

Welcome to the Iowa Academy of Science's National Wildlife Refuge Audio Series. In this segment, Academy member De Anna Tibben, Earth Science Teacher at Ames High School will describe the unique geology of De Soto National Wildlife Refuge.

I have many wonderful childhood memories of De Soto National Wildlife Refuge. Of course, when I was growing up, it wasn't yet classified as a Wildlife Refuge. The lake and park were open to recreational activities including water skiing. My family owns a 1969 Larson runabout with which we spent many hours making the "loop" of De Soto Lake. As a child, I marveled at how right in the middle of the lake we could stop and be able to stand up in the water. The first time my dad told me to put my feet down and touch the bottom I thought he was crazy. Sure enough, I, at the time less than five feet tall, could indeed stand with my head well above water, in the middle of the lake!

It wasn't until I was much older that I learned the geologic history of the area that I had fallen in love with. As a child, I often wondered why De Soto Lake was shaped so differently from other lakes we traveled to. The wonderfully looped nature of the lake comes from its history with the Missouri River. The lake is a feature referred to as an oxbow lake, or a cutoff meander of the river. At one time the area of the present day lake was an active river channel. Boats such as the Bertrand would travel up and down the river channel, negotiating through the many meanders. The water in these meanders of the mature Missouri River system would flow faster around the outside bank of the curve. If you have ever noticed a marching band take a corner, or remember playing the skating game "crack the whip," you've witnessed these phenomena. Let's think of the marching band members as our example. As the band line approaches the curve, all members are marching at the same rate. In order for them to maintain a straight line as they proceed through the turn, the person marching on the inside curve must march slower than the person on the outside curve. In fact, the poor chap on the outer curve really has to move to keep that line straight! Now imagine our sediment traveling through the river system. Over time, the cutting action of the water caused the meander to become greater on the outer curve, while depositing sediments on the inner curve. These deposits of sediment are commonly called sand bars. (It was on these sandbars that I could stand in the middle of the lake!) Many meanders, including the De Soto Lake, formed across the Missouri River Valley floor. As the meander became so curved, or eroded on the cut-bank or outer side, it formed the characteristic loop shape of the Refuge Lake today. As the curve or loop continued to form there was only a small strip of land, or neck that separated the curves of the meander.

The stratigraphy of the area hints to its fluvial history as well. Below the rich topsoil lie beds of loose sand, silt and clay in alternating layers. These sediment layers tell of the centuries and centuries of continued water or fluvial action. The larger sediments hint at times when the River was more powerful, carrying the larger sand and even gravel sizes. While the smaller clays and silts reflect a calmer, slower time of the River. The Valley itself also hints of times in the River's geologic past of greater volumes of water than of today. Great volumes of glacial melt-waters flowed in the Missouri River system 9,500 to 30,000 years ago. The geologic record shows the ancestral history of the Missouri River system. This ancestral system flowed eastward across western Iowa from its headwater region in the Rocky Mountains. Possibly the advances of the Pre-Illinoian glaciers diverted this ancestral Missouri River system southward. The present location of the Missouri River and its Valley system were formed by or during Illinoian time (140,000-160,000 years ago- Iowa's record is incomplete).

And now Academy member, William R. Clark, Professor of Wildlife Ecology at Iowa State University will share some information about the ecology and conservation at De Soto National Wildlife Refuge.

By the time the Lewis and Clark Expedition had reached the area of present-day Council Bluffs along the Missouri River they had already described two species that were new to science, the Eastern wood rat and the plainhorned toad, a small lizard. Along the sand bars of the Missouri they collected the first specimens of least

terns, a small aquatic bird, and also described great flocks of white pelicans. And today, over 200 years later, visitors to De Soto National Wildlife Refuge can still learn about the conservation of these species and observe many of them.

De Soto National Wildlife Refuge lies within the Missouri River floodplain. Historically the river flooded annually, constantly rearranging the braided channels, backwater sloughs, and sandbars along its course. The rich sediment deposited in the flood plain was the perfect seed bed for the predominant canopy tree, the cottonwood. However since the Missouri River was channelized for navigation and the De Soto Lake oxbow was cut off from the main river, flooding no longer occurs and cottonwoods no longer regenerate. The cottonwoods are being replaced by more shade tolerant trees such as hackberry, mulberry, and green ash, and especially by the midstory, brushy species called roughleaf dogwood. Historically prairie grasslands were probably not a major plant community of the floodplain but the Refuge staff have established managed grasslands dominated by native species including switchgrass, big blue stem, Indiangrass, little blue stem, sideoats grama, and Canada wild rye. Smaller stature native grasses, including buffalo grass and blue grama, which are characteristic of the short grass prairie to the west, are also found in some parts of the refuge. Much of this restored grassland was established on areas that had previously been cleared on the refuge for corn and soybean agriculture which still is practiced on some refuge lands.

Like most refuges in the National Wildlife Refuge system, De Soto was principally established as a stopover for migrating waterfowl. De Soto lies at a "pinch point" in the Mississippi flyway funneling ducks and geese from across the prairie pothole region of the Northern Great Plains and the arctic nesting grounds to the wintering grounds of the lower Mississippi Valley and the Gulf Coast. Each year during the 1980's and 1990's between a quarter and half million snow geese passed through De Soto during November migration. In recent years the snow goose migration at De Soto has slowed to just a few hundred birds. Attractive wetland habitat in the Dakotas and Nebraska, and reductions in the available food and loafing areas on De Soto, have caused the goose migration to shift westward. Canada geese use the Refuge too, although in much smaller numbers than snow geese have in the past. From the Visitor Center viewing windows and the points along the auto-tour route you can commonly observe dabbling ducks including mallards, wood ducks, green-winged and blue-winged teal, pintails, shovelers, gadwalls, and widgeon. Diving ducks including canvasback, lesser and greater scaups, common goldeneyes, buffleheads, and mergansers, as well as other aquatic birds like gulls, herons, egrets, white pelicans, and cormorants, are also seen during both fall and spring migration. Refuge biologists noted that peak duck populations were down in recent years and they are taking steps to restore aquatic vegetation to De Soto Lake to provide improved habitat.

Each fall numerous bald eagles follow the waterfowl migration through the Refuge and can be seen perched in the cottonwoods along the lake. Peak numbers of eagles usually occur in late November and December and again in March.

Interestingly, as waterfowl migration patterns have changed and refuge management has shifted away from crops and toward restored grasslands, populations of resident wildlife have become very evident. White-tailed deer, wild turkeys, pheasants, and coyotes can readily be seen along the auto-tour route.

De Soto Lake has a community of fish species such as largemouth bass, channel catfish, crappie and bluegill that are valued for their sport fishing qualities, as well as a very large population of rough fish including carp, buffalo and gizzard shad. Rooting in the mud by the rough fish has seriously affected the water quality and diminished aquatic plants preferred by migratory waterfowl. In the Missouri River there are more specialized riverine species such as sturgeon, gar and two species of chubs that are potentially endangered.

De Soto National Wildlife Refuge has provided habitat for threatened and endangered species. Although the bald eagle has recently been removed from the federal endangered species list, refuge managers are still concerned about the loss of cottonwood roost trees used by the national bird. Unfortunately, the least terns reported by Lewis and Clark, and the piping plover, another endangered species that once nested on sand bars within the refuge, have not nested since the 1970's.

The Visitor Center at De Soto National Wildlife Refuge is one of the best places in Iowa to learn about wildlife and the important roles of the refuges in protecting our natural resources. Start your tour there and as you drive the auto-tour watching for deer or spotting the eagles try to imagine what it must have been like to navigate the "big Muddy" as Lewis and Clark passed this way 200 years ago.

Thank you for joining us in discovering a portion of Iowa's amazing natural resources. Please explore the entire Iowa Academy of Science's National Wildlife Refuge Audio Series. The best way to help preserve our environment is to become active in your local area. For more information please contact the Iowa Academy of Science at www.scienceiniowa.org and your local, state and federal conservation departments.