

# FOSSIL BIRDS OF NORTH DAKOTA

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## Introduction

Bird fossils in North Dakota are as “rare as hen’s teeth.” The primary reason bird fossils are scarce is because most bird bones are hollow or pneumatic to lighten the skeleton for flight, and often simply rot away before they can become fossilized. Most bird fossils that we do find are the more robust parts of the skeleton, such as limb bones. Fossils of extremely fragile bird skull bones have not been found in North Dakota. In addition, most birds are terrestrial animals and upon death their carcasses usually do not end up in an environment conducive for preservation, like a pond, lake, or swamp. In fact, most of the bird fossils that we do find are in rocks that were deposited in aquatic habitats and, as a result, most of the fossils are from water birds. Remains of other birds, like song birds, are seldom found. But like today, birds must have been extremely diverse and abundant so our fossil record of this group is far from complete. Even though bird fossils are rare they have been found in several rock formations spanning millions of years and from several fossil sites in North Dakota (figs. 1 and 2).

## Cretaceous Seabirds

The old adage “rare as hen’s teeth” implies extreme rarity because birds today do not have teeth. But some of the earliest birds that lived in North Dakota did have teeth. These were seabirds that lived in the Western Interior Seaway that covered parts, and at times all, of North Dakota during the Late Cretaceous from about 80 million to 65 million years ago. Remains of these birds have been found in the Pierre Formation (Hoganson et al., 1999; Hoganson, 2006), Fox Hills Formation (Hoganson et al., 2007) and the Hell Creek Formation (Pearson et al., 2002) (figs. 1 and 2).

The most common of these birds is the hesperornithid *Hesperornis regalis* (“regal western bird”). Fossils of a related diving seabird, *Baptornis*, have also been found in North Dakota (Amanda Person, oral commun.). *Hesperornis* is the original “Big Bird” (although probably not yellow) and grew to heights of about 5 ft. (fig. 3). Although incapable of flight (it had vestigial wings), it was a swift swimmer that could propel itself through shallow coastal marine waters with its powerful hind legs and lobed-toed grebe-like feet. Like a loon, it was an excellent foot-propelled diver (fig. 4). Its jaws were equipped with sharp, pointed teeth adapted for preying on fish and squids. These shallow marine waters were dangerous because they were inhabited by large predatory fish such as the huge 16-foot-long bulldog tarpon-like fish, *Xiphactinus*, 25-foot-long marine reptiles called mosasaurs, and several species of sharks. *Hesperornis* was likely prey of sharks, other large fish, and mosasaurs (fig. 5). Fossil bones of hesperornithids have been found in the Pierre Formation at the Cooperstown site in Griggs County and the Pembina Gorge site in Cavalier County and in the

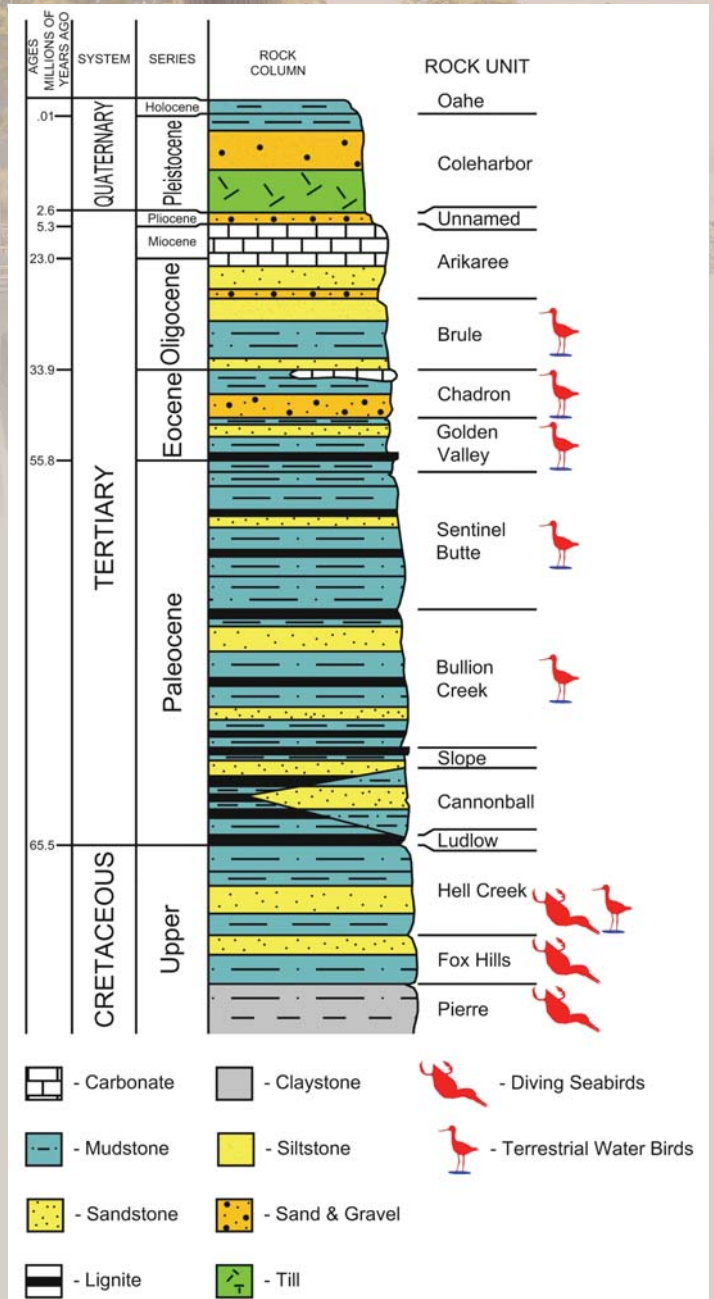


Figure 1. North Dakota stratigraphic column showing the stratigraphic distribution of bird fossils.

Hell Creek Formation in Bowman County. Avian teeth, likely from hesperornithid birds, were indentified by Hoganson et al. (2007) from the Fox Hills Formation, Emmons County (figs. 1 and 2).

# FOSSIL BIRD LOCALITIES

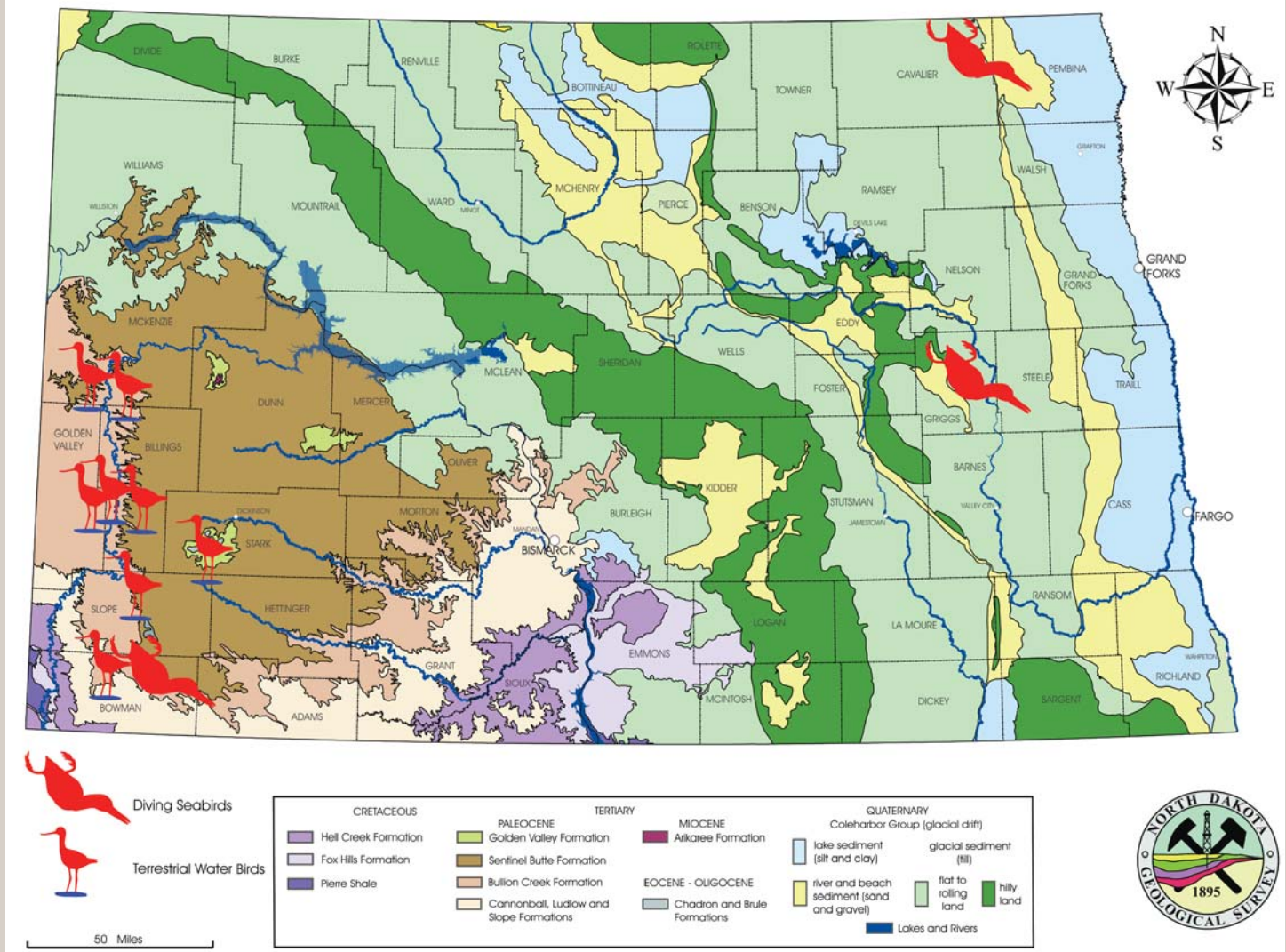


Figure 2. Simplified geologic map of North Dakota showing the location of bird fossil sites in North Dakota.

## Tertiary Terrestrial Birds

During the Paleocene, about 60 million years ago, western North Dakota was a humid, subtropical, forested swampland. This was several million years after the extinction of *Tyrannosaurus rex* and other carnivorous dinosaurs. Crocodiles, some of which grew to lengths of 15 feet, were now the dominant predators in North Dakota. Like today's subtropical rainforests, western North Dakota was teeming with exotic life. Dawn redwood, bald cypress, ginkgo, magnolia, palm and many other warm-climate plants grew in this swampy habitat. Fossils of crocodiles, champsosaurs (crocodile-like animals), several species of turtles, salamanders, many kinds of fish, mammals, clams, snails, and insects indicate that a diverse community of plants and animals lived in this ancient habitat. And of course, birds occupied many niches – living and feeding in the forest canopy and in and along the shorelines of swamps, lakes, and ponds. Fossils of these birds and the other animals and plants are found at several sites in western North Dakota in the Bullion Creek and Sentinel Butte Formations (figs. 1, 2 and 6).

The most well-known of these fossil sites is referred to as the Wannagan Creek site in Billings County where Bruce Erickson from the Science Museum of Minnesota conducted excavations in the Bullion Creek Formation over a span of 25 years (Erickson 1991, 1999). Remains of 70 crocodiles were uncovered and many other vertebrate taxa were found, including birds. Erickson (1975) described the first fossil bird from the Paleocene of western North Dakota, *Dakotornis cooperi*, from this fossil assemblage and referred to it as ibis-like. Benson (1999) examined all of the bird fossils recovered from the Wannagan Creek quarry and determined that *Dakotornis cooperi* belongs in the bird order Charadriiformes and the family Graculavidae. Charadriiformes is a diverse order of birds that includes shorebirds such as sandpipers, snipes, avocets, stilts, and many others. The Graculavidae are referred to as "transitional shorebirds." Benson (1999) also recognized three other Graculavidae taxa from the Wannagan Creek fossil assemblage but did not name them. The presbyornithid bird *Presbyornis isoni* was also identified by Benson (1999) from the site. Presbyornithidae is an extinct family of birds placed in the



**Figure 3.** Pelvis, femur, and tibia of a hesperornithid bird from the Pierre Formation, Cavalier County, North Dakota. Tibia is 11 inches in length. This drawing of a hesperornithid bird skeleton shows the position of the fossil bones.

waterfowl order Anseriformes, which includes ducks, geese, and swans. *Presbyornis isoni* is considered a “wading duck” that was about the size of a swan and had long legs and a long neck (fig. 7). It probably lived in colonies around water bodies and filtered food from the water similar to a dabbling duck (like a mallard). Fittingly, fossil bird tracks, possibly made by charadriiforms or gruiforms (rails and cranes), were reported from the Bullion Creek Formation in Billings County by Kihm and Hartman (1995).



**Figure 4.** Artist's rendition of *Hesperornis regalis*. Note its lobed, grebe-like toes and sharp teeth. Painting by Dan Varner.

Over the past several years, we have collected a few fossil bird bones during our study of the Paleocene paleontology of western North Dakota (fig. 6). Tom Stidham, a fossil bird expert with the Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, Beijing, is collaborating with Jeff Person and me to study these fossils recovered from the Bullion Creek and Sentinel Butte Formations (Stidham et al., 2012). Preliminary analysis of these fossils indicates the presence of a new species of presbyornithid (fig. 6), a possible *Cimolopteryx* (wader or gull-like bird), a possible Trogonidae (insectivorous, tree-dwelling bird), and a species that is similar to living gruiforms (crane-like birds). As might be expected, because of the forested, swampland setting at that time, most of these fossils and those studied previously from the Paleocene of North Dakota represent species with affinities for aquatic habitats and were water-dwelling or shoreline birds. As this study progresses, we anticipate that we will be able to gain further understanding of the avifauna that existed in North Dakota during the Paleocene in this subtropical, forested swampland.

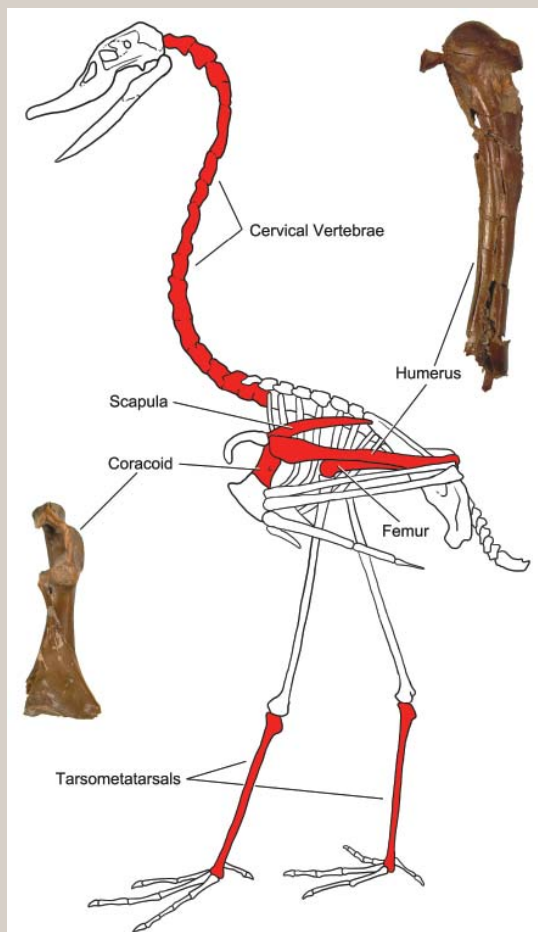
Bird fossils have also been reported from the Eocene Golden Valley Formation (Jepsen, 1963), the Eocene Chadron Formation, and the Oligocene Brule Formation (Murphy et al., 1993; Hoganson et al., 1998). These fossils have yet to be adequately studied.



**Figure 5.** *Hesperornis regalis* feeding on a fish and about to be fed on by *Plioplatecarpus*, a 24-foot-long mosasaur. Painting in the North Dakota Heritage Center, Bismarck.

### Epilogue

It is unfortunate that bird fossils are “as rare as hen’s teeth” in North Dakota’s fossil record, because these animals undoubtedly played a major role and occupied many critical trophic levels in ancient ecosystems, just as they do today. Our knowledge of ancient ecosystems and community structures are sorely incomplete without more information about these important and perhaps most beautiful of the animals. This lack of knowledge about ancient avifaunas is also distressing because without baseline data from ancient bird records, it is more difficult to assess the impact on bird populations today around the world by habitat loss and climate change.



**Figure 6.** Coracoid and humerus from a presbyornithid bird recovered from the Paleocene Sentinel Butte Formation in North Dakota. Humerus is 2 inches in length. Artwork by Becky Barnes.

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**Figure 7.** Drawing of a Paleocene duck-like bird, *Presbyornis*.

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