

Welcome to the Iowa Academy of Science's National Wildlife Refuge Audio Series. In this segment, Academy member Jan S. Wielert, Science Content Specialist at Pearson will share the geological beginnings of Port Louisa National Wildlife Refuge.

Many of us have attended a school play or a professional theater presentation. On stage, performers act out a script while we watch. We see the set, hear the actors' conversations, and follow a story from beginning to end. We arrive before the story begins and leave after it ends. If a friend goes to another performance, they will see the same set, watch the same actors and hear the same story.

When visiting a natural area, we also see a stage – the area itself. We encounter actors – the wildlife that is present on the stage. We hear conversations in the sounds of nature around us. But in this performance, the story began long ago, and may never end. We see only a few moments of a story that changes from day to day and season to season. If a friend visits this natural area tomorrow, they will meet different actors and hear different conversations as they encounter a different chapter of the story.

The story of any natural area begins as the stage is set. This is the realm of geologists – scientists who study the history of the Earth. In natural areas, geologic events of the past often set the stage for what we see today.

300-400 million years ago, ocean waters flooded the continent. In the Midwest, sedimentary rocks formed beneath a shallow sea. After the sea left, erosive processes carved valleys and left hills on the landscape. Soils formed while streams and rivers carried sediment from the land. Rainwater soaked into the Earth. Where the water dissolved limestone layers, caves were left behind within in the rock. In southeastern Iowa these sedimentary rocks are now the surface bedrock, which we see exposed in cliffs, road cuts, and quarries along the Mississippi River.

About 2 million years ago Earth's climate began to cool. In Iowa we find deposits of till, loess, and outwash sand and gravel left behind as glaciers repeatedly advanced and melted away. During the Ice Age climates alternated between much cooler and somewhat warmer conditions than we have today. Environmental conditions were very different when glaciers were nearby. Freezing and thawing of water split rocks and produced wedges of ice that penetrated the soil. Strong winds blew clouds of silt from glacial river floodplains. Wind-blown sands polished the surfaces of rocks that lay on the ground. The plants and animals that inhabited the glacial margins were well adapted for cold conditions. We know about these organisms from pollen, plant materials, and bones which we find in sediments deposited during those colder times.

Glaciers moved across Iowa several times during the Ice Age. Between the glaciations, river erosion and deposition shaped the land. As time passed, river patterns began to take on their modern arrangement. By 300,000 years ago, the northern portion of the Mississippi River followed nearly its present course through Minnesota, Wisconsin, northeastern Iowa, and northwestern Illinois. Near Clinton, Iowa, the Mississippi turned southeastward and joined the Illinois River near Hennepin, Illinois. At these times, the Mississippi River was far to the east of the Port Louisa area.

Between 300,000 and 130,000 years ago, a large glacier advanced west across Illinois and eventually covered the Port Louisa area. This is known as the Illinoian glaciation. During this glaciation, the Mississippi River flowed west of the Port Louisa area around the end of the glacial ice. When the glacier melted away, the Mississippi returned to its previous path and rejoined the Illinois River near Hennepin, Illinois.

About 21,000 years ago, during the Wisconsin an glaciation, another glacier advanced west across Illinois. The Mississippi River was still located far to the east of the Port Louisa area. As this glacier blocked the Mississippi

River in Illinois, the river water backed up and mixed with melting glacial water to form a large lake north and west of the glacier. This lake grew deeper and deeper. The water rose to a point where it overflowed a low ridge and rushed through a narrow gorge from Moline to Muscatine. Water poured from the glacial lake and erosion deepened the gorge. At Muscatine the water turned south and flowed through a valley that the Iowa River had previously eroded. Farther south the river rejoined the lower Mississippi River. The modern course of the Mississippi River in southeastern Iowa had at last become established along the eastern edge of Louisa County.

Between 21,000 and 11,000 years ago, several periods of sediment deposition and erosion left terraces and a modern floodplain along the Mississippi River. Sediment deposition occurred as glacial sands and gravels formed thick deposits on the floor of the Mississippi River Valley. Erosion followed when water from glacial lakes to the north increased the discharge of the Mississippi River.

By 11,000 years ago, glaciers were nearly gone in the upper Midwest. Erosion and deposition of sediment caused the Mississippi River to continually alter its path across the floodplain. Periods of flooding also led to changes in river patterns. In many places the river flowed along one bluff at one time and later flowed nearer the opposite bluff. These changes are preserved on the floodplain in the shapes of the islands, cut-offs, and meanders we see today. As the climate warmed, more familiar plants and animals entered the region to take their places on the stage.

Next, Academy member Neil Bernstein, Professor of Biology at Mount Mercy College will present the ecological story of Port Louisa National Wildlife Refuge.

Welcome to Port Louisa National Wildlife Refuge. Many people do not know it, but this is one of the gems of Iowa's natural areas that you can visit. Miles of trails take you past some of the most unusual habitats in Iowa, and one ecologist once compared parts of this area to the great swamps and bayous of the southern United States.

Why is this place so neat?

First, it is right next to the Mississippi River, and most of the land represents areas that seasonally flooded before the levee system and the locks and dams were built. So, there are many low-lying areas that were formerly wetlands, backwaters, and floodplain forests. Happily, the refuge managers are trying to re-create some of these habitats, and extensive trails wind past low-lying wetlands surrounded by wet prairies and sedge meadows. Only a short distance away are upland prairie communities that are being restored to oak savanna habitat. So, within a small space, you can encounter many different habitats, some rare to Iowa.

If you like to bird watch, this is ideal. Depending on the timing, you can look at migratory waterfowl, shorebirds, and Neotropical migrant songbirds all in the same area. If you are interested in reptiles, there are abundant basking turtles and several species of rare and protected snakes, including the federally protected copperbelly watersnake, and the state protected diamondback watersnake.

Where to start? If waterfowl are migrating, the overlook of Lake Odessa at the refuge headquarters is a great place to see thousands of ducks, swans, geese, pelicans, and other water birds. Lake Odessa represents what was once a common habitat along the Mississippi River in southeastern Iowa. Backwaters, like Lake Odessa were shielded from the main channel by wooded islands. Some of these backwaters were large, like Lake Odessa, and others were small, shallow temporary pools on floodplains. These quiet, protected aquatic habitats provided shelter and food for both migrating and resident waterfowl, spawning areas for fish, great feeding and breeding habitat for turtles, snakes, and amphibians. In addition, the wooded uplands were used by migrating and breeding Neotropical migrant birds.

To get a sense of the habitats, it is good to walk or paddle through them. At the north end of the Port Louisa National Wildlife Refuge, you can access hiking and biking trails that lead you through floodplain sedge and prairie meadows, marshes, and riparian forest, a forest type that borders wetlands and rivers. These areas are interspersed with shallow wetlands where numerous wading birds congregate. In migration, these wetlands are also full of shorebirds, and you can get close to them without too much disturbance. The uplands often have rare grassland birds like the Le Conte's Sparrow during migration.

For a different view, you can also access paddle trails if you own a canoe or kayak. These trails wind through the floodplain, into Lake Odessa, and, eventually, wind back through some of the islands. In the small channels, you can see thick beds of millet grass, a favorite food of waterfowl, and also large mats of American Lotus with their bowl shaped leaves rising out of the water. Check with the refuge headquarters ahead of time, as these paddle trails do not always have sufficient water during some times of the year. If you are lucky, you might see river otters as you paddle.

A slightly different view of the area can be gained at Horseshoe Bend, a low-lying floodplain in a bend of the Iowa River. In 1993, during the summer floods, the levees along the Iowa River broke and flooded through this area that was farmed most years. The federal government purchased the land, and the managers have been enhancing this area by improving flow to the lakes and seeding native grasses. This is a great place to see buttonbush in flower, and, in the fall, the spectacular cardinal flower is abundant.

The lakes in Horseshoe Bend also are surrounded by riparian forest. Tree swallows, green herons, and prothonotary warblers can be found here along with a variety of sparrows, wood ducks, and maybe a nesting hooded merganser. The uplands around Horseshoe Bend are being restored to savanna, and you might see a state protected ornate box turtle.

This is an area that you can visit over and over again and see something new each time. In fact, picking an area and visiting it regularly throughout the year gives you great insight into ecological processes and the passing of the seasons. You couldn't pick a more interesting area in Iowa to start your studies.

And now Academy member Matt McAndrew, Wastewater Operator at *OMI CH2MHill* will share the conservation history of Port Louisa National Wildlife Refuge.

Welcome to Port Louisa National Wildlife Refuge. This is one of 590 wildlife refuges in the United States. This wildlife refuge covers 8,373 acres.

In the 1800s European settlers along the Mississippi River were clearing timber and prairie for agriculture. The Mississippi River was viewed as an increasingly important trade route. Inconsistent water levels limited navigation seasons, and rocks, sandbars and submerged logs presented a danger to boat traffic.

Congress understood the importance of this trade route and authorized a series of navigation improvements to be implemented by the US Army Corps of Engineers. In 1930, construction began on a series of locks and dams to provide a 9-foot deep navigation channel for heavy barge traffic. These dams created a series of 26 navigation pools extending from St. Paul, Minnesota to St. Louis, Missouri.

The US Army Corps of Engineers was given flood control responsibilities and assisted in building levees that isolated the river from its historic floodplain except in extremely high floods. With the construction of locks and dams, the location of the refuge on the floodplain of this backwater slough was best managed for wildlife habitat.

Originally, divisions of Port Louisa Wildlife Refuge included Big Timber, Keithsburg and Louisa. These were established in the 1940's and early 1950's following construction of the lock and dam system. These units were consolidated as the Wapello District of the Mark Twain National Wildlife Refuge in 1958. In 2000, the Mark Twain National Wildlife Refuge was split into five separate refuges and the Wapello District became the Port Louisa National Wildlife Refuge.

Port Louisa National Wildlife Refuge is situated on the Mississippi River and provides habitat for migratory birds and a variety of other organisms. The habitat in the refuge consists of bottomland timber, backwater sloughs, marshes, wet meadows and grasslands. The refuge is located on the Mississippi Flyway, one of the major routes for migrating waterfowl. The refuge also provides important habitat for big river fish and a variety of native wildlife such as deer, fox, beaver, frogs, turtles, and snakes.

The objectives of the refuge are to

- protect and enhance refuge habitat for endangered species,
- provide habitat for migratory birds and resident wildlife,
- protect and enhance habitat for wood duck and Neotropical bird production,
- provide wildlife-dependent recreation and public use opportunities, and
- restore floodplain functions in the river corridor

Today, the Port Louisa staff of six maintains four divisions in the refuge: Louisa, Big Timber, Keithsburg and Horseshoe Bend. A variety of management techniques are used to enhance wetland and aquatic, forest and grasslands habitats.

In the case of wetlands, berms and levees are used to separate them from the river reducing sediment flow. Historic wet/dry cycles are being created by mechanical means and construction of ditches.

Forest management includes allowing selected refuge fields to naturally regenerate to trees, which songbird species rely upon. Management also includes planting oak, pecan, hickory, and other native tree species. Grassland and wet meadows are being restored on the Horseshoe Bend division of Port Louisa NWR. The elevation, soils, water table and flood regime have proven favorable for this establishment.

The Big Timber Division is nearly all contiguous backwater of the Mississippi River, consisting of sloughs surrounded by bottomland hardwoods. The area is not protected by levees and is open to River fluctuations.

The Keithsburg Division is a mosaic of wetland and bottomland forest habitat complex including sloughs surrounded by bottomland timber stands. The Division averages 0.75 mile in width and has a 3-mile long levee separating it from the Mississippi River.

The Louisa Division has a levee integral to maintaining a 9-foot navigation channel. The area is bordered to the south by the Lake Odessa Wildlife Area, which is managed by the Iowa Department of Natural Resources. This area is primarily managed for migratory fowl and fisheries.

Horseshoe Bend Division is located on the Iowa River Floodplain. In 1993, floodwater broke through the levee at three sites. The landowners decided farming was no longer economically feasible. The area is a mix of grassland, wet meadow and semi-permanently flooded wetland and forest.

A visit to the area will provide you with a view floodplain habitats, prairie and upland forest. The ebb and flow of

the Mississippi River can be seen if you return over the course of year. Take time to enjoy Iowa's natural environment and come to the Port Louisa National Wildlife Refuge.

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.