Fossils In North Dakota

FIND is a newsletter dedicated to helping young readers (in age or spirit) express their love of fossils and paleontology, and to help them learn more about the world under their feet. Each issue will be broken up into sections including Feature Fossils, Travel Destinations, Reader Art, Ask Mr. Lizard, and more!

Winter 2024 No. 55

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Next Issue: March 2025

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Feature Fossil: *Averrhoites* sp.

Not everything that enters collections is 100% identified - nor 100% cleaned for that matter! Sometimes we need to revisit cabinets and sort, identify, and do a little touch-up cleaning and repair.

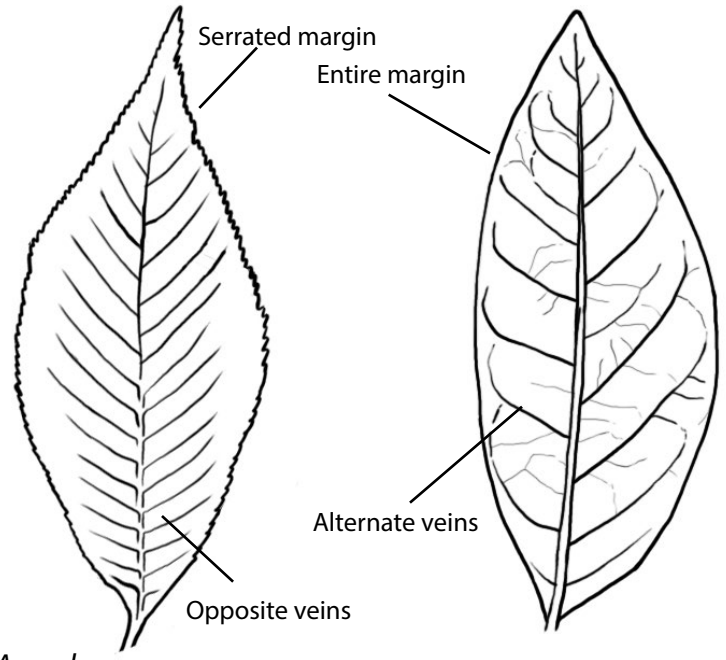
This last month we've been reworking some of our paleobotany collection - Paleocene plant fossils that were collected between 2001-2002 in McKenzie County. We do not have a dedicated paleobotanist on hand, but Becky has a fascination with plants, and a willingness to draw out leaf architecture (veins, borders, shapes, etc.) and build spreadsheets.

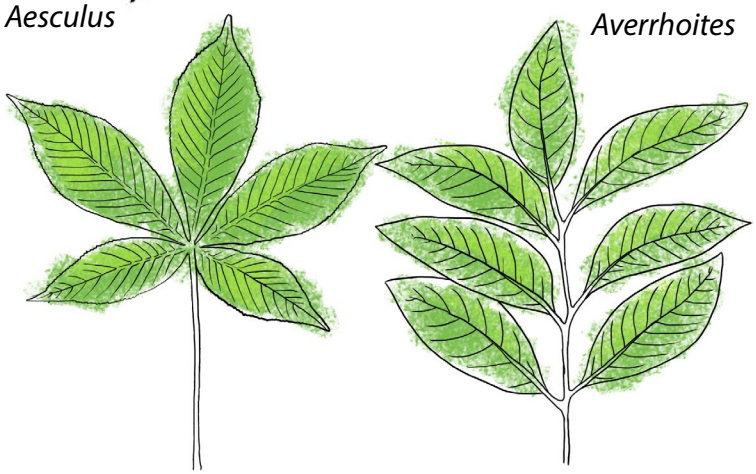
The goal was to identify and sort the plant plates into categories. The wrinkle in this plan is sometimes there are more than one leaf-type per plate. Start with the easy to identify plants, and as you run across a plate with an extra, slowly branch out your identifications. That way you train your eye for a specific leaf, and can spot them faster.

One of the first leaves we began to sort out is a plant called *Averrhoites*. The leaf morphology (shape) is similar to the genus *Sapindus*, which includes modern plants called "soapberries" or "soapnuts." The fruits, barks, stems, roots, and leaves of these modern plants can contain an organic chemical called saponin, which froths and foams, and can be in soaps.

At first glance, a single *Averrhoites* leaflet looks similar to *Aesculus* leaflets, the Horse Chestnut discussed in FIND 52. Looking twice, you can spot a lot of differences. The biggest difference is the outer border - the margin. *Aesculus* has a **serrated** edge like a steak knife, while *Averrhoites* is very smooth - called **entire**.

The veins are also arranged differently. Both have a single primary mid-vein, but the secondary veins that branch are where things really change. The secondary veins on *Aesculus* are **opposite** - meaning that they come in pairs, and meet the mid-vein at the same place on each side. Only the very first pair of *Averrhoites* is opposite - the rest are **alternating**.



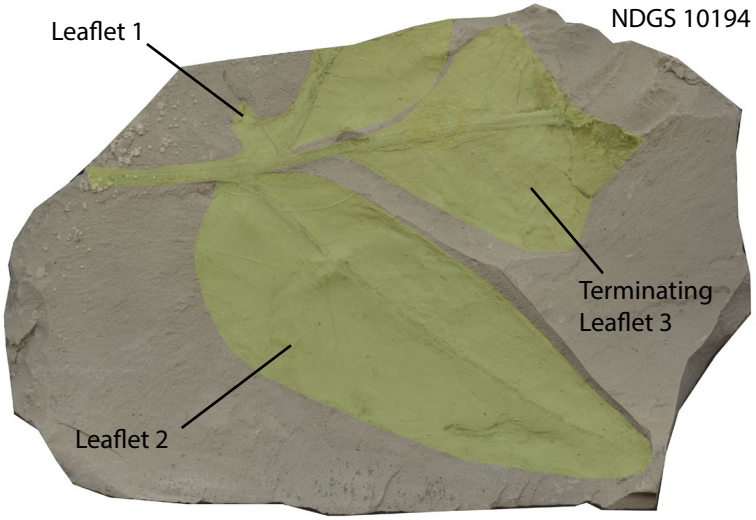


Both *Aesculus* and *Averrhoites* have compound leaves. Each "leaf" is made up of several "leaflets." *Aesculus* at left looks like a hand with fingers, and is called **palmate**. *Averrhoites* at right has an odd number of leaflets arranged along a line, and is called **pinnate** (odd). Trying to figure

out if you're looking at a fossil with a leaf, or a leaflet, can be quite challenging. It helps if you have a large number of leaf plates to look at. Maybe one has a perfect base, but is missing the edges. Another might have a good edge, but you can't see the stem (or petiole). It's just another puzzle to figure out with paleontology.

Above: A great example of the compound nature of these leaves, but doesn't tell us much about the overall shape of the leaf.

Below: The terminating end of the compound leaf, which tells us it has an odd-number of leaflets. The leaf is colored in green because the preservation is poor, and most of the veins are hard to see.



Above: Two leaf ends with exceptional veins, apex (tip), and margins (edges), but no base or stem.

The Pembina Gorge: Bridging North Dakota, USA, with Manitoba, Canada

Hi! My name is Maximilian Scott, and I am a paleontologist, and I do my research in Manitoba, Canada - just to the north of North Dakota. I study the competition behaviors in a large extinct lizard called a mosasaur, who would sometimes bite each other so hard that evidence of those bites was left on their bones.

Did you know that North Dakota was under water at the end of the time of the dinosaurs? That's right! What we now see in our great plains as a sea of grass, corn, and wheat was once an actual sea of water! Between 100 million-years-ago and 66 million-years-ago, the United States and Canada were split in half by a very big sea called the Western Interior Seaway. But how do we know this? Paleontologists and geologists read normal books just like everyone else, but they also read a very different kind of book - the rocks! The rocks tell us stories about what the world looked like in the past, and one of those rocks is a platy dark gray rock called shale, which is made of ancient mud from areas where there was once a lot of water. In North America, one of the biggest and most important layers of shale rock for understanding the seas of the Cretaceous Period is the Pierre Formation, which lays between rocks across the land of our continent from way down in Arizona, up through North Dakota, and into Manitoba, Canada - which is where I live and do my science. The Pierre Sea, which is the portion of the Western Interior Seaway where the Pierre Formation was deposited, was home to a lot of animals - some weird and some that you might recognize. Among the animals you're probably familiar with today are clams, snails, corals, worms, relatively normal-looking sea turtles, sharks, and other pretty normal-looking fish. But there were also some really weird animals! Some sea turtles, like *Archelon*, were the size of a car. Instead of sea lions and seals like today, the Pierre Sea had weird four-flippered reptiles called plesiosaurs - some of which with long necks and short heads, and others with short necks and long heads - which swam around and ate the fish. Speaking of fish,

the Pierre Sea had a fish bigger than you've ever seen called *Xiphactinus*, which could grow to be three times as long as an adult human! *Xiphactinus* would swim around eating lots of smaller fish, and also sometimes the weird, penguin-like wingless birds called hesperornithiformes. Hesperornithiformes, like *Hesperornis*, were diving birds with sharp needle-like teeth in their beaks for catching small fish. But the biggest and meanest animal in all the Pierre Sea was a giant lizard called a mosasaur. Mosasaurs are ancient relatives of snakes and komodo dragons, and were like reptilian whales in the ancient sea. They reached sizes from as long as a bed to as long as a school bus. They were the biggest lizards who ever lived on planet Earth, and they're what I get to study today.

Next time you go outside, remember that your home was once a fantastical underwater ecosystem filled with animals big and small, weird and familiar, scary and cute. They went extinct a long time ago - but since the sea of water has been replaced with a sea of grass, a whole new group of land animals have come to share our homes of North Dakota and Manitoba, and it's up to us to protect them and make sure they don't go extinct like the great mosasaurs of the past.

Thanks for learning with me!
Max

I love being able to combine prehistoric things with everyday items, or creative ideas. I have always enjoyed carousel creatures - not just horses, but all the fun animals they make into saddled mounts. You can pretend for just a moment that you're racing through a forest on some fairy creature - or perhaps flying in the air on the back of a bat or bird. So why not make a prehistoric carousel? With Max's Western Interior Seaway story, I felt inspired. So at right we have a fanciful seaweed bridled *Plesiosaurus*, with a coral saddle and a scallop blanket. What kind of prehistoric creatures would end up on your carousel?

I also love the blown-glass and wood-turned finial drop ornaments. As they twist and twirl, and light reflects off of their surfaces - much like light off of the moving waves... I pictured a diving *Hesperornis* with its beak pointed down, water-drop-like body, and of course those big wide feet for swimming. What kind of creatures can you turn into a finial drop?

We'd love to see your creations - try coloring these two ornaments, or make your own versions, and send us your artwork!