FROM THE PAGES

Digging for Dinosaur Fossils in North Dakota

By Hillary Richard
May 17, 2018

Share This

Photography by Jane Osborne/The New York Times/Redux

On a blisteringly hot June day in the North Dakota Badlands, there are very few signs of life aside from birds, snakes and wandering livestock. The landscape is tall, stark and punishing, with loose rocks to trip you and serrated cliffs to cut you should you fall. Conical peaks rise from the ground, each striated layer full of potential discovery.

This was once a land of savannas and plains, with rivers and lakes. Unrecognizable creatures with disproportionate limbs, spikes, shells, horns and unfathomable teeth roamed freely, feeding on the tall grass and, oftentimes, one another.

On this summer day, I'm perched precariously on a steep, uncomfortably jagged mountain ledge that pokes sharply even through my kneepads, the flat head of my rock hammer poised over a sharp chisel. The harsh summer sun casts a shadow over my tools, which are anchored in a crevice only millimeters deep. I pause.

"How old did you say this is?" I ask.

“That? Around 34 million years,” answers paleontologist Clint Boyd.

When I first said I was going to North Dakota, the reaction of family and friends was universal: “What’s there?” Images of vast, unobstructed spaces that blur into the horizon don’t typically spark a tourism frenzy. But that pristine, lonely landscape has allowed nature to preserve one of North Dakota’s greatest intrigues: its prehistoric residents. Nearly the entire surface of the state is sedimentary rock, largely untouched by glaciation, making it perfect for fossil preservation. There are ancient bones everywhere in North Dakota.

In what is now called the badlands, an area so named because nothing much grows here, rhinos once roamed. Lakes and rivers in what is now a bone-dry landscape once sustained a population of large land tortoises. Cinematic favorites like triceratops and T. rex traversed North Dakota.

The state and its fossils have a unique, constantly evolving relationship, thanks in part to modern-day discoveries made on public digs. Die-hard dinosaur fans return each year to assist paleontologists, but the public digs are not well-known outside the world of fossil enthusiasts.

The bones I am to excavate are hidden, save for two inches of a rib sticking out of the mountain. The thin, khaki-clad paleontologist assures me that rhinos were very common in this area and that I won’t ruin anything beyond repair. I swing the hammer onto the head of the chisel, sending a huge crack through stone that had been impossible to chip with just a trowel. With a second hit at a 45-degree angle, a chunk flies off, and I can see the rhinoceros’s rib bone, which had settled millions of years ago into the landscape outside Dickinson, due west of the capital city of Bismarck.

A few peaks and valleys over, Becky Barnes, another paleontologist, clad in jeans and one of her many humorous dinosaur-themed T-shirts, bends over a fossilized tortoise shell, her long braid poking out beneath a tan,

wide-brimmed hat. She nicknames the shell “Bruce’s tortoise” in her field notebook. Bruce is neither an early explorer nor a notable scientist. Bruce, like me, is just your typical volunteer on a dig in western North Dakota. He happened to chip into a mountain and find a stylemys (similar in appearance to an outsize Galápagos tortoise), which lived about the same time as my rhino.

In the Eocene Epoch, which lasted from roughly 55 million to 34 million years ago, this area looked similar to the African habitats where rhinos live. This landscape is anything but flat. Walking through the mountains requires good balance and close attention to each step. Only by cracking the surface of these inhospitable rocks can you begin to discover the curious world of wildlife that once roamed here.

The public digs have happened organically, in a very North Dakota way. Whenever residents would discover bones on their property (which still happens often), they would call the paleontologists from the state-funded Geological Survey, who would drive out to assess the situation. Once there, they would rely on local volunteers to help properly collect and transport the fossils to the lab in Bismarck.

Over time, this practice evolved into an open sign-up for volunteers to accompany the paleontologists on their annual fieldwork. The digs are hard work. It takes a dedicated, curious person to play paleontologist with the Geological Survey for a few days each summer to unearth creatures that no longer exist. Most of the excursions are free, save for a refundable deposit.

There are a number of dig sites, like the one outside Dickinson, where volunteers are guaranteed to uncover fossils. The three paleontologists whom I meet — Boyd, Barnes and Jeff Person — also discover several small creatures they have never seen before at this site, mainly types of fish and oreodonts (“walking food,” as Barnes calls them, referring to their place on the food chain).

Photography by Janie Osborne/*The New York Times*/Redux

Last year's public digs were scaled back to four from five in 2016 because of budget cuts. The Bismarck area dig is the only one that focuses exclusively on dinosaurs. At Pembina Gorge, volunteers can dig up sea life from 80 million years ago, like giant squid and mosasaurs. The Medora dig, near Theodore Roosevelt National Park, uncovers swamp creatures from 55 million to 60 million years ago. And the Dickinson dig has the youngest mammal fossils, at 30 million to 40 million years old. Volunteers can join for one day or stay the entire five days.

At 7:30 on the morning of the Dickinson dig, I meet up with the

paleontologists in the parking lot of the North Dakota Heritage Center & State Museum in Bismarck, off a highway dotted with chain stores and hotels. A group email had informed volunteers about what to wear (closed-toe shoes, long pants, brimmed hats), what to bring (plenty of water), what not to bring (iPods and headphones), and what to watch for (rattlesnakes, prickly pear cactus). Our car convoy heads west on I-94 following their truck, which stands out from the sea of trucks on the highway thanks to its trailer hauling a black fat-wheeled utility task vehicle.

The landscape changes as soon as the sprawl of big-box stores and Bismarck roadways disappears in the rearview mirror. The nearly 100-mile drive dispels any myth that North Dakota is flat. As I follow the convoy in my rental car, we pass rolling hills with emerald-green grass, farmhouses dotting acres of fields, and wild, rocky landscapes. Tall signs advertising the Medora Musical, a popular Western cabaret show, and the Enchanted Highway, a scenic route dotted with large sculptures, punctuate a big sky with swift-moving clouds. The convoy — eight adults, including a mother with an adolescent boy — turns off the highway and ventures into farmland, kicking up rocks and dust on unmarked roads before parking in a green field that slants upward. We outfit ourselves with awls, brushes, picks, trowels and collection vials.

We hike 15 minutes through prairie pastures before arriving at our test site, a flat and dry former pond, where the paleontologists can observe our techniques as we scour the ground inch by inch in search of tiny fossils, which initially appear quite similar to rocks. The paleontologists hold unabashedly nerdy debates about whether dinosaurs had feathers in between effortless explanations of terminology and time periods for the novices in the group. Their well of patience and enthusiasm seems endless as they examine countless pieces of rock we volunteers mistakenly present as fossils.

A group of elk watches with interest from a far-off plateau as we crawl in a

prairie field where cows graze. For every dozen rocks that look like bones, there is one legitimate fossil. Finding that first fossil is crucial, however, because after that, everything clicks into place. Suddenly, the array of tan rocks starts to look more like shapes and small bones, and people start to differentiate previously imperceptible changes in color and texture.

From there, we hike and take turns in the two-seater terrain vehicle to reach more dig sites up into the badlands. The group splits into pairs and heads for different regions, each accompanied by a paleontologist. During the next six hours, my mind flashes back to the rhinos I had seen in Botswana and Namibia, majestic and awe-inspiring. I try to picture them stamping along these fields, their strong, stumpy legs trotting where I now sit, surrounded by creatures that no longer exist. I ask the paleontologists about dinosaurs, geology, science, the state and whatever else comes to mind. The conversation gets existential at times, as six-hour conversations tend to do, and we wonder who would be digging up our bones millions of years from now and what kind of snap judgments they would make about our time here on Earth.

An hour into excavating, I find the rhino rib cage that I have unearthed is more whole than anyone expected, which means I have to dig directly into the mountain instead of chipping pieces near the surface. A few hours and several blisters later, an unmistakable hip bone with a ball socket pops out of the rock, accompanied by a two-inch piece of dismantled spine. The rhino, it seems, had a tough 34 million years.

While rhinos in the area are commonplace (along with saber-tooth cats and mesohippus, three-toed horses standing about two feet tall) other public digs have unearthed many surprises. The Pembina Gorge dig near Canada excavated a species of mosasaur, a sea creature similar to a very large Komodo dragon with flippers, which had never before been found in North Dakota. In Watford City, a small community northwest of Bismarck, a group discovered one of the most complete fossil birds ever found in the

state. Bird skeletons are extremely rare (their light and hollow bones rarely survive the test of time), so the paleontologists haven't yet been able to identify it. But at 60 million years old, this mystery bird existed just after the dinosaurs went extinct. The dig south of Bismarck went back even further, uncovering bones from the edmontosaurus, a duck-billed dinosaur that averaged 30 to 40 feet in length.

For those familiar with North Dakota history, dinosaurs are just a part of life. Museums across the state present fossils that could easily join a collection in the American Museum of Natural History. The Dickinson Museum Center, for example, has 11 full-scale skeletons and an impeccable triceratops skull that looms large over display cases of beautiful geodes, which seem to garner more attention from local visitors.

"We have so many incredible dinosaur resources in the state," says Kim Schmidt of the North Dakota Department of Commerce's Tourism Division, "that I think sometimes people forget this is unusual — that you can't find what we have everywhere."

But there is one dinosaur that can impress even the most nonchalant of North Dakotans. Dakota, the 67-million-year-old mummified hadrosaur, a duck-billed dinosaur, was discovered on a ranch near Marmarth, a city in the far southwest of North Dakota. This "dino mummy" is one of the most important discoveries of its kind; it was found with a layer of preserved skin and tendons. Dakota is on display at Bismarck's Heritage Center & State Museum, an impressive contemporary building with a thorough dinosaur exhibit that covers the state's entire paleontological history.

North Dakota is part of the Hell Creek Formation, a set of rocks from a geological period that records the very last slice of time before the dinosaurs went extinct. For paleontologists, digging around the state offers a more comprehensive twist. It has the Hell Creek Formation layer of ground, the extinction layer and a thick Paleocene layer on top. This means that they can study the last generation of dinosaurs as well as the

flora and fauna that survived them. By holding digs across the state, paleontologists can gain insight into an intriguing and mysterious window in time.

As Boyd puts it: “Having a nice complete section means we can look at exactly what happens to the mammals, the turtles, the fish, the plants. In North Dakota, you can study the extinction and what that did to the entire fauna better than you can in a lot of places in the country.”

Photography by Joshua_James/istockphoto.com

Deep down — very deep down, hundreds of feet in some cases — there are dinosaurs almost everywhere. Digs in the southwest and south-central parts of the state frequently turn up dinosaur fossils. A good fossil is one that was buried quickly by the elements, avoiding predators and scavengers. North Dakota had a large delta during the Hell Creek Formation, which occurred roughly 65.5 million years ago. Rain and sediment washed carcasses from shorelines into moving water, which buried them and effectively preserved them for eternity.

On a public dig in 2015, Barnes and her crew discovered a mosasaur that would have been between 33 and 49 feet long, “a big sea monster,” she affectionately calls it. They unearthed most of its skull and a large portion of its neck and shoulder, with most of the bones articulated. When Barnes was cleaning the neck jacket in the lab, she noticed something.

“There were six cervical vertebra all in a row, and there were massive tooth marks on the bottom side of the neck,” she says. “Something had chomped on the neck of this particular creature. It’s got a pathology, which is kind of neat.”

The public digs attract all kinds of people. There’s a core group of dedicated volunteers who sign up each summer, driving from the far reaches of neighboring states to work on bones that will one day go on display in a North Dakota museum. Then there are summer road trippers, seeking a unique experience on their way to Yellowstone. There are tourists looking for a day activity from Bismarck or Theodore Roosevelt National Park and, on occasion, travelers from abroad. There are dinosaur-obsessed children, of course, but an equal number of dinosaur-obsessed parents, like the mother with her son in our convoy. Then there’s me, the East Coast journalist with a penchant for seeking new adventures in remote locations.

At the end of the day, I leave the dig dusty, blistered, sunburned, scraped and exhausted, but thrilled with everything I’ve seen and learned. I have a greater appreciation of our fleeting place in history, our smallness on this Earth and how much there is left to discover about the places we think we know.

This article is reprinted in collaboration with The New York Times.

Read this article as it appears in the magazine.

Tags: badlands, digs, dinosaurs, fossils, North Dakota, summer 2018