

Welcome to the Iowa Academy of Science's National Wildlife Refuge Audio Series. In this segment, Academy member Carol Schutte, Biology Instructor at North Iowa Area Community College will tell us the conservation story of the Upper Mississippi National Wildlife Refuge.

This refuge is probably one of the longest refuges in the nation. It extends from Wabasha, Minnesota to Rock Island, Illinois. This includes most of Iowa's "east coast". The refuge itself encompasses thousands acres of marsh, floodplain forest, grasslands, and, of course, river.

Imagine this land long ago – this expansive landscape - a mosaic of wooded islands, extensive lowlands, narrow channels and shifting sandbars. The river was lazy and shallow in the summer, and perhaps raging in the spring, cutting new pathways as it raced toward the gulf. It was a magnificent world for wildlife and plants that had grown tolerant of, and even dependent on, the river's vagaries. But this temperamental waterway was not ideal for commercial shipping, so in 1866 several channel improvement projects were implemented, concluding ultimately with the lock and dam system that by 1930 established a 9 foot deep channel for tows and barges, and changed life on the river forever.

We are indebted to the Izaak Walton League, and its founder Will Dilg, in particular, for having the foresight to aggressively petition Congress to acquire and protect this stretch of land and water. In 1923 there was a plan to drain much of this floodplain. Dilg had enjoyed fishing and exploring the upper Mississippi for years, and could not bear the thought of these backwater areas being destroyed. This refuge stands today as testament of how one person can make lasting conservation contributions! Had that drainage effort been successful, the entire Midwest would have lost a large percentage of its precious native fish and game.

By 1930, 90,000 acres had been acquired for the refuge (that's about 68,000 football fields!). Another 106,000 acres, originally obtained by the Corps of Engineers, was later transferred to the management auspices of the Fish and Wildlife Service and the total today is 240,000 acres!

This grand area is a major flyway for migrating waterfowl; estimates are that 40% of all North American migrating ducks, geese and swans use this corridor! One exceptionally beautiful species, the canvasback duck, convenes half of its world population on this refuge each fall. The refuge hosts 167 bald eagle nests and approximately 5,000 blue heron and common egret nests. These birds – and bats, beaver, bobcats are all dependent on the small reptiles, amphibians, fish, dragonflies, mussels, and a plethora of other organisms that are also protected within this refuge. You see that's the beauty of large scale, watershed or ecosystem-level conservation: all of the diverse, supporting cast for the large, visible fauna are also included in the management plan.

In 2006 the Refuge team completed a Comprehensive Conservation Plan which will guide management and administration of the Refuge for the next fifteen years. Can you imagine the enormity of multi-agency management of a refuge that includes parts of four states and such a variety of habitat! Development of the Comprehensive Conservation Plan involved agency and general public input – with over 2,500 written comments accepted in 2005 alone. The adopted Plan strives to balance the diverse requests of the public – for hunting, fishing, boating, camping, canoeing, biking, hiking, birdwatching with the needs of wildlife for a healthy, undisturbed habitat. Some of the priorities outlined in the Plan include monitoring wildlife, water quality, invasive species, and, above all, restoring habitat vitality.

One example of monitoring wildlife and invasive species is the story of the struggle for mussel superiority in this area. The Refuge includes 41 species of native mussels, and many of these are endangered. These small animals are important filter-feeders that help clean the water and also, of course, are food for larger animals. Many of these natives are being displaced by a tiny invader, no bigger than your thumbnail - the zebra mussels!!

They are native to Eastern Europe, but have found their way into Midwest waterways via the great lakes seaway, and they transfer to other waterways by unwary boaters. This is just one example of the major conservation challenges to the management team of the Refuge. Invasive species are a threat to the ecosystem balance that has evolved over millions of years. Native species are deprived of nutrients, space, LIFE, by invaders who have no natural controls in their new habitat. Invasive plants and animals are a focus of many employees who spend countless hours and thousands of dollars to remove the invaders and restore a competitive upper-hand to the native species. You can help by being aware of these new threats and taking care to not carry seed, other plant parts, or aquatic animal hitch-hikers, to the next park, lake, or refuge that you visit.

In an effort to reverse negative trends in habitat quality and move towards a more sustainable ecosystem, managers and public requests have led to several drawn-downs in pools of the river. The US Army Corps of Engineers has conducted these operations in recent summers to encourage re-establishment of aquatic vegetation. The projects have been quite successful and additional draw-downs are planned. Knowledge about water level management, island stabilization and creation, backwater dredging, and channel modifications, has increased greatly over the last decade and these new tools should go a long way toward improving habitat in the Refuge.

Water quality monitoring and improvement of watershed land use to restore quality to the waters is a critical need. Some forms of pollution have actually declined since passing of the Water Pollution Control Act in 1972, but the river and Refuge are still under threat from a growing array of agricultural chemicals, dissolved heavy metals, and sediment. Water quantity is also a concern, with increasing demand of urban development and reservoir installation impacting water available for recreation and wildlife.

Aldo Leopold defined conservation seventy five years ago as “harmony between men and land.” As you can see, it takes planning and coordination to restore harmony to wild places like the Upper Mississippi National Wildlife and Fish Refuge for wildlife - and for you. This is your refuge! Please enjoy it, please help protect it!

Next, Academy member Theresa Theis, Science Teacher at Marshalltown High School will discuss the rock formations found at the Upper Mississippi National Wildlife Refuge.

Rarely more than two miles wide at any one point the Upper Mississippi River – National Wildlife and Fish Refuge is a long meandering section of protected land. 261 miles, over 240,000 acres and divided into four districts the refuge a perfect way to view the rich, varying, geologic history of northeast Iowa. Starting in Minnesota and traveling down the Mississippi River past Wisconsin, Illinois and Iowa the refuge is a river channel. It consists of hundreds of islands, lakes, sloughs and swampland. The bed of the mighty Mississippi River lies upon deep deposits of glacial material and sediments from millions of years of runoff. A navigational channel 9 feet deep runsthrough the area providing transportation for barges hauling many commodities from St. Paul to the Gulf of Mexico. As one travels along the Mississippi River through the refuge majestic bluffs soar over head and expose the geologic record in the layers of exposed stone.

The Mississippi River is most probably the product of retreating glaciers from the pre-Illinois glaciation time. When the ice melted in areas to the north, the flood waters deepened the river valley and later deposited up to 250 feet of material in the old river bed. Huge volumes of meltwater and sediment moved down the Mississippi Valley and other drainage-ways scouring and deepening the valley. As sea levels progressively rose once again, thesediment-laden meltwaters deposited large volumes of sand and gravel within the valley. Today streams, and sloughs connect large lakes providing a mosaic landscape of earth and water the refuge borders the Iowa counties of Allamakee, Clayton, Dubuque, Jackson, Clinton and Scott. It cuts through the Paleozoic Plateau, or Driftless Area, a sizable spread of land that escaped the last intrusion of glaciers.

The down-cutting of the Mississippi River valley has exposed a number of geologic formations in bold cliffs and steep ravines. The oldest rock formation exposed is the Jordan Sandstone. The sandstone, about 100 feet thick, was deposited during the latter part of the Cambrian Period, about 505 million years ago, as beach and nearshore sands of a slowly advancing and retreating seas. The Jordan Sandstone is an important aquifer, providing water to wells across much of eastern Iowa.

Above the Jordan Sandstone is the Ordovician-age Prairie du Chien Group, named for the nearby city of Prairie du Chien, Wisconsin. These strata include a succession of dolomites with minor sandstone and shale. The dolomite layers were originally deposited as lime sediments in a shallow tropical sea that covered much of the interior of North America between about 490 and 505 million years ago. These sediments were subjected to later chemical replacement by dolomite.

The Prairie du Chien seas eventually withdrew from the interior of North America during later stages of the Early and Middle Ordovician, beginning a remarkably long period of erosion that continued for 25 million years. As the seas again returned to the area, the deep valleys were filled with sand and shale, and a remarkably homogeneous interval of fine quartz sandstone was deposited across the region. This upper blanket of sandstone and the underlying valley-fill succession of variably colored sandstone and shale comprise the St. Peter Sandstone. Iron staining has produced rich colors, with reds, oranges, browns, and purples coursing through a mostly buff- to white-colored matrix of quartz sand.

The Platteville Formation, a 45-foot-thick succession of limestone and dolomite strata, is exposed in the upper slopes of bluffs along the river. It represents lithified sediments deposited in a broad tropical sea, which supported a diversity of shelled bottom-dwelling animals. This layer is also resistant to erosion and since it sits on top of a much softer layer often times ledges are created in the exposed strata. A frequently visited example of this is in Pike's Peak State park where Bridal Veil Falls can be seen.

The Galena Group is composed of the basal Decorah and the overlying Dunleith formations. The Decorah Formation is a succession of shale and limestone. The shale, typically greenish-gray in color, include spectacular lenses of brachiopod fossils. Interestingly, these shales also include thin but widespread layers of altered volcanic ash derived from distant eruptions near present-day Virginia.

Above the Decorah, however, the massive Dunleith Formation forms the highest cliffs and ledges. The Dunleith contains almost no shale and is dominated by dolomite, which displays a considerable quantity of chert. This formation reaches thicknesses of 80 feet and forms cliffs along the Mississippi River valley southward to the Dubuque area.

Just south of Galena, Illinois the refuge cuts through a prominent north facing escarpment of Silurian dolomite. The front of the escarpment stands about 200 feet above the level of the Lancaster Peneplain. From this spot, at Lookout Point, the Mississippi River valley is slightly more than 2 miles wide, whereas a short distance to the north near Hanover Bluff, the Mississippi River valley is a little more than 4 miles wide, and, to the south near Sloam Marsh, the valley is 4.5 miles wide. The widening of the Mississippi River valley to the north and south is because the Mississippi River has eroded its valley into the relatively soft Ordovician age Maquoketa shale below the resistant Silurian dolomite.

The Upper Mississippi River National Wildlife and Fish Refuge is bounded in magnificent layers of the geologic record which are alternately exposed and then hidden by the vegetation of the bluffs and hills. The power and force of the slow moving water is evident in the broad swath it has carved in the sedimentary rock.

Next, Academy member Jim Pease, Iowa State University Extension Wildlife Specialist will describe the wildlife

of the Upper Mississippi National Wildlife Refuge. The Upper Mississippi National Wildlife Refuge is over 260 miles long. It contains over 240,000 acres in 4 states (Minnesota, Wisconsin, Illinois, and Iowa), one of the largest pieces of public land in the Midwest. The Mississippi River, running right through the heart of the Refuge, is one of the busiest commercial channels in the US. This provides some special challenges in managing the refuge. It also provides an abundance of plant and animal life.

Be constantly on the lookout: there is much to see in every season of the year!

The river, wooded islands, treed shorelines, limestone bluffs, braided backwaters, and shallow marshes are hosts to hundreds of species of plants and animals. You could spend a lifetime exploring and learning about them!

Let's begin in the water. Fish are found in all types of water, from the clear, warm and sluggish backwaters and ponds to the cloudy flow of the main channel. Some 119 species make up the refuge's fish community, from several dozen species of minnows to the most popular game fish like bass, catfish, perch, walleye, crappie, northern pike, bluegills, and sunfish. It includes the ancient and fierce-looking gars and the rare paddlefish and shovelnose sturgeon. The slow backwaters and marshes are important even for fish that live in the main channel, because these backwaters provide many species with breeding and brood rearing areas. The backwaters are rich in tiny zooplankton and phytoplankton on which many fish fry feed. They are often filled with submerged, floating, or emergent plants that serve as nurseries for these young fish. As they grow, larger fish, frogs, turtles, birds, and mammals eat them—that's why so many hatch to begin with! You can see how important these backwaters are to the whole wildlife community of the refuge!

Fish also are important in the life-cycles of some of the most threatened and endangered species found on the refuge, the freshwater mussels. Many of the 43 species of mussels spend at least part of their lives in the gills of a host fish. Mississippi River mussels, often called "river clams", were once harvested by the millions. Their shells were used to produce buttons that were prized on clothing all over the world. Today, as a group, they are the rarest critters on the refuge. One species, however, that was not native here has found its way into the river: the zebra mussel. Watch for masses of these invasive species on boats or docks along the river.

Lots of other species depend on the water, too. Eleven species of frogs and three salamanders call this refuge home. Listen for the "banjo string" call of the green frog or the deep "ba-room" of the bullfrogs in the summer. Watch quiet backwaters for the amazing and now rare mudpuppy, a salamander that never leaves the water. Mudpuppies have external gills that look like feathery maroon "ears" to breathe oxygen from the water. The common tiger salamander on the other hand, hatches in the water but then leaves after maturing and spends summers in damp woods and fields,

If you quietly canoe or boat along the shore, especially in backwater areas, you may find another critter that enjoys the water: the northern water snake. It's one of 19 species of snakes found on the refuge; the water snake is the only one you'll find consistently around water. It will often sit motionless on branches overhanging the water, sunning and watching below. It may drop quickly into the water in pursuit of frogs or fish that swim below it. And they blend in well with their dark blotches on a gray to tan background, you have to look closely. Other snakes like bullsnakes, fox snakes, and garters will visit and even swim in the water, but the water snake is only one found along or in the water all the time. Watch also for some of the 11 species of turtles found on the refuge. Painted turtles of all sizes are often seen sunning themselves on rocks or logs in and along the water. If you are lucky, you may also spot the unusual soft-shelled turtle with its leathery shell or the often very large snapping turtle, head out of the water or sometimes far from the water in the late spring, laying eggs in soft dirt or sand.

As you search along the shoreline, be on the lookout for tracks and other signs in the mud of the 51 species of mammals that live here. Raccoons, opossums, and deer will often leave tracks in the mud. Watch for the piles of sticks that indicate bank dens of beaver. You may also see mounds of cut cattails in the shallow backwaters that indicate muskrats live here. Watch for the slides of river otters along the mud banks and the round, clawless tracks of bobcats in the mud. You may see a mink as it hunts for prey either in and out of the water. On a summer evening you can watch for some of the seven species of bats found on the refuge, swoop low over the water, catching flying insects. As you sit quietly after dark, listen for the arguments of the raccoons, the high pitched squeaks of flying squirrels, or the slap of a beaver's tail on the water. You are in a wild place!

The river and its backwaters and adjacent streams also influence the lives of over 300 species of birds. Some 133 species of them call this refuge their home during the breeding season. They include thousands of herons and egrets that breed in colonies called "rookeries". These contain dozens of loose, stick nests in trees in both upland woodlands, far from the water's edge, or in silver maples or cottonwoods growing in the soggy backwaters of the river. You will see these long-legged birds wading slowly in shallow water, waiting for just the right moment to grab a fish or frog for dinner. Or you may see them gracefully flying over-head, their long necks tucked into an "S" and their legs trailing behind as they wing it back to their nests. Listen, too, for the "rattle" of the belted kingfisher and watch dive straight into the water and other come up, fish in beak, and eat it in one swallow from their perch. You may also spot the majestic bald eagle, either on its massive nest in an old cottonwood tree or flying low over the water, deftly grabbing a fish with its talons. Spotting a peregrine falcon diving from high in the sky at a pigeon or duck flying below is pretty rare site. The bluffs found along many of the refuge's borders are roosts and historic nest sites for these now rare birds.

The Mississippi River is the pathway that hundreds of thousands of migrating birds follow north in the spring and south in the fall. To witness it is one of life's great spiritual pleasures. Hundreds of thousands of waterfowl, shorebirds, gulls, hawks, and songbirds pass through here and the refuge provides critical habitat for them. Nearly 40 species of ducks, geese, mergansers, grebes, coots, and pelicans follow this "Mississippi Flyway". Many pause here in their travels to replenish their food supplies and to rest. Once again, the river and the refuge's abundant backwaters and marshes are the "bed and breakfast" for these birds. Another 31 species of shorebirds, many winging their way to and from Central or South America stop here to rest. Watch for shorebirds like snipe and willets in the lowland areas. And the refuge's abundant forests are critical to over 40 species of tiny wood warblers and vireos and dozens of other songbird species as they pause in their flights north or south to feed on insects and berries in these woods. A dozen species of hawks fly this river corridor using the hot air rising out of the valley in "thermals" to conserve energy. You can join one of the many "hawk watches" to see often hundreds of hawks an hour pass through and over this refuge! And seeing flights of thousands of ducks—mallards, canvasbacks, wigeons, and teal— come sailing in, just ahead of a storm in the fall, taking shelter in the backwaters just off the river makes you realize just how important this refuge is. Were it not here, preserved and managed for the 565 species of animals that use it and the over 600 species of plants that grow here, our lives, and theirs, would be much poorer. It is truly a wild place with wild possibilities!

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](http://www.scienceiniowa.org) and your local, state and federal conservation departments.