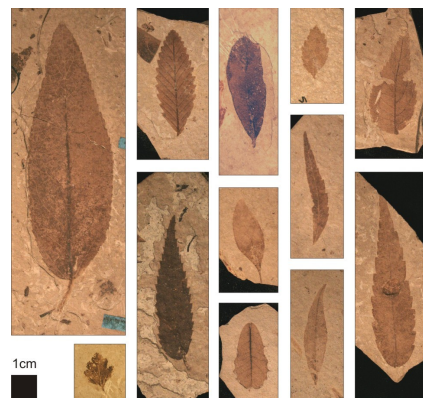
### **Predicting Mean Annual Temperature from Leaf Margins**

We can examine the margins (edges) of 12 leaves from each of the two formations. Notice that the edges of leaves are not all the same (even within a single leaf!). Mean Annual Temperature is the average temperature for the year; it gives a general sense of how warm or cool an area is. Compare the 12 leaves from the Green River Formation to the 12 from the Florissant.

#### **Green River Formation**



#### **Florissant Formation**



What is the total number of leaves with smooth margins? Florissant \_\_\_\_\_ Green River \_\_\_\_\_

Which of the two do you think would have a warmer average temperature? \_\_\_\_\_

### **Predicting Mean Annual Precipitation from Leaf Area**

Examine the overall shapes of leaves above. Notice that the sizes of the leaves are not all the same. To determine the mean annual precipitation levels at the time they were growing, we need to know how big the average leaf in the flora is. To do this, we estimate the area of each leaf using length and width measurements. To make a basic estimation, we can just look at the two sets of leaves.

Which of the two do you think has larger leaves? \_\_\_\_\_



**Bridge Creek Flora, OR*****Oligocene (34 myo)***

Smaller size = drier

More toothy = colder

MAP 65cm = 26 inches

MAT 46-52 F

**Green River Flora, CO*****Eocene (45 myo)***

Larger size = wetter

More smooth = warmer

AAP 86cm = 33.9 inches

AAT 64-73 F

**Florissant Flora, CO*****Oligocene (35 myo)***

Smaller size = drier

More toothy = colder

AAP 50cm = 19.7 inches

AAT 52-63 F

Very little research has been done on the climate of the Western side of the Cascade Range using leaf margins and sizes. Very few fossil localities exist with good preservation and an abundance of specimens. There is a formation of sedimentary rock near the small town of Lyons, Oregon which is in the foothills of the Cascades. It is hypothesized by scientists that this formation is about the same age as the Bridge Creek Flora. Dr. Herb Meyer collected and published the species of this location back in the 1960s. No official research regarding climate estimates has been done on this location since. Dr. Meyer wonders if there is a correlation between the Lyons Flora and the others researched. This leads me to my hypothesis.

**Hypothesis:**

If we measure the ratio of smooth to toothy margins and the average leaf size of fossils from the Lyons Formation, then we can estimate the average annual precipitation and temperature for the Western Cascade foothills 34 million years ago.

**Materials:**

Fossil Leaf Cards from the Lyons, Formation Metric rulers, Calculators, Magnifying glasses, Leaf exercise worksheet, Pencil

**Procedure:**

1. **Gather materials.**
2. **Record the ratio of smooth margin leaves to toothy margin leaves.**
3. **Check data with table partners.**
4. **Calculate the average annual temperature using the worksheet.**
5. **Report data to calculate class average.**
6. **Record data.**
7. **Measure the length and width of each leaf and record the data.**
8. **Check data with table partners.**
9. **Calculate the average annual precipitation using the worksheet.**
10. **Report data to calculate class average.**
11. **Record data.**
12. **Clean up.**
13. **Report class data to Dr. Herb Meyers, Florissant National Monument.**

## Data and Calculations Worksheet

(left out of newsletter ask Aaron for a copy).

## The Lesson Summary

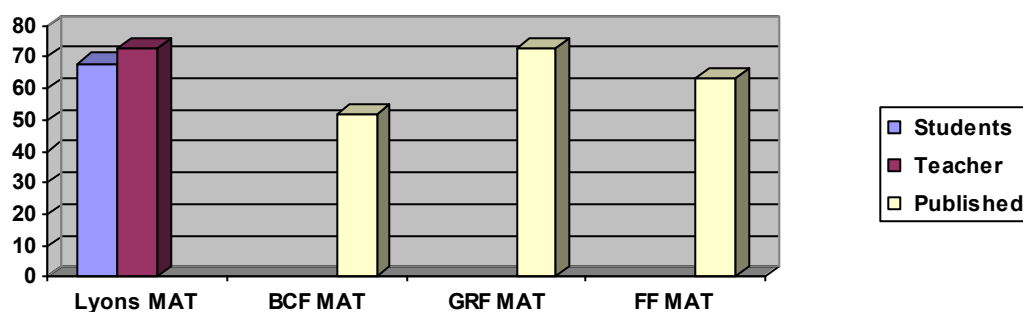
**Data Collection Observations**

About 120 students participated in measuring and collecting data. Metric rulers (not calipers) were used to measure leaves. Some leaves were not complete, so half of some leaves were measured and the surface area was doubled. Not all the leaves are identified to species and, although unlikely, could be duplicated. Students were not directly observed making measurements.

**Data****Mean Annual Temperature (MAT)**

The students' measured ratio of smooth to toothy leaves ranged from 11 and 25 to 16 and 20.

| Class    | Smooth | Toothy | MAT  |      |
|----------|--------|--------|------|------|
| Period 1 | 16     | 20     | 24°C | 76°F |
| Period 2 | 11     | 25     | 17°C | 63°F |
| Period 3 | 11     | 25     | 17°C | 63°F |
| Period 4 | 14     | 22     | 22°C | 71°F |
| Avg      |        |        |      | 68°F |
| Teacher  | 15     | 21     | 23°C | 73°F |

**Mean Annual Temperature per Locality (deg F)**

X axis = locality; Y axis = degrees

Lyons = Lyons Flora, Western Oregon, 34mya ???

BCF = Bridge Creek Flora, Eastern Oregon, 34mya

GRF = Green River Flora, Colorado, 45mya

FF = Florissant Flora, Colorado, 35mya

**Chart Observations**

The Lyons data of the Oligocene shows similarity to the Eocene of Green River, and much warmer than Eastern Oregon.

**Analysis: Mean Annual Temperature**

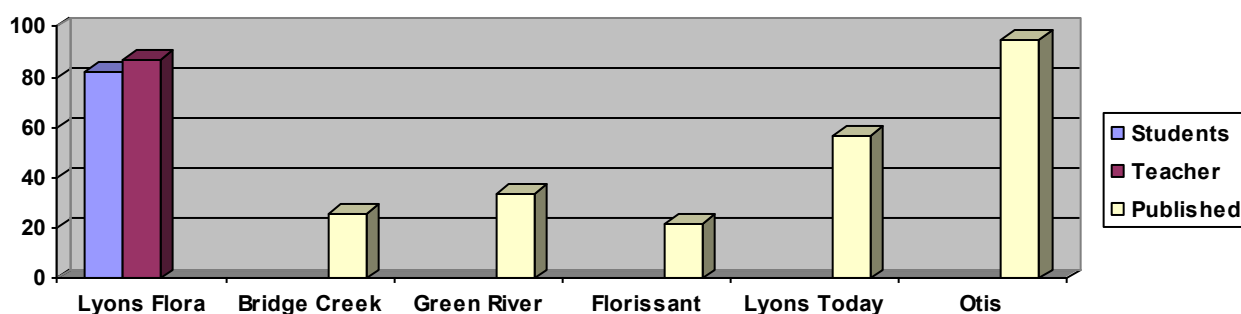
This data suggests that the Lyons Flora shows a very warm climate. It matches pretty close to the Eocene temperatures. It is generally cooler worldwide during the Oligocene, so I would have expected the temperature to be less than it shows. One class did estimate 63 degrees, so perhaps we are in range. Considering it is the beginning of the Oligocene, perhaps the formation was preserved before temperatures had dropped. Also, one would need to consider the type of forest the specimens represent; whether it was near a lake or stream and thus not a representation of the average type of forest on the West side of Oregon. Larger deciduous leaves may be found on trees that lived closer to bodies of water considering they may be more successful there.

Consideration was not made to the abundance or proportion of the types of trees/leaves that were found with respect to each other and/or conifers. There are a lot of *Metasequoia*, *Sequoia*, *Cunninghamia*, and cedars in the collection that were not considered part of the research.

**Mean Annual Precipitation (MAP)**

The students' measured a range of 75.8" to 87.2" of rain for the average year.

| Class    | Avg Leaf            | Area    | MAP   |
|----------|---------------------|---------|-------|
| Period 1 | 33.1cm <sup>2</sup> | 192.3cm | 75.8" |
| Period 2 | 37.7cm <sup>2</sup> | 218.5cm | 86.1" |
| Period 3 | 35.1cm <sup>2</sup> | 203.3cm | 80.0" |
| Period 4 | 38.1cm <sup>2</sup> | 221.2cm | 87.2" |
| Avg      |                     |         | 82.3" |
| Teacher  | 37.9cm <sup>2</sup> | 220.0cm | 86.7" |

**Mean Annual Precipitation per Locality**

X axis = locality; Y axis = rainfall in inches.

Lyons Flora, Western Oregon, 34mya ???

Bridge Creek Flora, Eastern Oregon, 34mya

Green River Flora, Colorado, 45mya

Florissant Flora, Colorado, 35mya

**Chart Observations**

The Lyons data of the Oligocene shows a significantly higher amount of rainfall than either the East side of the state (Bridge Creek Flora) or either Colorado locality. It's also more than the same locality today. The Lyons Flora average rainfall is similar to today's average rainfall recorded in Otis, Oregon.

**Analysis: Mean Annual Temperature**

This data suggests that the Lyons Flora shows a very wet climate. The measurements of the leaves' surface areas were confirmed by my own measurements. Student data is accurate for the purpose of this experiment. I would expect the rainfall to be greater than Eastern Oregon (Bridge Creek Flora) because it is much further from the ocean. The same can be expected for comparisons with the Colorado localities. The Lyons locality today is about 70 miles from the ocean resulting in an annual average rainfall of 57 inches. This is closer to the estimated rainfall of the prehistoric Lyons locality of 87 inches. Based on the geology of Oregon during the Oligocene, it is believed that the Lyons locality was in fact just a few miles from an inland sound much like the Puget Sound today. If we compare a similar locality today, for example Otis, Oregon which is just about six miles from the Pacific Ocean, we see a very similar average rainfall... 95 inches. Based on this research, 89 inches of rainfall is a reasonable estimation for the Oligocene Lyons locality.



## General Project Analysis

**What went right:** Most students were engaged and genuinely seemed to appreciate participating in authentic research. Many students demonstrated meeting the learning targets by analyzing and explaining the results in their own words.

**What went wrong:** When the leaf pictures were printed, they were “sized to fit” the page, which changed their dimensions. An extra calculation was needed to “resize” the leaves to their actual length and width. Besides some technical and grammatical errors in the lesson plans, many students were not able to show proficiency due to absences or weaknesses in measurement skills. Metric rulers are not as accurate as calipers for measuring leaf area. Some of the leaves were not complete and required some approximation. Rounding errors could also have affected data.

## Conclusion

**Restated Hypothesis:** Yes, if we measure the ratio of smooth to toothy margins and the average leaf size of fossils from the Lyons Formation, then we can estimate the average annual precipitation (87 inches) and temperature (70 deg F) for the Western Cascade foothills 34 million years ago. Of course the acceptance of these estimates depends on further discussion and research.

**Improvements:** I would like my students to use calipers for more accurate measurements. There were a number of measurements that were significantly different than my measurements and would like to assess why those students measured the way they did. I am not convinced the specimens truly depict the average rainfall considering the conifers and the relative abundance of both is not part of the research. Some discussion with the developers of the original lesson plan would perhaps reveal the impact considering the inclusion/exclusion of conifers has on estimating both MAT and MAP. I would like to look at the trees that represent the environment near Otis. Would the measurement of those trees' leaves estimate similar rainfall and temperatures to what really occurs now? I would also invite discussion about the accuracy of the research and viability of the results with professional paleontologists and paleoclimatologists, including Dr. Herb Myer.



**Identification:** *Sequoia*  
**Locality:** Hell's Canyon, Oregon  
**Formation:**  
**Age:**  
**Date collected:** 1950's  
**Collected by:**



**Identification:** *Metasequoia occidentalis*  
**Locality:** Beaverhead County, Montana  
**Formation:** Beaverhead formation  
**Age:** 60-113 mbp  
**Date collected:**  
**Collected by:**

# Some Fossil Activities for Ohio Visitors

## The Ohio State University Orton Geological Museum

By Cindy Yablok

Overall, this museum's displays and information presentations are very well organized. They also have more on fossils than they do on rocks and minerals (that are visually on display). Most of the fossils are arranged in the displays by periods. My favorite fossil was simply a cast of a Glyptodont skeleton found in 1846 in Uruguay, South America which lived in the Pleistocene era. It looked like a giant armadillo (and was a relative) that got to the same size and weight of Volkswagen Beetle with a spiked tail and looked incredibly well armored.



The Ohio state fossil is the *Isotelus maximus* trilobite which was one of the largest which could reach nearly 30 inches. This one pictured on the left was at least 17 inches found, in Adams County Ohio.

Skull of Jurassic dinosaur *Cryolophosaurus ellioti* (Dinosaur with the crest on its head). It was the first Dinosaur discovered in Antarctica in 1991 and named after the Ohio State University professor who discovered it. In the Jurassic period it sat at a low elevation in a warm place. It was found at 13,000 feet on Mount Kirkpatrick, 400 miles from the South Pole.



Starfish plate next to a detailed blown up picture.

### Family Fossil Dig Sites

In the southwestern part of the state, there are 2 different family fossil parks that you can explore and dig at for free (they are about an hour apart). The fossils are very small in size. The first one is Oaks Quarry Park in Fairborn Ohio (just east of Dayton) 1267 E. Xenia Dr. These fossils are of Silurian period, 440 MYA. The fossils most commonly found in this old limestone quarry are the crinoid stem disks from the stalks, also Brachiopods, and corals. You may only dig from one designated pile but some of the sponges and corals have good detail (despite small size). The fossil identification information you receive at the parking lot gives you excellent pictures and corresponding species names. The second park for family digging is Trammel Fossil Park at the end of Tramway Dr. in Sharonville Ohio. This park is of the Devonian period. Again, mostly small brachiopods and corals are found (trilobites are uncommon but have been found) and also good documentation for kids to learn about the fossil.

Continued on pg 28



# Transporting Fossil Plates

By Dan O'Loughlin

It is always delightful when a perfect fossil is found in the middle of a large plate. You now have the task of getting this fossil home without breaking it. If the plate is thick enough, you may be able to simply wrap it and lay it flat in your vehicle. Thin plates tend to break when laid flat, so here are some thoughts on getting a thin fossil plate back in one complete piece. First, it should be obvious that padding will be needed. Bubble wrap or newspaper are often used. Once wrapped, it is best to transport the slab upright on its edge. Many plates can be lined up next to one another in this upright position. To further protect the slab, you can place it on a seat of your car and not pack things around it. It can be tied to the seat in this upright position for the safe journey home. If you have many plates, pad them then pack them in a box, which can also be placed on a seat to minimize vibrations. With any luck your fabulous fossil will arrive home in one piece.



A plate measuring 16x14" from Republic, Washington. The plate is only 1/4" thick at its thickest. The pine that I am after is to the right of the plate. Any attempt at field prepping often results in a fracture through the fossil. Once safely home, I can use a saw to reduce the matrix.



Bubble wrap applied to a plate from Arbuckle mountain and held in place with tape, string, or rubber bands



This trace fossil plate from Yellow Water Reservoir, Montana is placed on the seat of my car on its edge for the long trip home. Towels were used because of its great size.



These small plates from Stonerose are placed in 6mm Bubble Zip® Bags from GT Bags (<http://www.gtbag.com/>) then packed into a box for transport.



## Serpulid Tube Worms

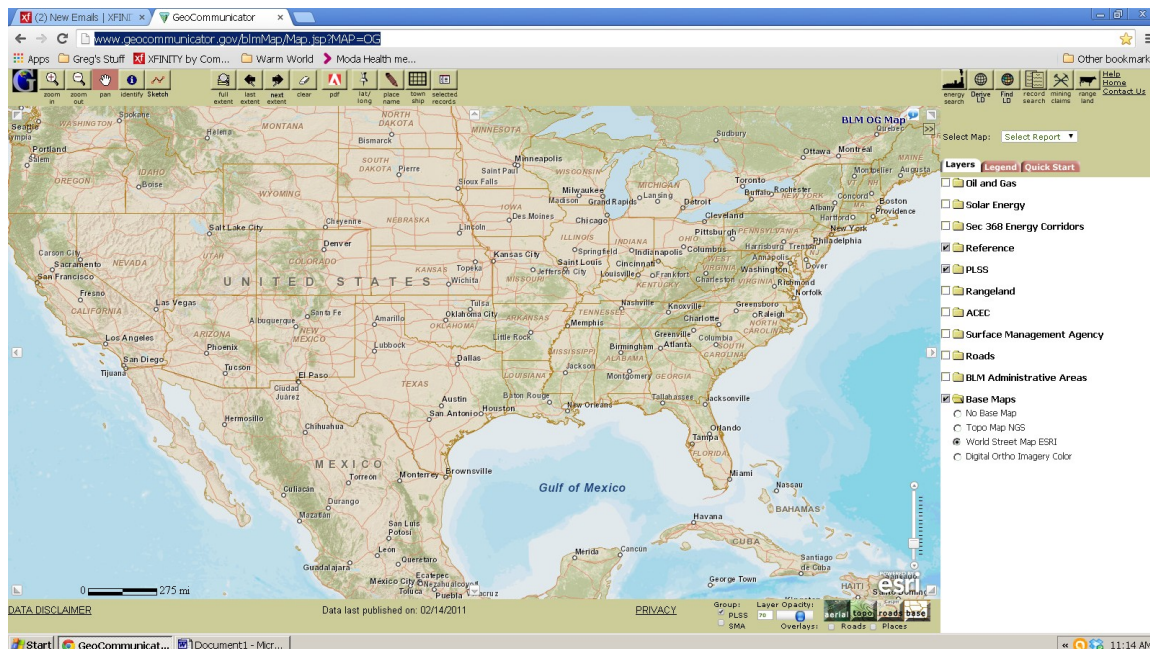
Here are two small serpulid tube worms that were fossilized 30 millions years ago along with their host crab. The top one looks like a glued-on Cheerio, while the other one is more snake-like. The crab was probably a molt as the shell is not complete and the small legs on the side were missing. Prepared by Bruce Thiel.



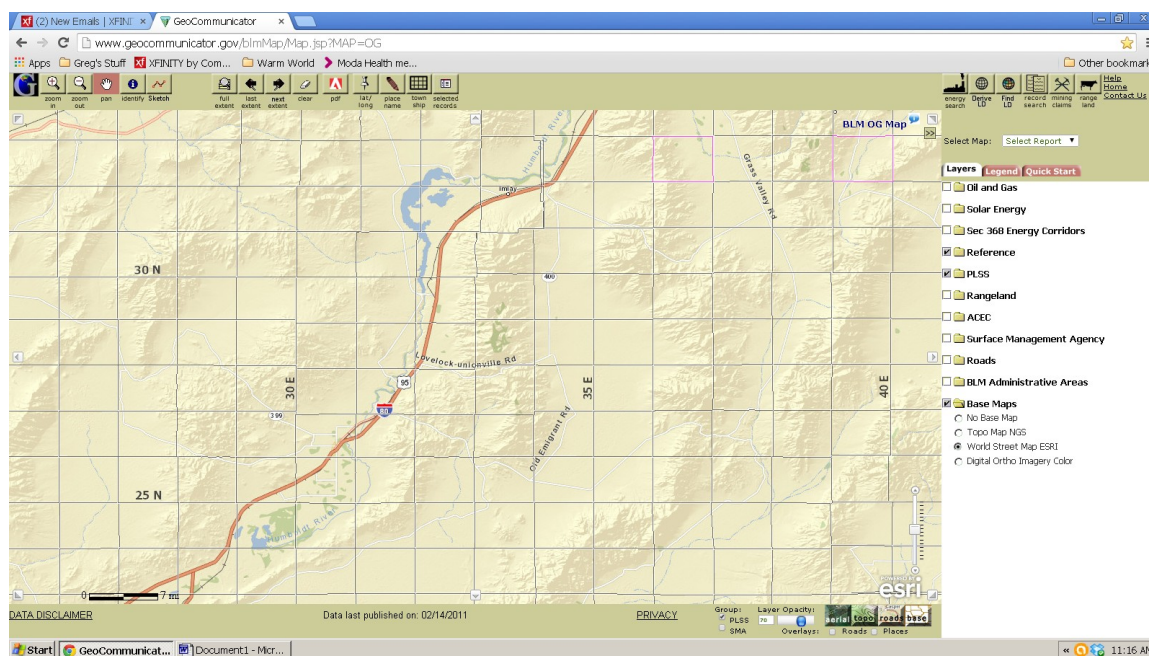
# How to Use Geocommunicator

By Greg Carr

I have found a wonderful site from the BLM that gives you on-line and interactive maps of the continental US. It details all BLM – controlled land, as well as topo, satellite picture or road map backgrounds. Combining the Topo map backgrounds with BLM ownership data gives you a full view of federal owned land. The website can be found at: <http://www.geocommunicator.gov/blmMap/Map.jsp?MAP=OG>



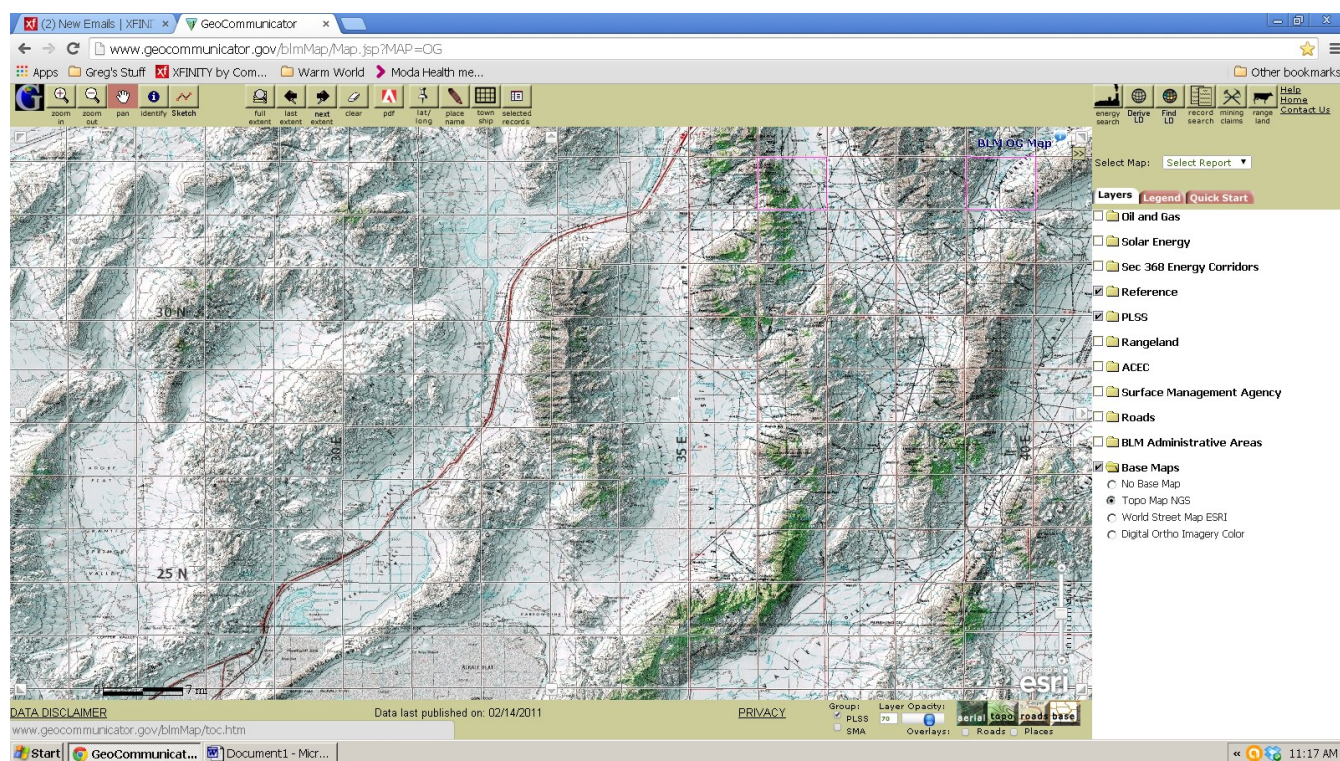
Basically it shows the entire continental US, and you zoom in as desired:



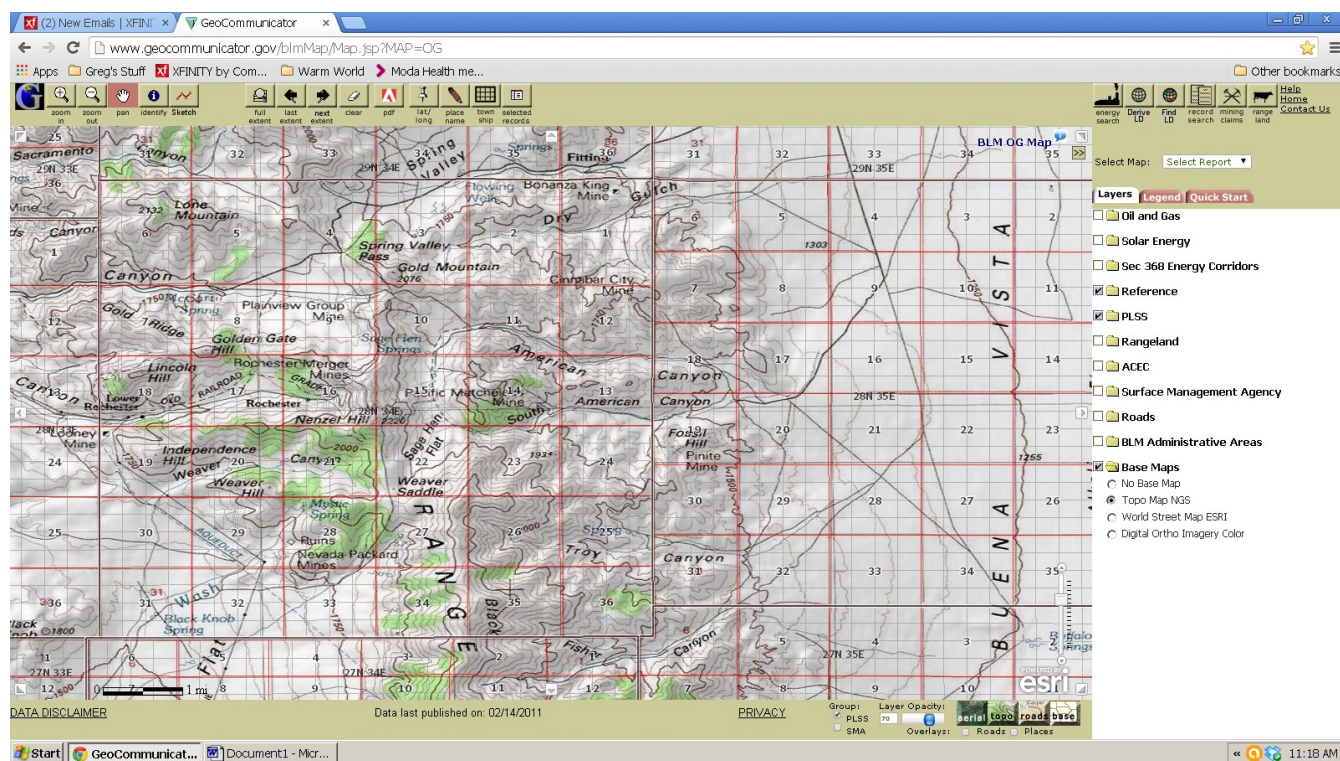
For example, a number of years ago the NARG group went to amonite hill in Nevada. I zoomed into the approximate area on the road map background:



Then I switched to topo map background:

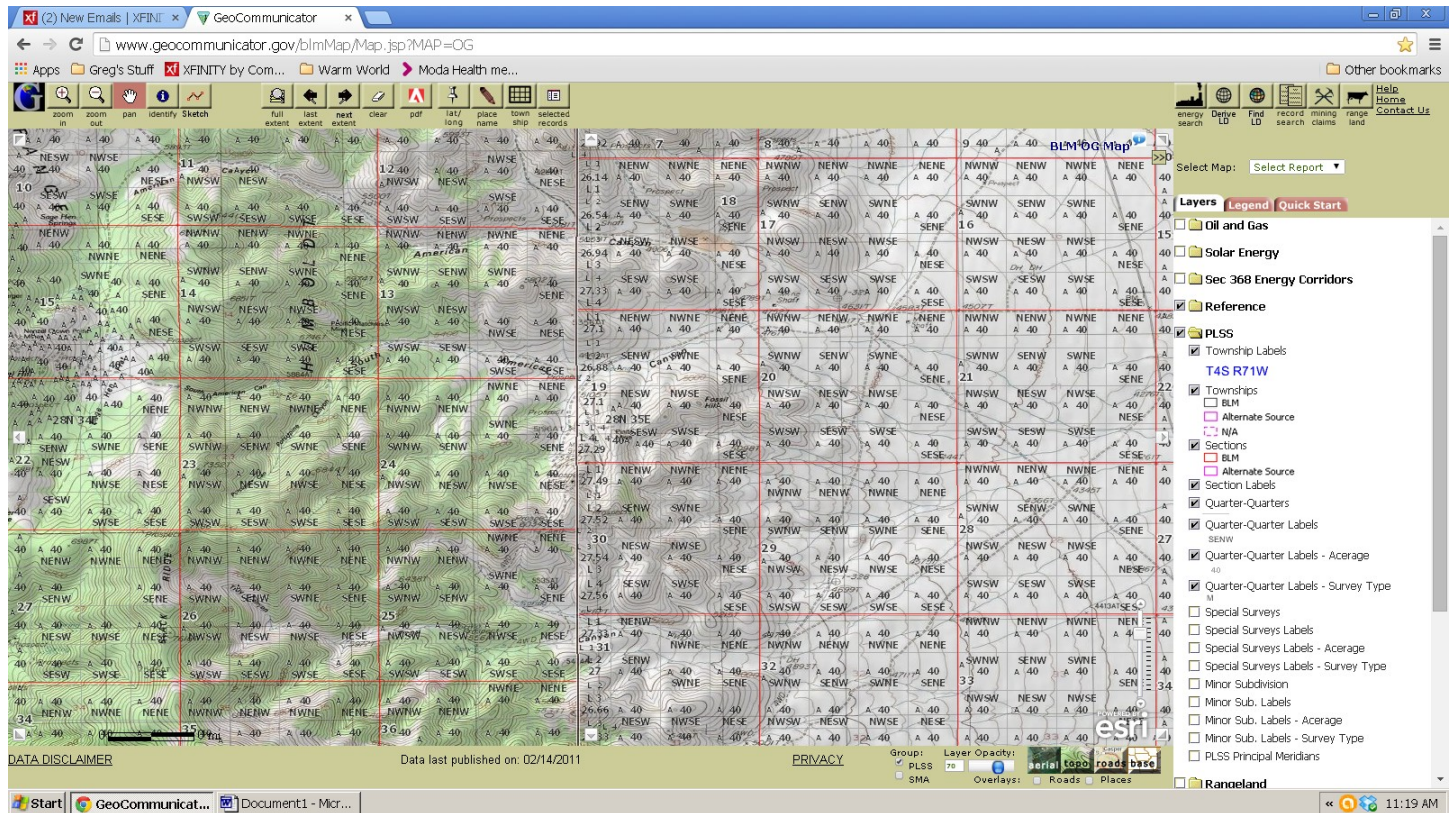


Then I zoomed in a little more to find the Fossil hill site:

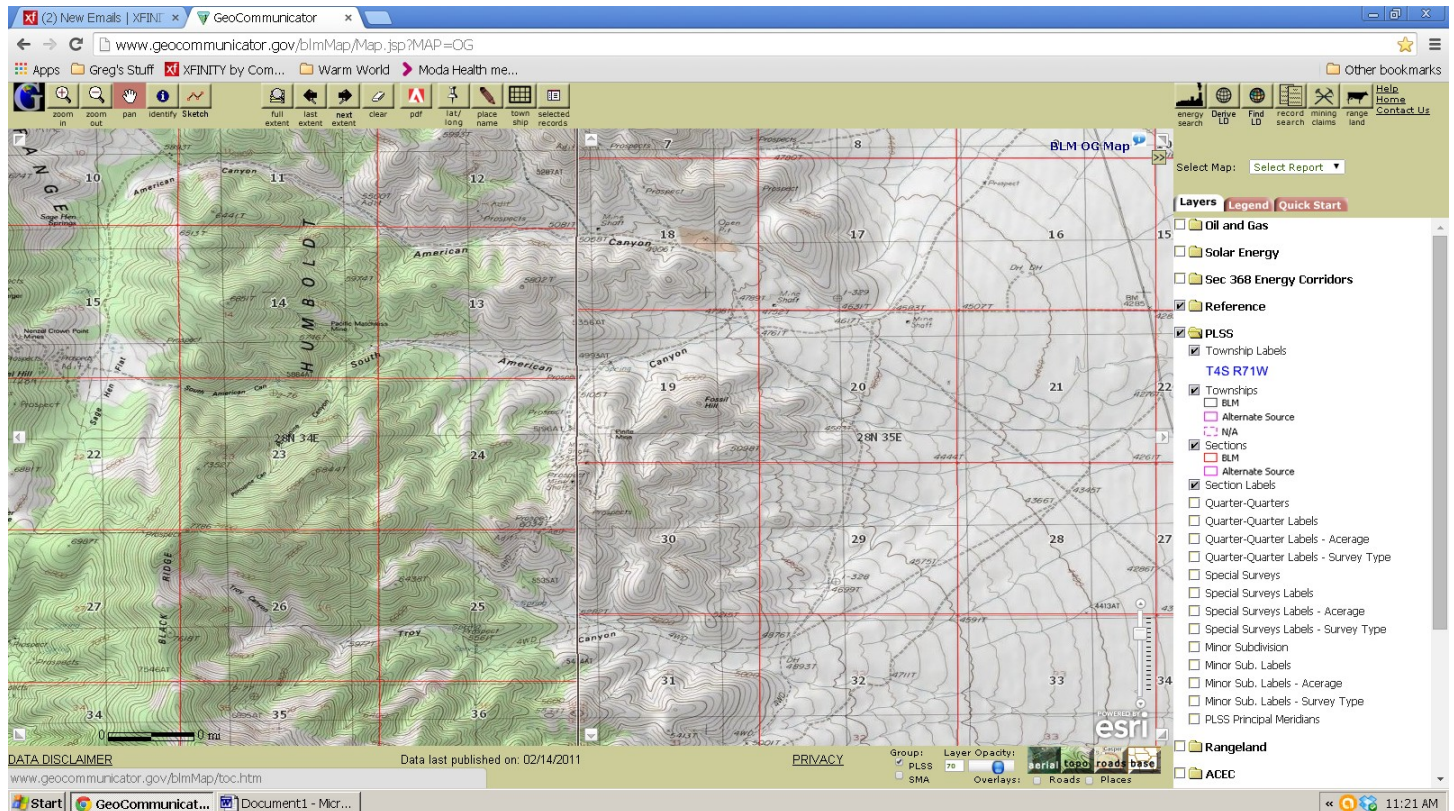




Zooming in a little more gets the map loaded with all sorts of section labels I don't want as they block the map:

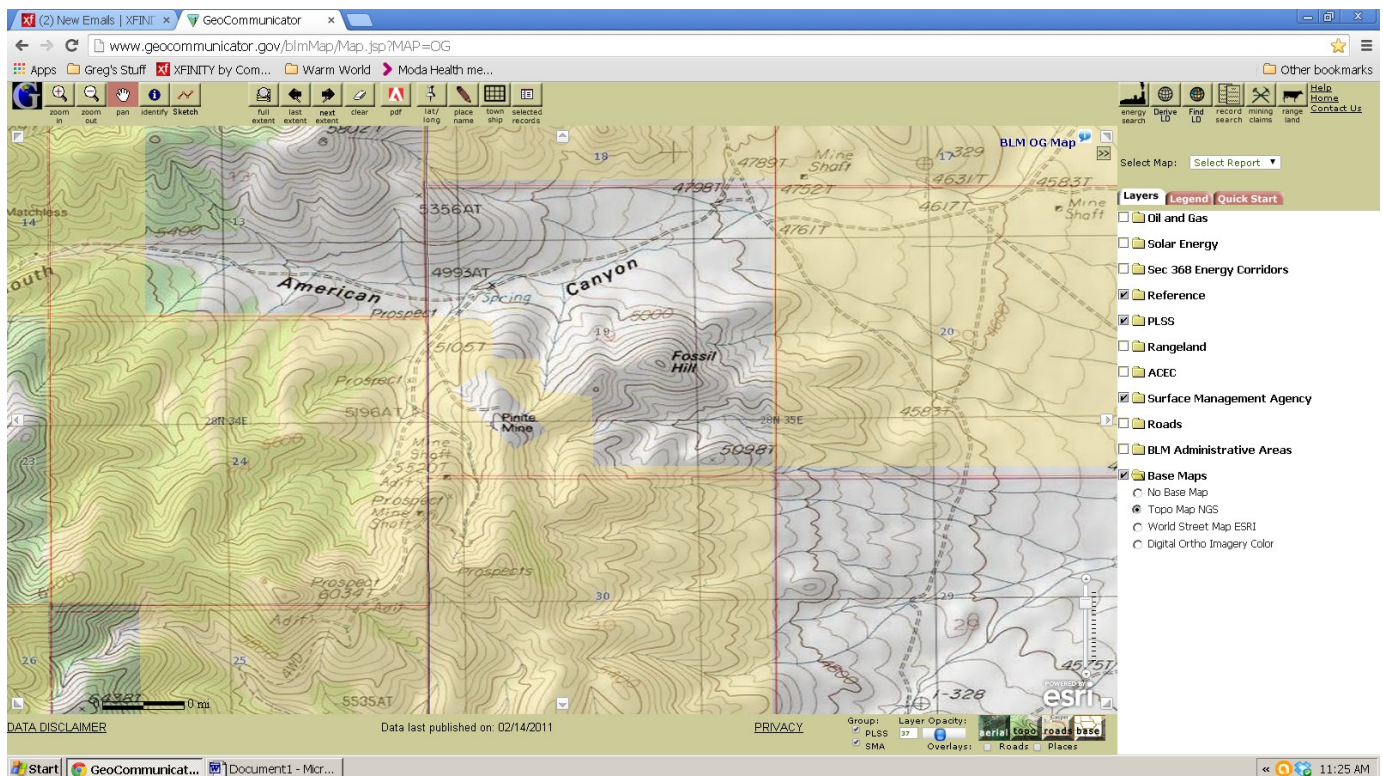
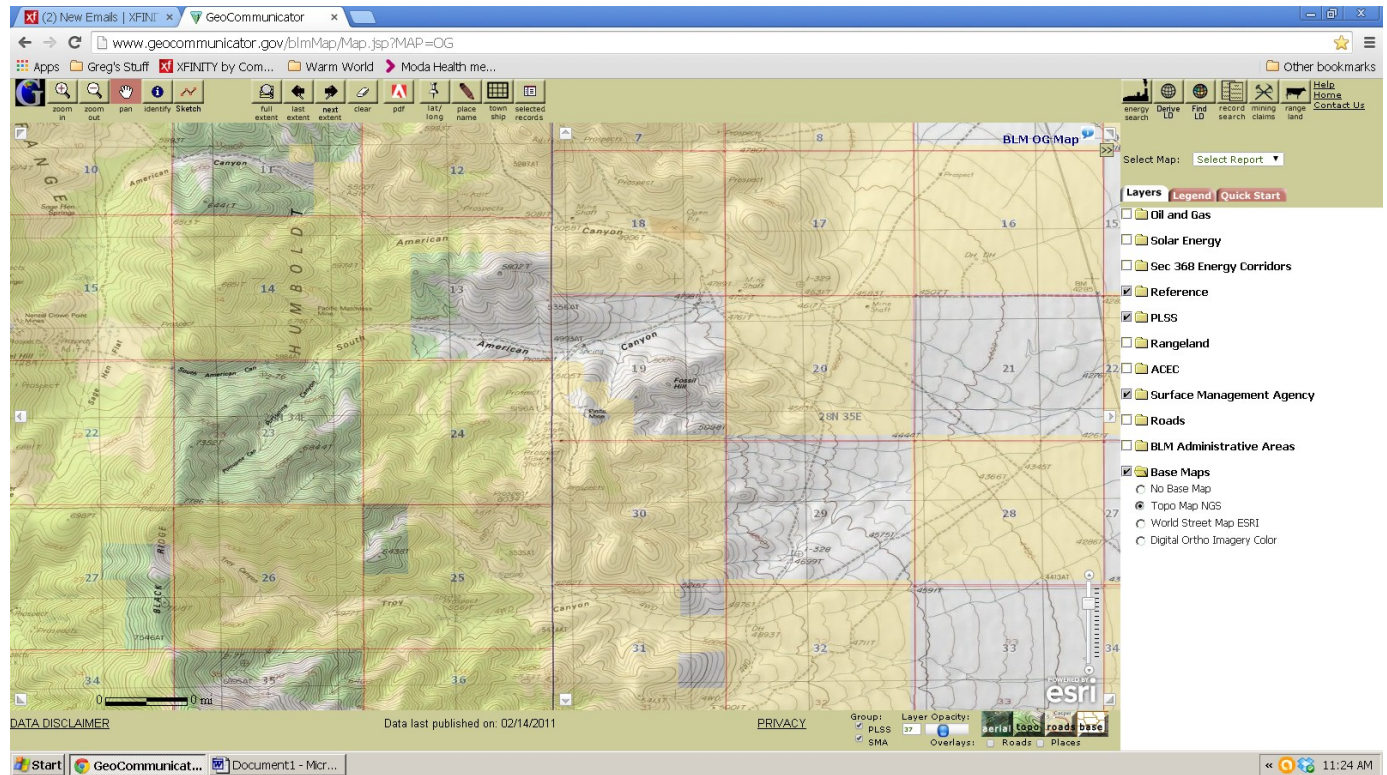


So I go to the menu at the right, select the PSS block, click on it and uncheck the unwanted labels:





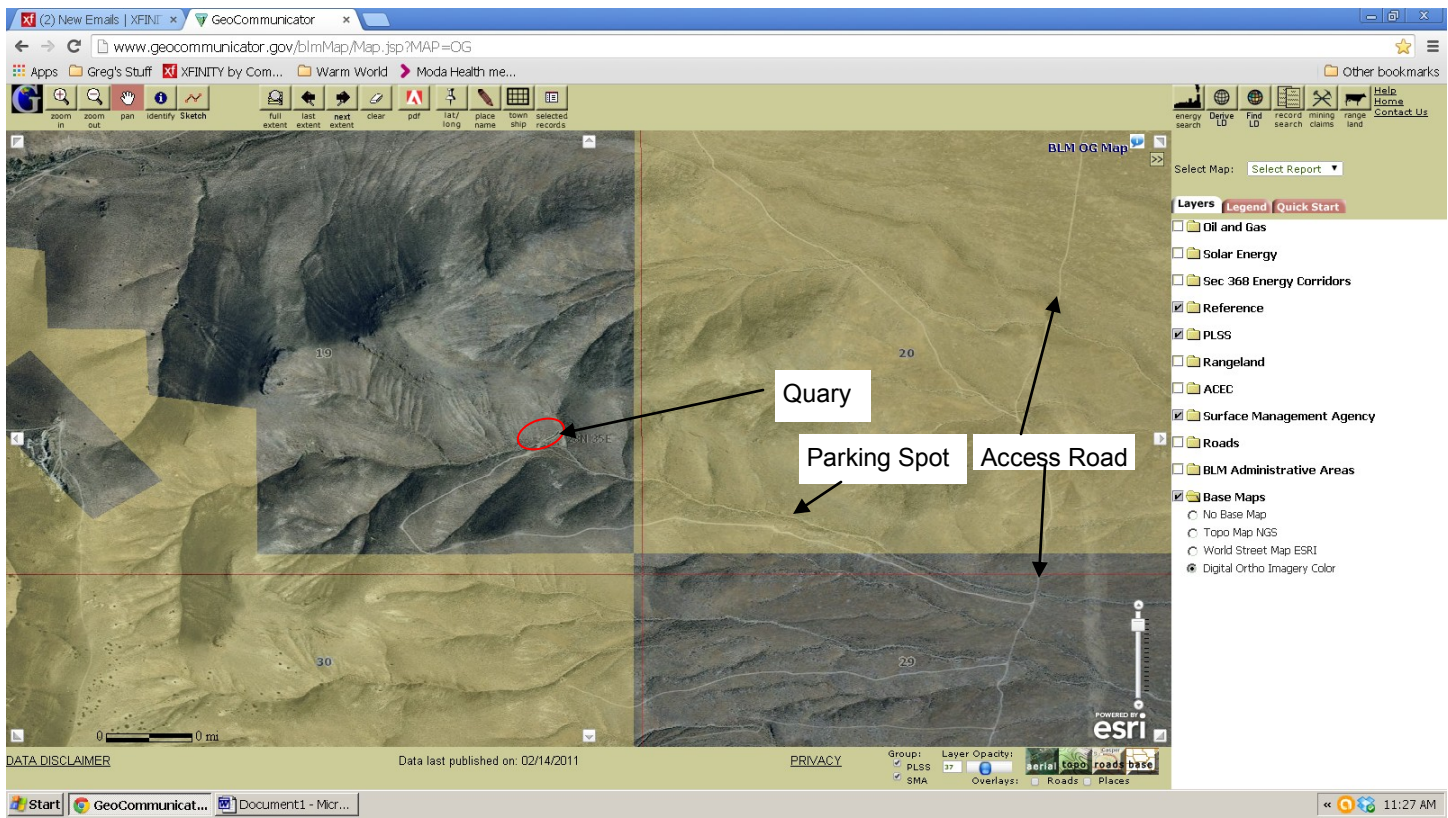
Then to determine land ownership I go to the menu and click on the 'surface management agency block. That highlights BLM ownership blocks. The density of the blocks can be varied with a slider at the bottom so that you can still see the underlying background:



You can see that the fossil hill site looks to be in private property. Let's zoom in some more:



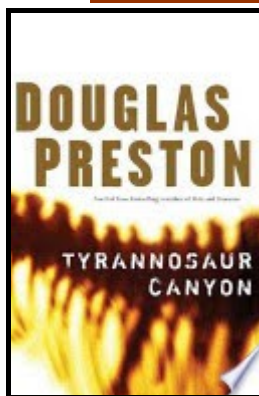
Yep, it sure is. Let's change to a satellite photo as a background and zoom in real close:



For those of us who went there, some people can remember walking up an arroyo to the quarry, and I drove up & down a steep hill to get there. It's public land half way up that arroyo, then transitions to private land. You can actually see the quarry cut in the satellite photo! And we can clearly see that the quarry is on private land, not BLM land. (Note: NARG had permission to collect on this property, the owner took us to the location and told us what we could and couldn't collect.)

So I hope you find this information valuable.

Sincerely, Greg Carr



## Book Review

### Tyrannosaur Canyon

by Robert Rosé

I just finished reading an adventure novel by Douglas Preston called Tyrannosaur Canyon. This novel is written for fossil collectors and dinosaur lovers. The book starts out with some verbatim descriptions of Apollo 17 astronauts gathering moon rocks. How this is tied in to finding a *Tyrannosaurus Rex* fossil in New Mexico you will not find out until the end of the book. In the middle are vertebrate paleontologists, horse people, an ex-CIA monastery novice, a gun-totting convict, a female museum scientist, US military and a New Mexico canyon country backdrop where intrigue and murder happen. They do discover and retrieve the body of the female T-rex in the end but it's not easy. I did find one error in the paleontology where he refers to Cenozoic trilobites!!

This is a good story where almost everyone ends up getting what they deserve. Enjoy!

# Displaying your favorite fossils

By Debbie Shannon

Recently I was able to purchase a number of fossils from an estate sale. After sorting through them and deciding which were nice enough to display, the next problem was how to display them. The local craft store (Craft Warehouse) helped to resolve this. They had several different styles of unfinished display boxes that were perfect. These are 2 styles that caught my eye but the store had many other sizes and shapes.



Next had to decide whether to paint or stain the boxes. I decided to stain them and used PolyShades by Minwax. Two brush sizes were used, one for the larger areas and one for the finer areas around the glass and hardware.



I'm not the neatest painter around so I used painters tape around the glass and over the hardware so that stain did not get everywhere.

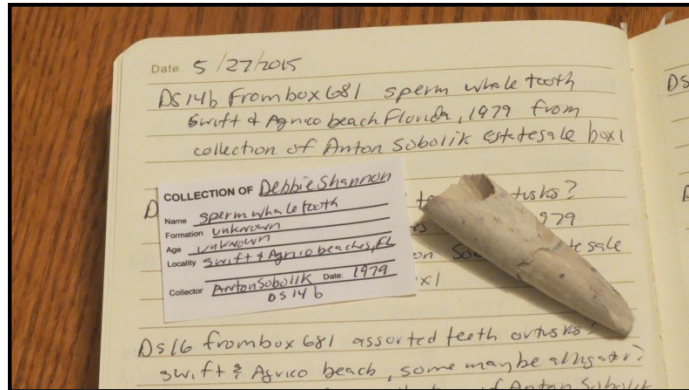
Remember to follow the directions on the can of stain or paint, including painting outdoors if there is a potential of fumes. Also be aware that many stains are not water based so you may want to wear old clothes. Recycle the brushes unless you want to spend the time to clean them per the stain instructions. (I chose cheap brushes so I could just recycle them when done.



Next I went to a craft/material store and purchased some batting used by quilters. There are a lot of different types of material that can be used for fossil padding. I chose 1/2 inch thick polyester batting for setting the fossils on and thin cotton batting to lay as a sheet on top of the fossils.



After cutting the batting to fit the various compartments, the fun started. I spent hours filling out labels (thanks to Dan who sent us printable label sheets several months ago) and deciding where each fossil should go. I had also purchased a hardbound notebook and finally started documenting the fossils in my possession.



Here is what the finished boxes look like:



Enjoy!

# Grow Your Own Ginkgo

Here is a simple way to grow ginkgo seeds. You first have to find a female tree which is easier said than done. Almost 100% of the ginkgo trees sold at nurseries are male taken from grafts. The seed of the female smells like rotten butter which explains the female tree's sparse occurrence. Once located, the seeds are collected from October through January. Ginkgo trees drop the majority of their fruit over a very short time period so collecting time is up to you. The longer you wait, the easier it is to clean them since the flesh will soften with time. Trust me; few animals would remove the fruit from the ground while you are waiting for nicer weather to collect in. Once the seed is gathered, the inner seed must be separated from the outer seed coat. Soak the seeds in water for 3-5 days. This will soften the outer coating making the next step simpler. If lots of seeds are being worked with, a pressure washer and a screen made of 1/4 inch hardware cloth works best. If you separate them by hand, use a double layer of latex gloves. Once again, the coating smells awful. It contains butyric acid along with a similar irritant as poison oak so you may get a rash. Once the seeds are separated, soak them in dilute dish washing soap to neutralize the acid, remove the smell, and remove growth inhibitors for a better growth rate. Next, use a file or sandpaper to grind through the shell on one side. Be careful not to damage the seed within. This allows for better water absorption and a higher germination rate. Now take a plastic sandwich bag and place a cup of potting soil or dirt within it. Dampen the soil with enough water to form a ball. Place 5-6 soaked seeds in the soil and spray with an antifungal spray. Mix the bag well. Place the bag in the refrigerator and leave in there until mid to late February. At that time take the bags of seeds out of the refrigerator and place them on a window-sill. In about 6-10 weeks, you should notice some sprouts. The bags are acting as small terrariums. Open the top of the bags and capture some air in them to expand the bags and give the sprouts more room to grow. Once the sprouts are 2-3 inches tall, transplant them into 1 gallon pots. Spray the pots with a fungicide. Place 1 gallon bags over the top of the pots to maintain heat and humidity. These pots can then be left outside. Place the pots in a shallow tray for easy watering. When summer arrives and the seedlings are 6 inches tall remove the bag covering the pot. Be careful, at this stage cutworm beetle larva love to eat the newly forming trees. Ginkgoes may remain in these pots for 1-3 years. After that, you may either transfer them to a larger pot or plant them in the ground. It will take 12-15 years before you realize the seedling you planted in your yard is a female. Good luck!





Partial collection of seeds from one tree. It is easy to get over 40 pounds of seeds off one tree.



Ginkgo seeds before separating



Cleaned seeds



Sand through outer shell



One brand of fungicide

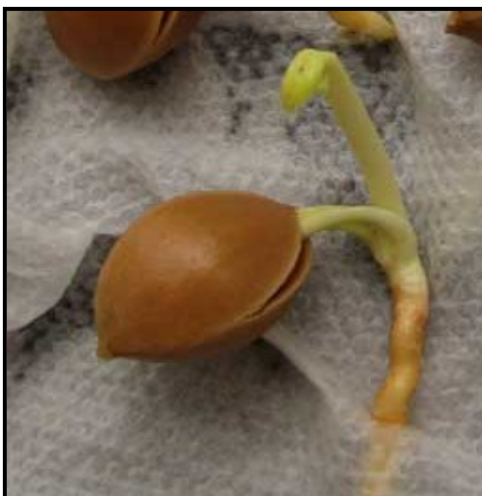




New seedling after 6-8 weeks on a windowsill. Nonharmful algae can be seen also growing in the bag.



Early rooting on a paper towel



Stem and root seen



Seedling picture courtesy of Matt Opel <http://burgersonion.blogspot.com/2013/12/ginkgo-from-seed.html>





Seedling planted in a 4" peat pot



Using a bag to protect the seedling from drying out



Seedlings growing in 1 gallon pots.

For more information and other techniques go to

### The Ginkgo Pages

<http://kwanten.home.xs4all.nl/name.htm>



Tree after three years

## NARG's Up Coming Activities

2015

### \* July 8-14      McDermitt & Wyoming

We are departing on July 8 in the morning and heading to McDermitt on the border of Oregon and Nevada. We are actually going to collect thunder eggs from a new site recently discovered. We may also collect petrified wood in the area. We will plan to leave for Kemmerer, WY on July 10th. We will mostly be hunting for the Blue Forest petrified wood, but will also plan to explore a quarry for fossil fish and other vertebrates. Detailed information is coming soon on the potential for this, but we've been told (for a modest collecting fee) we can keep anything we find. I am going and am planning to head back for Oregon on the 13th or 14th. Please contact Aaron if you are planning to meet us there and participate. I will put you on a list for further information and coordinating. 503 364-2979

### \* July 25-27      Campout on the Nehalem River at Bill Sullivan's House

Our annual campout for fun and fossil crabs will continue. Details are yet to be inked, but plan to float the Nehalem for crab concretions and agates; or participate in over-land hunts for the same.

Let us know you are planning to attend.

Aaron Currier [fossils@curriergraphics.com](mailto:fossils@curriergraphics.com) or Margaret Johnson [johnsnml@comcast.net](mailto:johnsnml@comcast.net)

### \* Aug. 8      Hillsboro, OR      NARG FossilFest      This year's theme is Pleistocene

<http://NARGPaleo.org>

### \* Aug 3-12      Komo Bluff, WY      Nail Quarry - Trip Leader Jerold Dodson

[jdodson01@msn.com](mailto:jdodson01@msn.com)

The trip to Como Bluff WY is scheduled for first 12 days in August. Sorry it overlaps with NARG weekend. At the quarry: August 3 (Monday) thru August 12 (Wednesday). Morning of August 3 will be spent getting dig site set up with awnings, ditching, etc. August 12 will be close down of quarry, removal of tarps, etc. ditching for winter and general clean up of site. We are maxed out with participants right now. If you are interested in going this year, email Jerry Dodson at [jdodson01@msn.com](mailto:jdodson01@msn.com). Also cell phone or text 360-721-9492. Will put you on reserve list.

It takes a good 1.5 to 2 days from Portland to Medicine Bow. The turnoff to Medicine Bow is East of Rawlins. Hwy 28/30. Rawlins is a good place to find groceries, water and fuel. Medicine Bow is very small approximate 250 residents and only has a convenience market with gasoline.

We will probably work the quarry in shifts in order to have max 8/9 in the quarry. But there is plenty to do. Fossil hunting in the Sundance layer (you can keep fossils from there). Im planning side trips to both the Tate Museum at Casper College in Casper WY where all of the dino bones go from our Nail quarry. Also a small but powerful NHM at the University of WY in Laramie. Can also look at a trip to Thermopolis where a commercial museum has a remarkable collection.

### \* Aug. ?      Pleistocene Fossil Digs

Information is coming on NARG's participation in both the Mammoth site excavation and recovery on the Yamhill River with Mike Full and the Woodburn dig opportunities for Pleistocene fossils in August.

### \* October 9-11      Hillsboro, OR      Portland Regional Gem and Mineral Show

Washington County Fair Complex

<http://www.portlandregionalgemandmineral.org/>

### \* November 7      Rice NW Museum      NARG Auction & Potluck

<http://NARGPaleo.org>



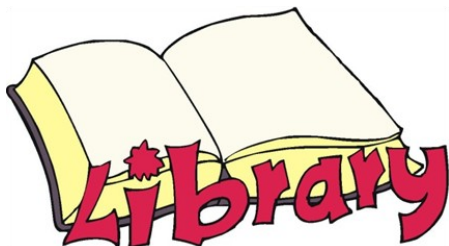
# Fossil Calendar

|                |                                                 |                                              |                      |                                                                                                                                   |
|----------------|-------------------------------------------------|----------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| March 7        | <b>Dino Day</b>                                 | Burke Museum (U of Washington)               | Seattle, Washington  | <a href="http://www.burkemuseum.org/events">http://www.burkemuseum.org/events</a>                                                 |
| March 13-15    | <b>Tualatin Valley Rock and Gem Club Show</b>   | Washington County Fair Complex               | Hillsboro, Oregon    | <a href="http://www.tvrgc.org/Home.html">http://www.tvrgc.org/Home.html</a>                                                       |
| March 28-29    | <b>Sweet Home Rock &amp; Mineral Show</b>       | Sweet Home High School                       | Sweet Home, Oregon   | <a href="http://lebanonareachamber.chambermaster.com/events/">http://lebanonareachamber.chambermaster.com/events/</a>             |
| April 10-12    | <b>MAPS Fossil Exposition</b>                   | Sharpless Auctions Facility                  | Iowa City, Iowa      | <a href="http://www.midamericapaleo.org/">http://www.midamericapaleo.org/</a>                                                     |
| April 10-12    | <b>NY/NJ Mineral, Fossil, Gem, Show</b>         | NJ Convention and Expo Center                | Edison, New Jersey   | <a href="http://www.ny-nj-gemshow.com/">http://www.ny-nj-gemshow.com/</a>                                                         |
| April 15-18    | <b>Fossil Prep. &amp; Collections Symposium</b> | N. Carolina Museum of Natural Sciences       | Raleigh, NC          | <a href="http://www.paleomethods.org">www.paleomethods.org</a>                                                                    |
| April 17-19    | <b>WAMS Rock Show</b>                           | Polk County Fairgrounds                      | Rickreall, Oregon    | <a href="http://www.wamsi.org/">http://www.wamsi.org/</a>                                                                         |
| April 24-26    | <b>Mt Hood Rock Club Show</b>                   | Kliever Memorial Nat. Guard Armory           | Portland, Oregon     | <a href="http://www.mounthoodrockclub.com/">http://www.mounthoodrockclub.com/</a>                                                 |
| April 24-26    | <b>Stonerose - Member's Dig</b>                 | Stonerose Interpretive Center                | Republic, Washington | <a href="http://stonerosefossil.org/">http://stonerosefossil.org/</a>                                                             |
| May 17-23      | <b>Annual SPNHC General Meeting</b>             | Hilton University of Florida Conference Cntr | Gainesville, Florida | <a href="http://www.flmnh.ufl.edu/spnhc2015/home/">http://www.flmnh.ufl.edu/spnhc2015/home/</a>                                   |
| June 5-7       | <b>Tate Summer Conference</b>                   | Casper College                               | Casper, Wyoming      | <a href="http://www.caspercollege.edu/tate/conference">http://www.caspercollege.edu/tate/conference</a>                           |
| August 1       | <b>Rice Museum Summer Fest</b>                  | Rice NW Museum of Rocks and Minerals         | Hillsboro, Oregon    | <a href="http://www.ricenorthwestmuseum.org/">http://www.ricenorthwestmuseum.org/</a>                                             |
| September 6-14 | <b>Denver Mineral, Fossil, and Gem Show</b>     | Denver Coliseum                              | Denver, Colorado     | <a href="http://www.coliseumshow.com/">http://www.coliseumshow.com/</a>                                                           |
| October 14     | <b>National Fossil Day</b>                      |                                              |                      | <a href="http://nature.nps.gov/geology/nationalfossilday/index.cfm">http://nature.nps.gov/geology/nationalfossilday/index.cfm</a> |
| October 14-17  | <b>Society of Vertebrate Paleontology</b>       | Hyatt Regency Dallas                         | Dallas, Texas        | <a href="http://vertpaleo.org/Annual-Meeting/Home.aspx">http://vertpaleo.org/Annual-Meeting/Home.aspx</a>                         |
| October 24-25  | <b>Clackamette Mineral and Gem Show</b>         | Clackamas County Fairgrounds                 | Canby, Oregon        | <a href="http://www.clackamettegem.org/home">http://www.clackamettegem.org/home</a>                                               |

For a listing of local gem and mineral shows check out: <http://www.mineralcouncil.org/shows.pdf>

<http://orerocon.com/> Click on Portland Area Rock Clubs, includes PNW Clubs)

# NARG



The NARG library has just become easier for members to use. The 430 books can be viewed by using the link below. Once you find a book you want, click on it and find its "index" number. Requests for books using the index number are made to danolough@aol.com. He will notify you if the book is already checked out. If it is not, he will bring it to the next NARG meeting. Members can check out 2 books at a time and should return them at one of the following 2 meetings.

<http://cloud.collectorz.com/danolough/books>

## NARG Membership

NARG's membership dues for 2015 are due January 1, 2015

|                       |        |
|-----------------------|--------|
| Individual Membership | = \$25 |
| Family Membership     | = \$40 |
| Student Membership    | = \$10 |

You may pay for your membership by:

- \* Bring your money to our next NARG meeting, Wednesday, , Jan. 7, 2015.
- \* You can mail your payment to:

NARG  
P.O. Box 2207  
Beaverton, OR 97075-2207

\* You can pay your dues thru Pay Pal. You don't need a Pay Pal account to pay this way. You can pay using a credit Card.

### Use the following links:

Family Membership \$40 [https://www.paypal.com/cgi-bin/webscr?cmd=\\_s-xclick&hosted\\_button\\_id=AXASMFKA8MZU4](https://www.paypal.com/cgi-bin/webscr?cmd=_s-xclick&hosted_button_id=AXASMFKA8MZU4)

Single Membership \$25 [https://www.paypal.com/cgi-bin/webscr?cmd=\\_s-xclick&hosted\\_button\\_id=438FVX4E6CTQY](https://www.paypal.com/cgi-bin/webscr?cmd=_s-xclick&hosted_button_id=438FVX4E6CTQY)

Student Membership \$10 [https://www.paypal.com/cgi-bin/webscr?cmd=\\_s-xclick&hosted\\_button\\_id=9QCCT4D7FTFRU](https://www.paypal.com/cgi-bin/webscr?cmd=_s-xclick&hosted_button_id=9QCCT4D7FTFRU)





**Identification:** Dinosaur leg bone

**Locality:** Colorado Plateau, Utah

**Formation:** Morrison formation

**Age:** 146-156 mbp

**Date collected:**

**Collected by:**

## Shopping with Amazon

NARG receives anywhere from 4% to 6% of your purchases from Amazon.com, if you enter Amazon thru their banner on NARG's website. If you forgot to go thru NARG's site just put your selected item in your cart. Log out, then enter Amazon via the banner on NARG's site.

A big thanks to all who have participated in the plan this year. We have received \$69 thru this program so far this year.

# How to use NARG's Paleolist

## About NARG\_Paleolist

The NARG email list is for facilitating announcements and general discussion of club matters and all things paleontological. The list functions by passing along each email to all the group members. When you email the list, you will receive a copy of your message as well. You can change the way you receive group messages from each message separately to a daily digest of all message at this URL.

List members can also view the email addresses of all the other members here. If you no longer want to receive messages from the list, then you can unsubscribe yourself, but you will not receive any more messages or newsletters from NARG. All group announcements including meeting agendas and newsletters are sent via the list only, not as individual messages to each of you, so you won't get these any more if you choose to unsubscribe.

[http://orerocon.com/mailman/listinfo/narg\\_paleolist\\_orerocon.com](http://orerocon.com/mailman/listinfo/narg_paleolist_orerocon.com)

To see the collection of prior postings to the list, visit the NARG\_Paleolist Archives. (*The current archive is only available to the list members.*)

## Using NARG\_Paleolist

To post a message to all the list members, send email to

[narg\\_paleolist-bounces@orerocon.com](mailto:narg_paleolist-bounces@orerocon.com)

(save this in your address book for future use)

When responding to an email from the NARG Paleo List, click on the **reply** button to send response to sender. If you want your response to be seen by all list members hit **reply all** button.

You can subscribe to the list, or change your existing subscription, change your email address.

(Continued from page 9)



Ammonites in a drawer shown by curator Dale Gnidovec.



Placoderm, armored fish from 360 mya.

#### **NARG Officers:**

|                        |                |                |
|------------------------|----------------|----------------|
| <b>President:</b>      | Aaron Currier  | (503) 364-2979 |
| <b>Vice President:</b> | Dan O'Loughlin | (503) 866-5997 |
| <b>Secretary:</b>      | Tami Smith     | (503) 620-5317 |
| <b>Treasurer:</b>      | Peg Johnson    | (253) 370-8892 |

#### **Directors:**

|                 |                |
|-----------------|----------------|
| Robert Rosé     | (541) 367-2052 |
| Larry Purchase  | (360) 254-5635 |
| MacKenzie Smith | (503) 403-8941 |
| Linda Harvey    | (503) 310-3036 |
| Garret Romaine  | (503) 350-6330 |

#### **Honorary Director:**

|                 |                |
|-----------------|----------------|
| Bill Sullivan   | (503) 429-6707 |
| Michael Santino | (503) 989-2155 |

#### **Committees:**

|                          |                |
|--------------------------|----------------|
| <b>Newsletter:</b>       | Peg Johnson    |
|                          | Aaron Currier  |
|                          | Dan O'Loughlin |
| <b>FossilFest:</b>       | Linda Harvey   |
|                          | Dan O'Loughlin |
| <b>NARG Auction</b>      | Linda Harvey   |
| <b>Portland Regional</b> | Dan O'Loughlin |

## **NORTHWEST FOSSIL FEST**

**August 8, 2015**

*A Celebration  
of Paleontology in  
the Pacific Northwest*

at the Rice Museum  
in Hillsboro, Oregon



*presented by the*  
North America  
Research Group

**FREE ADMISSION**  
[nargpaleo.org](http://nargpaleo.org)