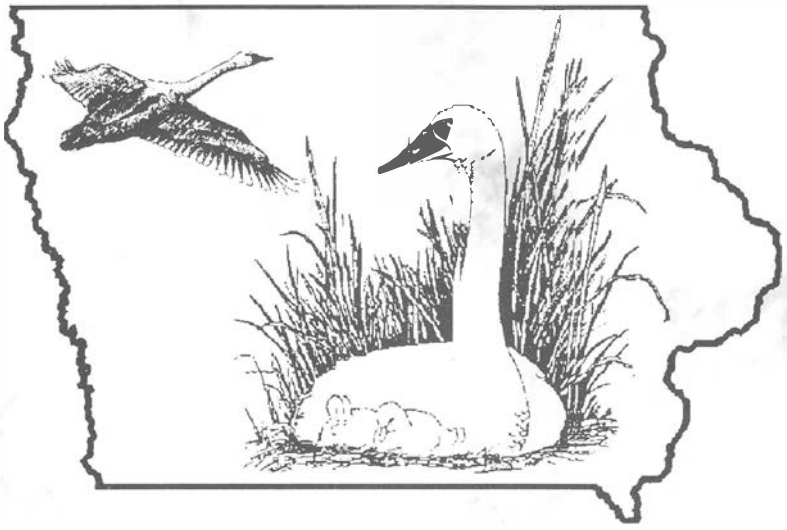
Iowa's Trumpeter Swan Restoration Program



An Information and Activity Booklet About

Trumpeter Swans and Wetlands

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Welcome to the ***Iowa Trumpeter Swan Restoration Program*** Education Materials!

It is our privilege to present this informational and educational packet on trumpeter swans, the wetland ecosystems in which they live, and their restoration into their native territory. Educational activities, resource materials, and a bibliography are contained within this packet to aid you when teaching about the majestic trumpeter swan.

These materials were developed by environmental educators to help the *Iowa Trumpeter Swan Restoration Program* provide information to the youth, educators, and citizens of Iowa.

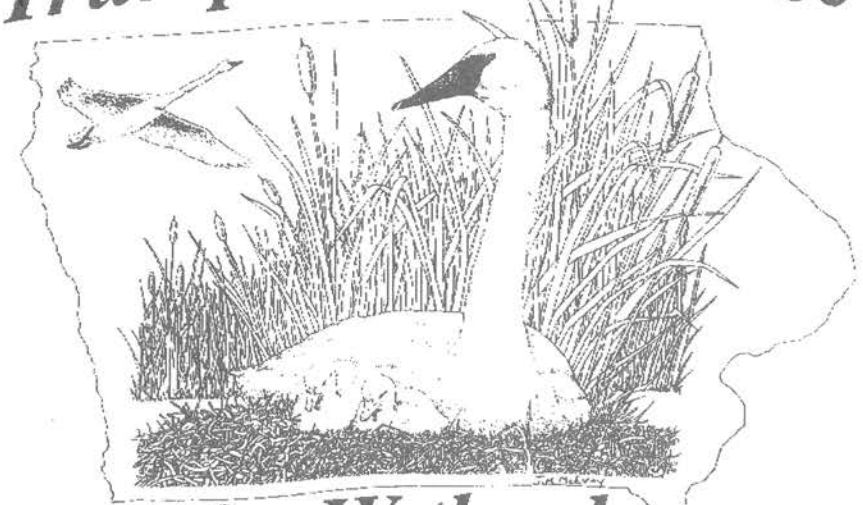
The *Iowa Trumpeter Swan Restoration Program* is funded by the Iowa Department of Natural Resources Wildlife Diversity Program, with a major donation from the David A. & Robert Luglan Sampson Family Memorial and the Cherie Davison Memorial, as well as corporate and private sponsors. A section of these materials tells how your students can participate in the Trumpeter Swan Swansorship Program and includes fundraising ideas.

These materials help you to explore the life cycle of the trumpeter swan and the wetland ecosystem in which they live. Each activity contains background information, step-by-step instructions, extension ideas, and additional resources. It is our hope that these materials will help foster a positive attitude towards conservation efforts to impact the future of Iowa.

Thank you for joining in this effort,

Trumpeter Swan Education Committee

Trumpeting the Cause



for Wetlands

Acknowledgments & Credits

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The **Iowa Department of Natural Resources (IDNR)**;
The **Iowa Association of Naturalists (IAN)**;
The **Iowa Conservation Education Council (ICEC)**;
The **David A. & Robert Luglan Sampson Family Memorial**, formerly of Webster City, Iowa;
The **Cherie Davison** Memorial.

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Trumpeter swan graphics used with permission from The Trumpeter Swan Society.

The Wildlife Diversity Program

The purpose of the Iowa Department of Natural Resources Wildlife Diversity Program is to conduct research and management activities for nongame species and to promote public education and enjoyment of those species. The Wildlife Diversity Program educates people about landscaping for wildlife, bird feeding, and wildlife watching. This program also produces various publications on Iowa's wildlife and conducts surveys on frogs and toads, birds, wintering bald eagles, heron rookeries, and migrating shorebirds. Bat houses and bluebird houses are constructed and monitored. Many nongame species such as the river otter and peregrine falcon were successfully reintroduced into Iowa because of the research and dedication of wildlife biologists. The program has been involved in more than forty projects, helping over 250 of Iowa's 400 + nongame species.

The Iowa Association Of Naturalists

The Iowa Association of Naturalists (IAN) is a professional organization of people interested in promoting the development of skills and education within the art of interpreting the natural and cultural environment. IAN members are actively involved as professionals or volunteers in interpreting natural and cultural resources in Iowa. The goals of IAN are: to establish lines of communication among interpreters for the stimulation of thought and exchange of ideas, and mutual assistance; to maintain communications with related organizations and the public to promote interest in and understanding of the objectives of interpretive programs; and to support the preservation and interpretation of areas that have significant natural and cultural values.

The Iowa Conservation Education Council

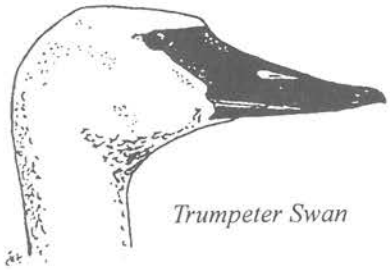
The Iowa Conservation Education Council (ICEC) has been a champion of conservation and environmental education in Iowa for more than thirty-five years. A non-profit organization, its strengths include stimulating closer cooperation among agencies, institutions, and individuals interested in conservation; assisting schools in environmental education (EE); encouraging development of EE materials; and promoting stewardship of the environment. ICEC regularly sponsors workshops for educators, EE awards programs, and special EE projects.

Sensational Swans

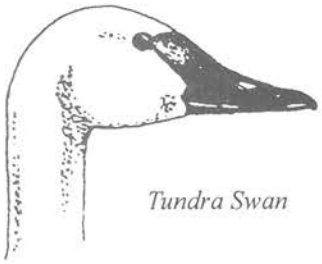
Native Swans

Anyone who has ever visited a park with a large pond or a wildlife area with a wetland will be amazed at the variety of waterfowl that are attracted to these areas. The bird that always draws the biggest crowd is usually the largest bird in the area. Few Iowans realize that Iowa wetlands were once the home of the largest waterfowl species in North America, the trumpeter swan.

There are two species of swans that are native to North America, the tundra swan and the trumpeter swan. At a distance, tundra swans and trumpeters can be difficult to distinguish from each other. Adult tundra swans, formerly called whistling swans, are generally smaller than trumpeters, weighing between thirteen and twenty pounds and standing only three feet tall. About 80% of the tundra swans have a yellow, teardrop shaped spot on their bill in front of their eyes (**lores**) that can be seen at close range. Trumpeters do not have this marking on their lores.



Trumpeter Swan



Tundra Swan

Adult trumpeters weigh twenty to thirty pounds, stand about four feet tall, and have an impressive wingspan of seven feet. The adults have snowy white plumage with black feet and bills. The male trumpeter (**cob**) is slightly larger than the female (**pen**). **Cygnets**, swans less than one year old, are grayish in color and have pink bills with black tips. A cygnet's bill turns all black during its first winter and its plumage turns white when it reaches one year of age.

Trumpeter and tundra swans can be distinguished from one another by their calls. The tundra swan's call is high pitched, often quavering and accentuated in the middle. It resembles the call of the snow goose. The trumpeter's loud call has been described as resonant, sonorous, and trumpet-like. Hence the name trumpeter swan.

Exotic Swans

The swans that we regularly see on constructed ponds are mute swans. This swan is not a native North American species, but was introduced by European settlers. Mute swans are most noted for their graceful posture because they typically hold their necks in an S-curve. They are close to trumpeters in size, but have an orange bill with a black fleshy knob that extends from the base of the bill to the forehead. Mute swans are considered an undesirable species because they often compete with native waterfowl for food and habitat.

A Trumpeter's Way Of Life

Trumpeters are one of the first waterfowl species to arrive on their northern breeding grounds, often returning before the ice melts. The pen guides the pair back to her former nesting territory or the area where she learned to fly if it is her first nesting attempt. This behavior is called **homing**. Trumpeters usually nest in a large marsh (6-150 acres) with a water depth of one to three feet and a mixture of **emergent vegetation** (cattails, sedges, and

bulrushes), **submergent vegetation** (hornworts and waterweeds), plant tubers, and open water. Adult swans feed primarily in shallow water using their long necks to search for vegetation and **invertebrates** such as aquatic insects, clams, and worms. An adult trumpeter will consume nearly twenty pounds of moist, leafy aquatic vegetation per day. Captive trumpeters readily eat corn, wheat, commercial waterfowl food, plus lettuce and spinach leaves as well as other leafy greens.

Nesting

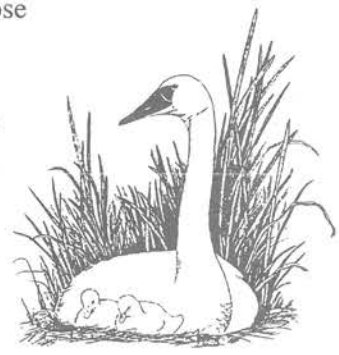
Most trumpeters begin nesting and raising young when they are between four and six years of age, but some may establish **pair bonds** when they are only twenty months old. Swans usually mate for life, but if one of the pair dies the remaining swan will find another mate. Trumpeters are very territorial and vigorously defend their mating, nesting, and cygnet feeding areas.

Nest building begins in mid-April and may take two weeks to complete. Muskrat and beaver lodges are frequently used as bases for the nests, which can reach six feet in diameter. Egg laying usually begins in late April in the Midwest. One egg is laid every other day until the **clutch** (nest of eggs) is complete. The average clutch has five eggs and the female **incubates** it for approximately thirty-five days. The pair remains together during the nesting season, but only the pen incubates the eggs.

Raising Cygnets

After the cygnets have hatched, they stay in the nest for twenty-four hours before starting to feed in shallow water. Both parents accompany the young during the brood rearing period, where both adults watch over and care for the cygnets. Young cygnets eat plants, aquatic insects, and other bottom dwelling invertebrates which the adults bring to the surface by scratching the bottom. Cygnets are fully feathered in eight to ten weeks, but are unable to fly until they are thirteen to seventeen weeks old, usually around mid-September.

Cygnets and adults remain together until they reach the breeding grounds the following spring. The cygnets are then chased away by the adults but remain in sibling groups until they reach two years of age when they begin to seek mates. These non-breeding swans (**juveniles**) usually **molt** (lose and grow new feathers) in June. Breeding pairs molt later. It is uncommon to see both swans in a pair molting at the same time. During the molting period (approximately thirty days), swans are flightless and unable to escape **predators** or defend the cygnets.



Approximately one of every four cygnets die before **fledging** (growing adult feathers). **Predation** by mink, great-horned owls, snapping turtles, gulls, or other predators is the leading cause of death. Once they reach flight stage, trumpeters suffer little mortality from natural predators. As with other waterfowl, parasites and diseases such as fowl cholera, botulism, duck virus enteritis, and aspergillosis are ever present threats.

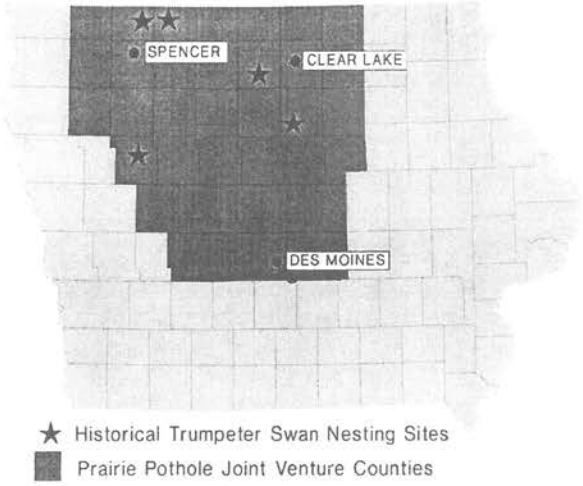
Lead poisoning, caused by the ingestion of lead shot on wetland bottoms, has been diagnosed as a major cause of mortality for adult swans in the Midwest. However, the threat of lead poisoning continues to decline because of the law requiring waterfowl hunters to use steel shot. Utility lines pose a serious threat to **migrating** trumpeters as well. It is not known how long trumpeters live in the wild, but one captive trumpeter was known to have lived for twenty-nine years.

Historical Range of Trumpeter Swans

Accounts of early Euro-American explorers and fur traders in North America indicate that the trumpeter swan's historical breeding range included most of the northern third of the continent. Within this large area were three distinct regions where trumpeters were a common nesting species: the Red Rock Lakes-Yellowstone-Jackson Hole area; the Flathead Valley in Western Montana; and southern Minnesota and northern Iowa. Alaska also maintained a large population of trumpeters. Trumpeters in the Midwest usually wintered in the Ohio and Mississippi River Valleys as well as on the freshwater marshes of Texas and Louisiana.

In Iowa, trumpeters nested throughout the Des Moines Lobe area. Historical records show that trumpeter swans nested near Sac City in Sac County (1859), near Oakland in Franklin County (1871), near Spirit Lake in Dickinson County (no date), near the Des Moines River in Emmet County (1875), and at Twin Lakes in Hancock County (1883). In 1883, the last wild trumpeter swan nesting site was reported in Hancock County. By the mid 1880s, trumpeter swans were extirpated from Iowa, they vanished from all of their former breeding territories.

Historic range of the trumpeter swan.



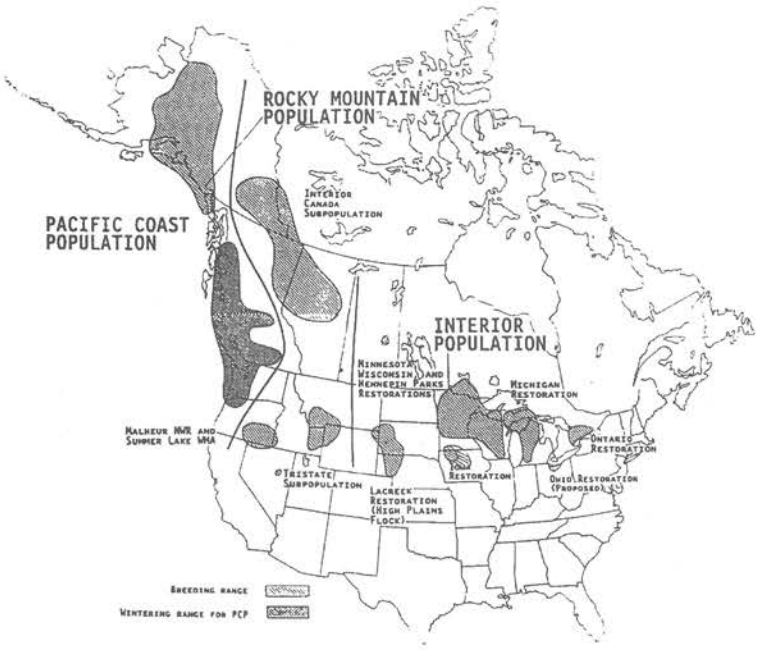
Reasons For Extirpation

Why did this majestic bird disappear from its native habitat? In the early 1800s, swan plumage and meat were very popular items. Unchecked and unregulated, Euro-American settlers, fur traders, and market hunters exploited the swans for these things. The swans' downy skins were used to make powder puffs and their plumage decorated hats, clothing, and pens. Swan meat was a delicacy and hunters often shot young swans which were unable to fly.

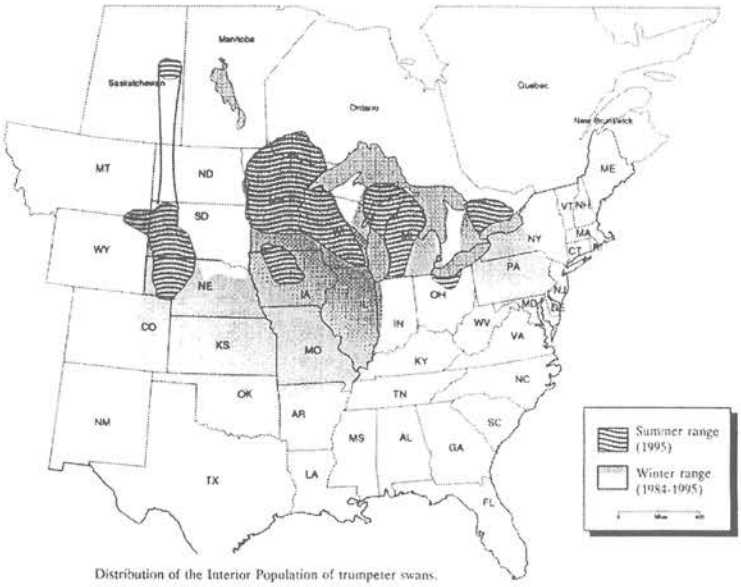
Greater demand for swan products was not the only reason for the demise of the trumpeter swan. Population increases throughout the United States and the advancement into the Industrial Age also played major roles in its decline. People began settling areas that formerly were thought to be inhospitable. Wetlands were drained to make more land available for towns and farmland. Water pollution, air pollution, and garbage were just a few results of the population increase. Trumpeter swans may have withstood the increased hunting pressure, but when coupled with pollution and a decrease in suitable habitat, the swans did not have a chance of survival.

Hope For The Future

Many people have thought that trumpeter swans and other birds were important species to maintain in the United States. In 1918, Congress passed the Migratory Bird Treaty Act which gave trumpeter swans and other migrating birds complete protection. Despite this act, only sixty-nine trumpeter swans were known to exist in the United States south of Canada in 1932. These swans were located in the remote mountain valleys where the states of Montana, Idaho, and Wyoming meet. In 1935, Montana's Red Rock Lakes National Wildlife Refuge (NWR) was acquired. Under intensive management, the trumpeter swan population increased so rapidly that by the late 1950s the refuge housed 640 swans. The only other sizable population of trumpeters, seventy adults, was observed in the Lower Copper River Basin in Alaska in 1956. For management purposes, trumpeter swans are currently divided into three populations: the Pacific Coast population which primarily nests in Alaska, the Rocky Mountain population, and the Interior population which includes Midwest trumpeters.



Populations of trumpeter swans
(modified from Gillette and Shea, 1995).

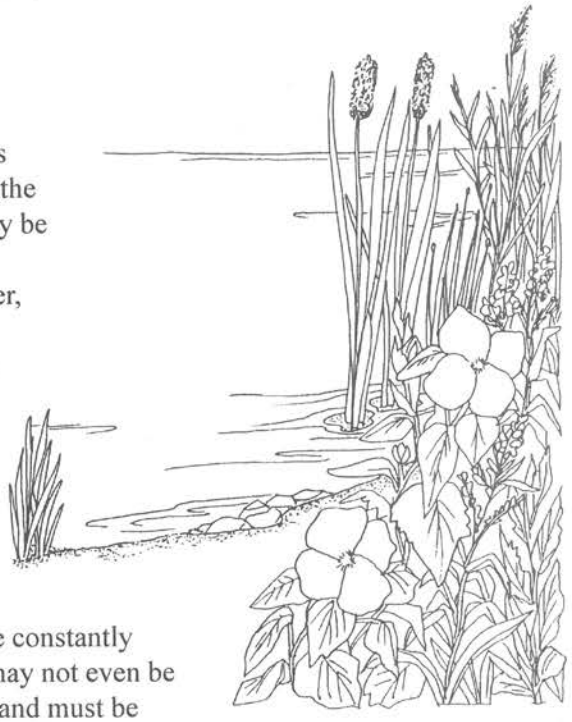


Distribution of the Interior Population of trumpeter swans.

Wading Into Wetlands

Wetlands have always been around, but it seems that they are becoming more controversial these days. Issues concerning wetlands are popping up all over the United States, including Iowa. Throughout history, wetlands have been considered sacred and horrible at the same time. Wetlands are a natural water purification system as well as a source of income, food, and other resources. Wetlands are also misused, dredged, drained, filled in, built upon, and used as a dumping ground for trash and hazardous waste.

What Is A Wetland?



How can you tell if you're in a wetland? Wetlands are depressions created as the last glacier receded thousands of years ago creating the most common kind of wetland in Iowa, prairie potholes. They may be any size or shape and are often low spots in the land where water gathers naturally. All wetlands have three things in common: water, special soil, and specialized plants. The particular types and arrangement of these three components differentiates between the wetland types.

Water

Wetlands are supplied with water from two main sources: **surface water** (rivers and streams) and **groundwater** (water that seeps to the surface or comes up from a spring). They may be constantly wet, regularly or infrequently flooded, or seasonally wet. There may not even be water standing on the surface of the ground. By definition, a wetland must be inundated with water for at least seven consecutive days or have soil that is saturated for fourteen consecutive days during the growing season. In some areas, however, the land need only have a 50% chance of being seasonally ponded or flooded in order to be considered a wetland.

Soil

Because of the prolonged presence of water, wetland soil develops special characteristics. When soil is saturated, most of the spaces between the soil particles are filled with water, which means that there is little or no room for oxygen. Soil that is constantly wet and lacks oxygen is called **hydric soil**. A variety of chemical reactions which affect the nature of the soil and change some of its physical properties such as color, texture, and acidity occur in hydric soil. Only organisms which can survive without oxygen live in wetland soils. Certain bacteria perform their metabolic processes with the help of minerals such as sulfur and organic materials found in wetland soil. These bacteria release sulfides that give wetland soil a characteristic "rotten egg" smell.

Plants

Plants that grow in wetlands have many special **adaptations** which enable them to survive the stressful conditions. Wetland plants have to be flexible and sturdy to withstand seasonal flooding. Some plants have developed channels in their stems to hold water and give them support. Other plants have air pockets in their stems and leaves which enable them to float. Wetland trees have a variety of root systems to help them with gas exchange, aeration, and oxygen transportation. Since many wetlands are alternately wet and dry, the soil may lack certain minerals needed for good growth. Some plants also must adapt to cycles of abundant nutrients followed by periods which lack the necessary minerals.

Wetlands — A Valuable Resource

Wetlands are the most productive of Iowa's **biological communities**. They provide habitat for numerous species of fish, birds, and other wildlife, including one-third of America's **threatened** and **endangered** species. Many animals that live in other environments as adults were born and raised in wetlands. Wetlands are one of the most productive habitats on Earth, providing a strong base of plants and animals for the world's food web. This also means economic strength from the harvest of furbearers such as beaver, mink, and muskrats as well as other recreational activities.

Wetlands provide protection against floods by catching and storing runoff and rainfall. Because wetlands catch and hold water, we are assured that our **aquifers** (groundwater "holding tanks") will be recharged. Wetland plants such as cattail, cleanse incoming water of sediment and other pollutants, assuring that water which recharges aquifers or flows out of the wetland is clean.

A History Of Iowa Wetlands

If you were traveling west by covered wagon in the early 1800s, you would have noticed the many wetland oases that dotted the landscape. Iowa once was covered by vast prairie grasslands, open savannas, and thick woodlands interspersed by wetlands. In the past 150 years, Iowa's prairies, woodlands, and wetlands have all been reduced greatly and largely replaced by farms, towns, industries, and roads. Wetlands were among the last of these communities to be impacted because of the work involved with draining or filling in a wetland.

Iowa once had approximately 2.5 million acres of wetlands, many of which were found in northern and central Iowa in the Des Moines Lobe. This area, sometimes called the "thousand lake" region by pioneers, was a 7.6 million-acre area of vast prairies dotted with thousands of pothole wetlands, many which were seasonally wet.

Federal acts were passed giving county commissioners the power to drain wetlands to make them more "productive." Once started, it didn't take long to destroy most of Iowa's wetlands. Within a period of 100 years, from 1850 to 1950, over 95% of Iowa's wetlands disappeared leaving only 26,000 acres of natural wetland habitat. In recent years, with more knowledge of the great value of wetlands, we have begun to protect them through conservation and restoration efforts, laws and local policies, and educational and recreational programs.

Conserving Iowa's Wetlands

As we gain awareness of the remaining wetlands, we also become more aware of the plants and animals that live in those areas. The destruction of Iowa's wetlands has caused many wetland plant and animal species to become threatened or endangered. Throughout Iowa and the United States, many concerned citizens and agencies have worked to stop the destruction of wetlands. One success was the implementation of the "no net loss" policy for wetlands, which means that if a wetland is destroyed, one must be created in another place. Other programs such as the Wetland Reserve Program (WRP) and the Emergency Wetland Reserve Program (EWRP) were instituted in Iowa by the Natural Resources Conservation Service (NRCS). Since 1992, these programs have gained nearly 50,000 acres of potentially productive wetland habitat to be restored as funds are made available.

Reintroducing Native Wetland Species

Since so few productive native wetlands remain, it is important to restore more wetlands to their former productive potential. One way to restore the natural balance of wetlands is to reintroduce native species. Wetlands can be reconstructed by regulating water flow into and out of an area. Once this is accomplished, native plants and animals can be reestablished. One such reintroduction program has begun to return trumpeter swans to their former nesting areas in Iowa. This attempt to reintroduce swans to their former Midwest territory could not be possible without the realizations that swans and wetlands are integral parts of our ecosystem.

Trumpeting Once Again

Midwest Trumpeter Swan Restoration Project

The first Midwest Trumpeter Swan Restoration Project was initiated in 1960 at Lacreek NWR in South Dakota, using swans translocated from Red Rock Lakes NWR. In 1963, two of these transplanted pairs of swans raised young on Lacreek NWR. In 1966, the Hennepin County Park Reserve District, located twenty-five miles from Minneapolis, Minnesota, established a flock of trumpeters using Red Rock Lakes NWR stock. In the 1980s, trumpeter swan restoration programs were initiated in the Interior region by natural resource agencies in Minnesota (1982), Missouri (1982), Ontario (1982), Michigan (1986), Wisconsin (1987), and Iowa (1993).

Iowa's Trumpeter Swan Restoration Program

The Iowa Department of Natural Resources (IDNR) Wildlife Diversity Program is responsible for restoring trumpeter swans to Iowa. This recovery program has been modeled after trumpeter swan restoration projects implemented in Michigan, Minnesota, and Wisconsin. It is hoped that the combined efforts of these states will restore the trumpeter swan to its entire native midwestern territory.

Goals

Even though Iowa has lost nearly 95% of its former wetlands, there is still enough suitable habitat to allow trumpeters to reside in the Iowa "wilds" once again. The goal of the *Iowa Trumpeter Swan Restoration Program* is to establish a breeding and migratory population of at least fifteen pairs of trumpeter swans by the year 2003.

In order to do this, cygnets are being raised in captivity by private propagators, zoos, and other individuals. The trumpeters are held in captivity in breeding and wintering sites throughout Iowa during their first two years. At twenty-three months of age, the trumpeters are given free flight to begin nesting and migrating on their own. It is hoped that the area in which the trumpeters are raised will become **imprinted** on them, so they will return to that same area yearly.

Limiting Factors

There are many potential **limiting factors** which may decrease the trumpeter swan's restoration potential. Lead poisoning, waterfowl diseases, and accidental shootings or poaching are all factors which may limit the chance of survival of the released trumpeter swans. Additionally, many of Iowa's remaining wetlands must be improved in order to provide adequate food, cover, and nesting areas for the swans.

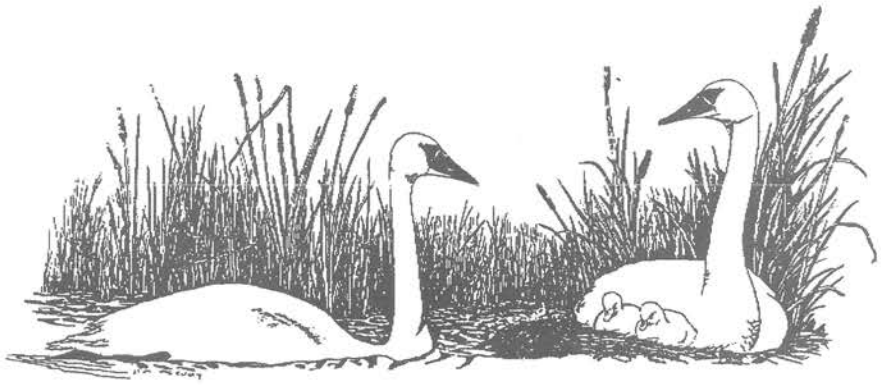
Funding

The *Iowa Trumpeter Swan Restoration Program* will alert Iowans of the growing need to protect and restore wetland habitats. It is estimated that over $250,000 will be needed during the next decade to see the project through to a successful completion. The David A. & Robert Luglan Sampson Family Memorial, formerly of Webster City, Iowa has been the main donor of this project with over $145,000 contributed so far. The Cherie Davison Memorial has contributed over $13,000 in additional funds. Many other donors are also helping to make this effort possible. The funds will be used for:

- the **purchase of swans**, equipment, and materials such as fencing, food, and aerators at wintering sites;
- the acquisition and restoration of **wetland habitats**;
- information and **education** efforts about the restoration of this formerly native species, the wetlands they inhabit, and the many associated values of wetland habitats;
- **research** to determine the necessary components of reestablishing a breeding and migratory population of at least fifteen pairs of trumpeter swans by the year 2003;
- **medical treatment** for sick or injured birds.

Contributions from private and corporate sponsors are an integral part of this project. People may become involved with the *Iowa Trumpeter Swan Restoration Program* through direct donations or by purchasing a t-shirt to ***Trumpet the Cause for Wetlands***. Students can support the program through the **Trumpeter Swan Swansorship** program where they can raise funds and donate them to the *Iowa Trumpeter Swan Restoration Program* to purchase and care for swans at Iowa sites.

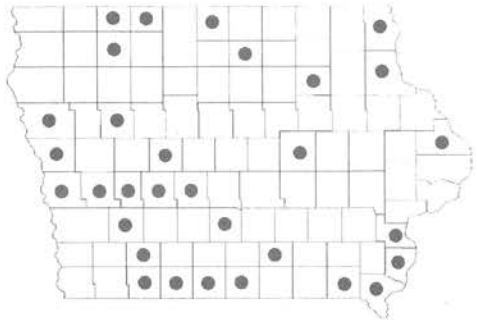
LOOK for the information at the end of the packet to find out how you can be a part of this great effort!



Restoring Other Iowa Natives

The IDNR has a long history of trying to restore extirpated species to their native Iowa territory. Since the 1960s, the IDNR has initiated reintroduction programs for the giant Canada goose, ruffed grouse, wild turkey, barn owl, greater prairie chicken, river otter, peregrine falcon, and sharp-tailed grouse. These programs are directed through the Wildlife Bureau, including the Management, Research, and Wildlife Diversity sections. Most of these programs have been very successful.

Giant Canada Goose



The subspecies of goose which commonly nested in Iowa's prairie pothole region was the giant Canada goose. Increased, unregulated hunting pressure caused by a high market value for goose down, meat, and eggs was largely responsible for the extirpation of the giant Canada goose from Iowa by 1910.

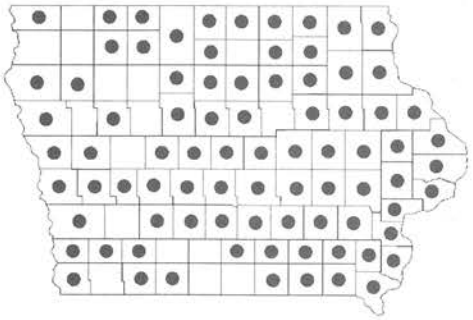
In 1964, the IDNR began an extensive effort to reestablish nesting giant Canada geese in Iowa by purchasing sixteen pairs of giant Canada geese from game breeders and releasing them at the Ingham-High Wildlife Unit near Estherville. From 1971 through 1994, new flocks were established at fifteen additional sites across the state, usually by moving young, flightless giant Canada geese from areas where they were abundant to areas where there was vacant nesting habitat. Currently, giant Canada geese nest in every county in Iowa. The presence of local giant Canada geese act as call flocks, bringing migrating giant Canada geese to the state in numbers that may even exceed the numbers of giant Canada geese seen in the 1800s. There is a very bright future for giant Canada geese in Iowa as 1994 showed record goose production.

Ruffed Grouse

Ruffed grouse were found nearly statewide in Iowa during the mid 1800s. Since they prefer a woody or brushy habitat, their population declined dramatically due to deforestation and timber grazing that occurred during settlement. The ruffed grouse disappeared from all of its native Iowa territory, except northeast Iowa, by the 1930s.
A reintroduction program began with the release of seven birds in Shimek State Forest in 1962. Another twelve birds were released at the same location in 1965. The first two stockings were unsuccessful, but almost 1,300 ruffed grouse now have been released at thirty-eight sites in fourteen different counties.

An evaluation of the status of past releases, the potential of future releases, and location of suitable habitat must be completed by the IDNR before any further attempts will be made to reintroduce this bird to Iowa. The ruffed grouse population seems stable in northeastern Iowa and the numbers of ruffed grouse in other Midwestern states have begun to slowly recover from the lows they once reached.

Wild Turkey



The wild turkey was found throughout Iowa when the first settlers crossed the Mississippi in the 1830s. Most turkeys prefer to live in a woodland habitat. Although acorns are its main staple, turkeys eat a variety of seeds, nuts, berries, insects, and corn. Rapid settlement in the mid 1800s caused woodland habitat to disappear. This and unregulated hunting led to the extirpation of the turkey from Iowa by 1910 when the last wild turkey nest was found in Lucas County.

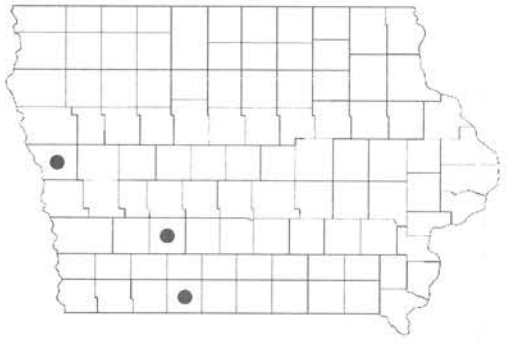
Across the state, at least six attempts were made to establish turkeys by releasing birds that had been raised in captivity. In the 1960s, attempts to establish wild Rio Grande and Merriams turkeys, subspecies found in the southern United States, were unsuccessful because the birds were raised in habitats that were vastly different from the Iowa habitats into which they were being released. The late 1960s brought the release of an eastern subspecies of wild turkey trapped in Missouri in habitats similar to those in Iowa. These turkeys adapted and reproduced successfully enough to support a limited hunting season in 1974. Wild turkey numbers continue to increase and a hunting season for turkeys occurs in all parts of the state.

Barn Owl

Iowa is at the northern edge of the barn owl's range and it historically nested here in low numbers averaging approximately ten nest sites yearly. A captive breeding and reintroduction project was initiated in 1982. Over 430 barn owls were released at preselected barn sites from 1983 through 1987. However, very little nesting occurred during that effort, probably due to several factors including: predation by great horned owls; changes in habitat as savannas were converted to crop fields; and a decrease in the number of voles, which makes up 90% of the barn owl's diet.

In 1994, six barn owl nests were recorded in Iowa, three of which were found in nest boxes that were erected at various sites to encourage barn owl pairs. Wildlife biologists feel that increased nesting is directly related to Conservation Reserve Program (CRP) areas, which were formerly cropland areas that have been set aside as grassland areas.

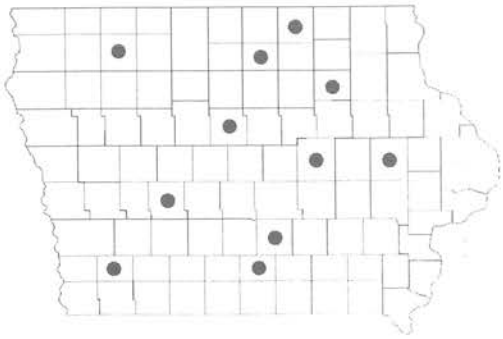
Greater Prairie Chicken



Greater prairie chickens were native to most of Iowa's prairies. At the time of European settlement, it was the most common game bird in the state. Until the 1880s, the population of greater prairie chickens increased because of the habitat changes created by early settlers. Small grain crops provided additional food, pastures and hayfields provided good nesting cover, and there were still large expanses of prairie remaining for display grounds (**leks**) and nesting areas. The perfection of the steel moldboard plow in the 1860s made it easier for farmers to plow the prairie soil, eliminating greater prairie chicken nesting habitat as well as their nests. These changes resulted in a decreasing population of greater prairie chickens from 1880 until its disappearance from southern Iowa in the mid 1950s.

In 1980, the IDNR released fifty-three greater prairie chickens on hillside prairies in the Loess Hills of western Iowa. After this release, there were a few scattered sightings and then the birds disappeared. In 1982, forty-nine more birds were released into the same area. These birds, and probably the birds from the earlier release, quickly left the steep hillsides for the Missouri River Floodplain. Since these lands are almost entirely covered by row crops, it is doubtful that the birds could find suitable nesting cover and survive there. From 1987 to 1989, 254 greater prairie chickens were released in Ringgold County in southern Iowa, where there are numerous grasslands and pastures. Four leks have been established, indicating some success for this program.

River Otter



River otters were once found throughout most of southern Canada and the United States. They are among the largest and most valuable of the furbearing animals. River otters live near water where they eat fish and crayfish. They were fairly common in Iowa at the time of settlement, but disappeared almost entirely from the state by 1900. Their disappearance can be attributed to unregulated trapping and the degradation of streams and rivers.

Efforts to restore the river otter to some of its former territory began in 1985 when sixteen river otters were released on the Red Rock Reservoir. These river otters, as well as 176 others, were obtained in a three-way trade, with Iowa turkeys going to Kentucky, who then purchased river otters from Louisiana to be shipped to Iowa. These animals survived well and more were obtained. Forty-six river otters were purchased with funds raised by the Iowa Trappers Association, Furtakers of Iowa, and the Iowa State University Fisheries and Wildlife Biology Club. A total of 222 river otters were released at eleven sites in Iowa from 1986 through 1990. Record numbers of river otter sightings were reported to the IDNR during the winter of 1994-1995. Currently, the river otter has been taken off of the Iowa state endangered list, but it is still considered to be a threatened animal and may not be hunted or trapped legally.

Peregrine Falcon

Peregrine falcons are known for their dives, which can reach approximately 200 miles per hour. At one time, peregrine falcons were found throughout the eastern and Midwestern United States. Historically, Iowa hosted an average of twelve pairs of peregrine falcons which nested on cliffs along the Mississippi River.

Due to the use of DDT, peregrine falcons disappeared from most of their eastern range by 1964. In Iowa, the last known peregrine falcon nest occurred in 1956. DDT, a **pesticide**, entered the food chain when contaminated insects were eaten by birds that were the peregrine falcons' prey. DDT accumulates in the fatty tissues and, at high levels, interrupts the bird's reproductive cycle.

In 1989, the IDNR began releasing captive-bred peregrine falcons as a part of the Midwestern effort of the Eastern Peregrine Falcon Recovery Program. The IDNR released fifty peregrine falcons from 1989 through 1992. They hope to establish five nesting pairs in Iowa by the year 2000. Nesting attempts of peregrine falcons were first documented in the state in 1992 with two nests reported in Cedar Rapids and Des Moines. The IDNR will continue to monitor peregrine falcon nesting attempts and, if needed, release more peregrine falcons at additional sites in the future.

Sharp-tailed Grouse

Originally, sharp-tailed grouse were found in prairies and forest edges in northwest Iowa. They disappeared rapidly after settlement because of loss of habitat and were extirpated from the state by 1892. In 1989, thirty-seven sharp-tailed grouse were released in Monona County, but the release was not successful. These birds were brought to Iowa from South Dakota and did not have enough time to adjust to the change in the length of day before their release. Day length is linked to the sharp-tailed grouse's reproductive cycle. They need a specific amount of daylight to establish booming grounds and mate successfully. The IDNR released sixty-nine additional sharp-tailed grouse in 1995 in Monona County. These birds were held in pens in order to allow them to adjust to the different day length, hopefully increasing their survival rate. Additional sharp-tailed grouse releases are planned for the same area.

Construct A Wetland

Trumpeter Swan / Wetlands Education Curriculum

Objective

Students will be able to describe the properties of a wetland, as well as it's significant functions relating to the environment and the surrounding land.

Materials

Chalkboard, modeling clay, one roasting pan, a small piece of indoor-outdoor carpet, and several jars of muddy water.

Background

Most generally, people focus their wetland thoughts toward "productivity". The relationships between humans and wetlands have been following the policies of "the only good wetland is filled-in, dredged, or channellized". Although the negative attitudes about wetlands are changing, the "past" areas are considered wastelands.

Amazingly diverse in ecology, wetlands offer more to the environment than most biomes throughout the world. For biological reasons, waterfowl raise broods, muskrats build lodges, sandhill cranes provide magnificent migrations, and trumpeter swans instill majestic beauty across the water's surface - all occurring within a wetland area. Wetlands also provide other beneficial services, such as flood control, pollutant buffers, and erosion barriers. The land is virtually energetic and nutritious!!!

With more assistance and education, people can save wetlands. The feelings toward wildlife, plants, natural scenery, and environmental-friendly agricultural practices seem to impress upon individuals the need for a better and cleaner world. With society looking positively toward the Earth, wetlands are a vital learning aspect for children.

Procedure

1. Have the group spread a layer of modeling clay in one-half of the roasting pan - representing land. The other one-half of the pan should be left empty - representing a lake or other body of water.

2. Shaping the clay, have the group create a gently sloping surface (sloping into the empty portion of the pan).

3. Ask one group member to cut a piece of the indoor-outdoor carpeting, large enough to completely fill the space across the pan along the edge of the clay.

4. Ask several group members to explain the functions of wetlands. Encourage them to elaborate on the biology (plants and wildlife), as well as the agricultural aspects.

5. Using hands-on techniques, have one group member demonstrate the functions of wetlands using the model.

6. Pour some muddy water slowly on the land and have the group explain what they observe. NOTE: Perform the experiment several times, with and without the carpet.

Extensions

Divide the group into smaller sections and have each section construct their own wetland model. Using florist foam, instead of carpeting, the students can attach wetland animal and plant pictures to toothpicks and then place them in the appropriate areas.

Take the group on a tour of a wetland area. Create a list of plants and animals that inhabit the wetland; the list should include species that may or may not be visible.

Grades: 3-7
Subjects: Science, Environmental Concepts
Duration: 45 minutes
Group Size: Any
Setting: Indoors

Deadly Waters

Trumpeter Swan / Wetlands Education Curriculum

Objective

For younger students: Students will be able to name and describe different kinds of pollution that can affect water as well as animals and plants that live in water.
For older students: Students will be able to identify major sources of aquatic pollution and to make inferences about the potential effects of a variety of aquatic pollutants on wildlife and wildlife habitats.

Materials

Ten different colors of construction paper (2 sheets each); graph paper; tape or glue; paper punch; Pollution Information Sheets; student worksheets, 1/4 teaspoon measure (for paper punch tokens); 1 tablespoon (for 1/2" square tokens).

Background

All water that has ever been available to our planet is on or in the earth right now. On the entire planet there are 326 million cubic miles of water. If the earth were a globe 28 inches in diameter, all of the water on the planet would fill less than one cup. Of that amount, only .03% is in river systems and freshwater lakes. This means that only slightly more than one drop would fill all the rivers and lakes. Waterways like rivers, lakes, and streams are a vital expression of the water cycle. All the rain and snow that falls on the land either seeps into the water table or is carried to the sea. In addition, all along the way, water evaporates or finds its way through plants and transpires back into the atmosphere to form clouds and precipitate again.
With this picture of the scale and interconnectedness of our planet's freshwater resources in mind, it is apparent how fragile this vital substance is. Yet each day water is being damaged by pollution-pollution that stresses ecosystems beyond their capacities to support life.

Grades:	5-12
Subjects:	Science, Social Studies, Health, Home Economics, Industrial Arts
Duration:	30-45 minutes or longer
Group Size:	Any
Setting:	Indoors

Pollution is a complex topic. Most current resource books include four definitions....

Chemical Pollution — the introduction of toxic substances into an ecosystem, e.g. acid rain, contamination of water supplies by pesticides.

Thermal Pollution — varying temperatures above or below the normal condition, e.g. power plant turbine heated water.

Organic Pollution — oversupplying an ecosystem with nutrients, e.g. fertilizer inflow.

Ecological Pollution — stresses ordinarily created by natural processes: for example:

1. Adding a substance that is not a naturally occurring substance in the ecosystem (adding something that is not usually there), e.g. extreme tides pour saltwater into habitats ordinarily protected from seawater;
2. Increasing the amount or intensity of a naturally occurring substance, e.g. abnormal increase in sediments in runoff water to produce silt;
3. Altering the level or concentration of biological or physical components of an ecosystem (changing the amount of something that is already there), e.g. introduction of aquatic plants via bird droppings, etc.

Most of us view pollution dominantly as human-caused. In the definitions above, chemical pollution through the introduction of toxic substances is clearly human-caused. Organic pollution in lakes and rivers typically results when organisms living there are enhanced by chemical fertilizers used in agriculture. Thermal pollution is dominantly human-caused through nuclear power plants, fuel-based electrical power production, and many industries. Some dams also produce unnaturally cooled water with bottom discharge of water.

Surprisingly, these three forms of pollution-chemical, thermal, and organic-can take place without human intervention. When pollution takes place without human intervention, it is most often ecological pollution. (At times, human activity can also increase pollution via naturally occurring substances. For example, roadbuilding, rowcrop agriculture, and some forest practices can increase siltation.) Natural ecological pollution, in the larger view of things, may

be beneficial or harmful. Whether beneficial or harmful or neither, ecological pollution-which is dominantly derived from natural processes-does affect wildlife and wildlife habitat. Some acid rain results from volcanic eruptions. Landslides and avalanches alter runoff patterns as well as sometimes killing plant and animal life. Shifts in oceanic currents affect water temperature as well as weather patterns. Sometimes hot springs and geysers can heat water above normal temperatures in lakes and streams.

Obviously, many substances naturally occurring in water are also beneficial as well as harmful to aquatic life and habitats.

Yet, all that is known points to humans as the greatest source of damage to habitat. To understand pollution's effects and causes prepares us to be able to take constructive action now and in the future to maintain a healthy environment.

Documentation of human illness and death due to pollutants is overwhelming. Research shows that pollution also causes illness and death in wildlife.

The way we feel about pollution has to do with the attitudes and values we hold regarding the quality of life. Issues of economic importance often affect human reaction to pollution. One researcher called pollution the "chosen disease". Only in catastrophic circumstances like the disaster in Bhopal, India or in Valdez, Alaska are we able to see short-term effects of pollution. In the case of DDT, it took years before we could see the effects. For the most part, pollution is invisible; it often takes years to display its toxic destructiveness. Since the effects of most pollution are long term, we must develop long term views about its effects on wildlife and its habitat.

Groundwater is continually being affected by toxins we cannot see. Some pollutants enter water from localized source, like a chemical discharge from a factory. This is called a **point source pollution**. Other pollutants enter from a variety of less easily identified sources; for example, when rain washes motor oil left from dripping cars in store parking lots into city drains to reenter the water supply. This is called a **nonpoint source pollution**.

In its many journeys, water may be contaminated by thousands of different substances and conditions. For the most part these substances and conditions alter water in such ways that it becomes a hazard to wildlife, wildlife habitat, and humans as well. Some effects are direct, others are indirect.

The major purpose of this activity is for students to increase their understanding of water pollution and its potential effects on human and wildlife habitats.

Activity

1. Before the activity begins, make 100 tokens of each of the ten colors of construction paper.
   The construction paper may be folded in quarters to speed up the process of cutting or punching.
   For younger students, cut the construction paper into 1/2" squares using a paper cutter. For older students, punch out construction paper tokens with a paper punch. Put all the tokens, either 1/2" squares or punched tokens, in a container. Stir them so the colors are thoroughly mixed. Make one copy of the Pollutant Information Sheet for each student.

2. List the four major categories of pollution on the chalkboard and discuss each. They are: chemical, thermal, organic, and ecological. Refer to the background for a description of each.
   NOTE: The first three are dominantly caused by humans, although there are rare cases where natural processes can cause them. Ecological pollution is typically natural, although there are cases where it is caused by humans.

3. Pass out the Pollutant Information Sheets.
   Review each kind of pollution with the students. Talk about how some of these can fit into more than one of the four kinds of pollution. Color code each with a different color of the construction paper. Write a short description of the pollution on a piece of paper of the color to which it is coded.
   (Some teachers have simply copied the Pollutant Information Sheets, cut the descriptions apart, and pasted the appropriate paragraphs on each of the colored paper). Post each sheet of colored paper with its corresponding description of the kind of pollution it represents in a row in a convenient place.

4. Once all the kinds of pollution have been discussed, and the students understand that each kind of pollution will be represented in this activity by one color of paper, tell the students that they are to divide into teams of three. These will be research teams; each team will analyze the pollution content

of a hypothetical river. Distribute the colored paper tokens that have been cut or punched from the construction paper. Provide 1/4 teaspoon of the paper-punched tokens, or one tablespoon of cut 1/2" square tokens, to each research team. Also provide each team with a piece of graph paper.

5. The teams must separate the colored tokens into piles; using the color key, they should identify each type of pollutant. Once this is done; they should count the number of each kind of pollutant they have identified and then use graph paper to construct a simple bar graph showing the whole array of pollutants. Arrange the pollutants in the same order as they are displayed in the color key that is posted in the classroom. This makes it easy to compare each team's findings. Remind them that each has a different river. Their results are not likely to be the same!

6. When they have the bar graphs completed and have compared the teams' results, tell them that any quantity above two units of each kind of pollutant is considered damaging to wildlife habitat. In their hypothetical rivers, what pollutants would be likely to cause the most damage to wildlife and wildlife habitat? How would these affect trumpeter swans and their survival? Give examples and discuss the kinds of damage that could be caused.

7. OPTIONAL: Invite the students to match the pollutants with the four categories of pollution listed at the beginning of the activity. Some seem to fit rather easily; others could fit in more than one category, depending on the source of the pollution. For example, is the thermal pollution human or naturally caused (power plant water effluent or thermal hot springs)?

Extensions

1. List five things you can do—starting today—in your own life to reduce the number of pollutants you add to the environment.

2. Look at a body of water and attempt to identify what, if any, kinds of pollutants are affecting it.

3. Get information about current national and state laws protecting water quality in the United States. Write a short history of the U.S. Clean Water Act.

4. Why is DDT still being used, and where? Find out the current status of this pesticide use in the U.S. and other parts of the world.

Evaluation

1. Describe the effects that large quantities of the following things might have on an aquatic environment. Consider the short term and long term effects: hot water, fertilizer, soil (silt), heavy metals, etc.

2. Water is taken from a river, treated, used by people of a community, sent to a city seage treatment plant, and put back into the river. Is this aquatic pollution? Defend your response.

This activity was taken from "Sustainable Agriculture and Wildlife: Piecing Together a Habitat Puzzle", Iowa State University Extension, Iowa 4-H Education and Natural Resources Center and Iowa Wild Aquatic Supplemental Teacher's Resource Manual, Iowa Department of Natural Resources.

Pollutant Information Sheet

Sediments

Particles of soils, sand, silt, clay, and minerals wash from land and paved areas into creeks and tributaries, in large unnatural quantities, these natural materials can be considered a pollutant. Construction projects often contribute large amounts of sediment. Certain lumbering practices affect sediments in runoff. Sediments may fill stream channels and harbors that later require dredging. Sediments suffocate fish and shellfish population by covering fish nests and clogging the gills of bottom fish and shellfish.

Petroleum Products

Oil and other petroleum products like gasoline and kerosene can find their way into water from ships, oil drilling rigs, oil refineries, automobile service stations, and streets. Oil spills kill aquatic life (fish, birds, shellfish, and vegetation). Birds are unable to fly when oil loads the feathers. Shellfish and small fish are poisoned. If it is washed onto the beach, the oil requires much labor to clean up. Fuel oil, gasoline, and kerosene may leak into ground water through damaged underground storage tanks.

Animal Waste

Human wastes that are not properly treated at a waste treatment plant and then released to water may contain harmful bacteria and viruses. Typhoid fever, polio, cholera, dysentery (diarrhea), hepatitis, flu and common cold germs are examples of diseases caused by bacteria and viruses in contaminated water. The main source of this problem is sewage getting into the water. People can come into contact with these microorganisms by drinking the polluted water or through swimming, fishing, or eating shellfish from polluted waters. Often unexpected flooding of barnyards or stock pens can suddenly increase the toxic effects of animal waste in water. Animal waste can also act as a fertilizer and create damage by increasing nutrients.

Organic Wastes

Domestic sewage treatment plants, food processing plants, paper mill plants, and leather tanning factories release organic wastes that bacteria consume. If too much waste is released, the bacterial populations increase and use up the oxygen in the water. Fish die if too much oxygen is consumed by decomposing organic matter.

Inorganic Compounds

Detergents, pesticides, and many synthetic industrial chemicals are released to waterways. Many of these substances are toxic to fish and harmful to humans. They cause taste and odor problems and often can not be treated effectively. Some are very poisonous at low concentrations.

Inorganic Chemicals

Inorganic chemicals and mineral substances, solid matter, and metal salts commonly dissolve into water. They often come from mining and manufacturing industries, oil field operations, agriculture, and natural sources. These chemicals interfere with natural stream purification; they destroy fish and other aquatic life. They also corrode expensive water treatment equipment; and increase the cost of boat maintenance.

Fertilizers

The major source of pollution from agriculture comes from surplus fertilizers in the runoff. Fertilizers contain nitrogen and phosphorous that can cause large amounts of algae to grow. The large algae blooms cover the water's surface. The algae die after they have used all of the nutrients. Once dead, they sink to the bottom where bacteria feed on them. The bacterial populations increase and use up most of the oxygen in the water. Once the free oxygen is gone, many aquatic animals die. This process is called eutrophication.

Heated Or Cooled Water

Heat reduces the ability of water to dissolve oxygen. Electric power plants use large quantities of water in their steam turbines. The heated water is often returned to streams, lagoons, or reservoirs. With less oxygen in the water, fish and other aquatic life can be harmed. Water temperatures that are much lower than normal can also cause habitat damage. Deep dams often let extra water flow downstream. When the water comes from the bottom of the dam, it is much colder than normal.

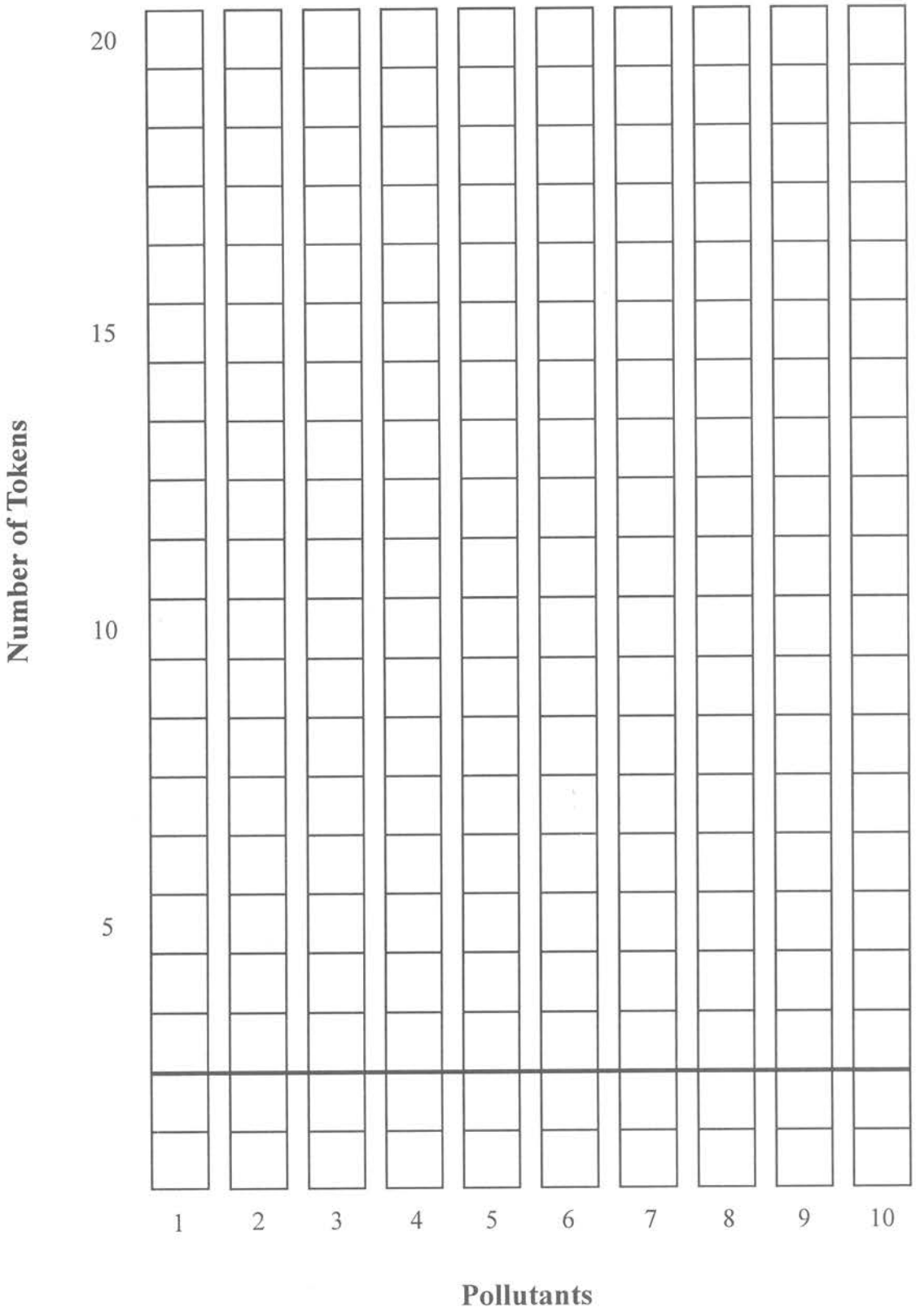
Acid Precipitation

Aquatic animals and plants are adjusted to a rather narrow range of pH levels. pH is a measure of the acidity of a solution. When water becomes too acidic, due to inorganic chemical pollution or from acid rain, fish and other organisms die.

Pesticides, Herbicides, Fungicides

Agricultural chemicals designed to kill or limit growth of life forms are a common form of pollution. This pollution results from attempts to limit the negative effects of undesirable species on agricultural crop production. Irrigation, groundwater flow, and natural runoff brings these toxic substances to rivers, streams, lakes, and oceans.

Deadly Waters Bar Graph - Student Worksheet 1



Deadly Waters Student Worksheet 2

Matching

Place the letter of the type of pollutant in the space next to the description taken from the *Pollution Information Sheet*. Each letter is used only one time.

a. Acid precipitation
b. Animal wastes
c. Fertilizers
d. Heated water
e. Inorganic chemicals
f. Inorganic compounds
g. Organic wastes
h. Pesticides, herbicides, fungicides
i. Petroleum products
j. Sediments

___ 1. The main source of this problem is sewage getting into the water. It can also result from runoff from farm feed lots.

___ 2. Detergents, pesticides and industrial chemicals that can cause taste and odor problems; some are poisonous.

___ 3. One source of this kind of pollution is water used in steam turbines in electrical power plants.

___ 4. Small particles of soil that cover fish nests and clog the gills of some fish and shellfish.

___ 5. Oil, Gasoline and kerosene are examples of this type of pollution.

___ 6. If too much of this type of pollution enters a body of water, bacteria increase and use up the oxygen in the water.

___ 7. Metal salts from mining, manufacturing, and other sources that may destroy aquatic life; they also corrode water treatment equipment.

___ 8. Rain or snow that is acidic (has a low pH).

___ 9. These contain nitrogen and phosphorus that can cause large amounts of algae to grow.

___ 10. These are agricultural chemicals used to kill or limit weeds, insects and other unwanted pests.

Deadly Waters Student Worksheet 3

1. List the four major categories of pollution.

   _____

   _____

   _____

   _____

2. Describe the effects that large amounts of the following things might have on the aquatic habitat.

   a. hot water

   _____

   _____

   b. fertilizer

   _____

   _____

   c. soil (silt)

   _____

   _____

   d. pesticides

   _____

   _____

   e. petroleum products

   _____

   _____

3. Water is taken from a river, treated, used by the people of a community, sent to a city sewage treatment plant, and put back into the river. Is this aquatic pollution? Defend your answer.

   _____

   _____

   _____

   _____

   _____

   _____

Habitat Tag

Trumpeter Swan / Wetlands Education Curriculum

Objective

Students will learn that animals must have food, water, shelter, and space to survive. They will also learn about the impact humans can have on habitat and on animal species.

Materials

Cards labeled "food" and "water" (one each per student plus a few extra). Bases for shelter (masking tape Xs on the floor or carpet squares). Optional: tags or vests to differentiate players.

Background

Every species of wildlife requires specific kinds and quantities of food, water, shelter, and space in a specific arrangement. These specific needs are called "habitat requirements". Different animals live in different habitats because they have different habitat requirements. In this tag game, each animal must find its habitat requirements in order to survive. Predators get food by capturing (tagging) prey. The habitat component in shortest supply determines the number of animals that can survive. This is known as the 'limiting factor'. Humans can change the available habitat in many ways. They can damage food and water sources, destroy cover or kill predator and prey species. Loss of habitat has caused problems for migratory birds such as swans, especially in the lower 48 states. Many traditional societies adopted rituals, rules and accepted behavior that insured that resources would not be over exploited. Habitat protection laws, bag limits and hunting regulations were devised to prevent humans from over-developing habitat and over-hunting animals so that wildlife can continue to thrive.

Grades: 3-12
Subjects: Science, Math
Duration: 45 minutes
Group Size: Any
Setting: Indoors or Outdoors

Procedure

Place "food" markers on one side of the room or yard and place "water" markers on the other. Scatter several bases around the playing area which will serve as shelter for students to stand on. Designate a few of these as predator shelter.

Explain that for an animal to survive, it must have food, water, and shelter (a place to hide). The object of the game is to get a food and a water marker and reach cover before being caught by a predator. Predators get food by tagging a prey. Predators must get water markers, tag a prey and return to the predator shelter bases. Only one person may be on a base at a time. If a prey does not have food and water, she/he may only stand on a shelter for the count of 10. If a prey has food and water, she/he may displace a thirsty or starving prey player with only one marker (food or water). Predators cannot touch prey players when they are on shelter base. The predators could represent coyotes and their prey are swans.

Select a few students to be predators. Start the prey on one side of the room or yard and the predators on the other. After saying 'start', play for 3-5 minutes. Those who obtained food, water, and shelter survived. Those who did not become predators. Original predators become prey.

Many variations are possible. The distance between cover spots may be varied, or limiting the number of food or water markers or players, changing the ratio of predators to prey. Students will learn the importance of the arrangement of habitat components and that the resource in shortest supply (food, water or shelter) will limit the number of animals that survive (limiting factor).

Extensions

After students have played the game with varying numbers of predators, food, water, and shelter markers, introduce a new twist — humans. Human players can change the available habitat by taking away some of the food, water or shelter markers. Humans do this in real life when they log, mine, build houses and factories, and pollute the environment. Human players can catch prey even if they are on shelter markers and they can catch as many as they

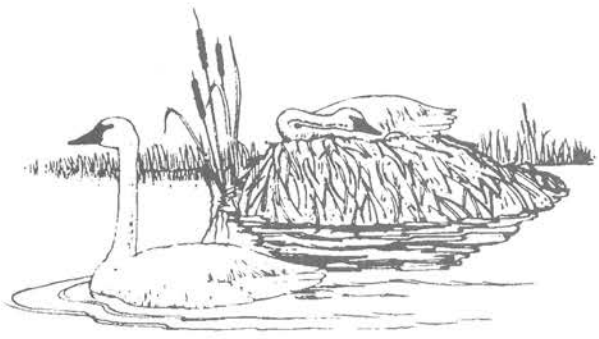
wish. They can also catch predators. Anyone caught by a human is out of the game. The game is over when there are no more prey. What happens when humans destroy too much habitat? What happens when humans catch too many prey or predators? Ask students to discuss how they could keep the game going and still have humans.

They may make new rules, perhaps limiting the number of predator or prey players they can catch. They might limit the amount of time the human players can play, perhaps to 30 seconds per round. This simulates creating habitat protection laws, hunting regulations and bag limits. These laws are designated to ensure that humans don't destroy too much habitat or take too many animals, but leave some for predators and some to reproduce.

Evaluation

Ask students to name the components of habitat. Ask students to explain why there are game laws and why habitat protection laws are established.

This activity adapted from Teach About Geese, U.S. Fish and Wildlife Service, Alaska.



Migration Headache

Trumpeter Swan / Wetlands Education Curriculum

Objective

Students will be able to list limiting factors affecting populations of migrating water birds, predict the effects of such limiting factors, describe the effects of habitat loss and degradation on populations of migration water birds, and make inferences about the importance of suitable habitat for migrating water birds.

Materials

Two paper plates for every three students (clearly mark the plates to differentiate top from bottom); or use 12" x 12" carpet samples available at no cost from most carpet retail stores.

Background

Migration is a mysterious topic. How do birds, fish, mammals and insects travel the immense distances they do with such exactness? Some travel at night, some during the day, some in the skies and others deep within the sea. Yet unerringly they locate habitats necessary for the continuation of their species. Scientists have proposed that they use the stars, the sun, and even the earth's magnetic field for guidance. Some animals, such as salmon, seem to use smell to guide them home from the sea. Most probably, migrating species use a combination of means to guide their journeys.

There are a variety of remarkable migrating water birds. Many migrating birds—ducks, geese, swans, cranes, ibises, herons, rails, egrets, gulls, terns and shorebirds, for example—require the presence of wetlands in their breeding habitat and on their wintering grounds. Since these two regions are often thousands of miles apart, they need wetlands to provide them with food and rest in between.

Grades:	4-12
Subjects:	Science, Language ARts, Math, Social Studies, Physical Education
Duration:	45 minutes
Group Size:	20-40 or more
Setting:	Outdoors or large area indoors

The populations of some species of water birds are healthy; however, populations of many water birds are showing a long-term downward trend. Examples of populations of species that appear to be healthy in most areas are Canada goose, golden, ruddy duck and green wing teal. Examples of species that have experienced some decline but are now increasing are wood duck, sand-hill crane, snow goose and tundra swan. Examples of species that appear to be or are declining are emperor goose, American bittern, pintail, black duck and canvasback duck. Among the species that are officially listed as endangered are piping plover, wood stork, whooping crane and Eskimo curlew.

The primary threats to the survival of migratory water birds are the disappearance and degradation of wetlands. Without wetlands, dozens of species of ducks, geese, swans and other water birds face the loss of the necessary habitat for survival. Many federal, state and private groups recognize the importance of wetlands to wildlife. Millions of acres of wetlands have been purchased and protected to actively preserve flocks of migratory birds that span continents on their journeys.

There are international treaties and national laws affecting migratory species, including water birds. In the United States, the U.S. Fish and Wildlife Service has principal legal responsibility for managing migratory wildlife at the federal level. State wildlife agencies share some responsibilities with the U.S. Fish and Wildlife Service in protecting migratory animals.

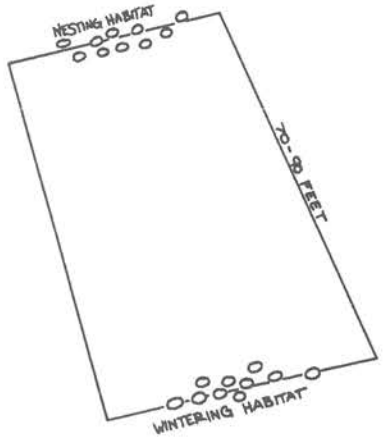
The migration routes, or flyways, of North American water birds are well known. Before regulations, the market hunters of the 19th century took advantage of the fact that vast numbers of water birds would often concentrate at set points along these routes, and greatly decimated the flocks. Wetland habitats—usually found in low, fertile plains along water courses—were historically prized for conversion to farmland and settlements. Today, the journeys of water birds take them over lands on which human influences are ever increasing in scope and magnitude. Agriculture, development and industry are all reducing the availability of natural wetlands. Pollution, through pesticides such as insecticides and herbicides, take their toll. On the positive side, the use of lead shot by

waterfowl hunters has been outlawed nationwide since 1991. Lead pellets would fall into wetlands and be consumed by waterfowl. Lead is toxic to both waterfowl and their predators. Shotgun pellets used on wetlands are now made of steel. Some scientists suggest that acid precipitation might be affecting insect populations which in turn affects the birds that depend on insects for food. Natural conditions also affect the migratory birds. Predators, weather, disease and fire influence both the animals and their habitat.

In this activity we have chosen to simplify the events of migration so as to keep the simulation manageable. In doing so we have avoided increasing the complexity of involvement between nesting and wintering areas. In actuality, many of the hazards faced by migrating water birds are hazards en route. We guide the teacher to emphasize these in discussion rather than during the simulation. Each student (assuming a class size of thirty) represents thousands if not tens of thousands of water birds. Thus, occasional losses to predation and other events of relatively minor magnitude during the course of migration are not emphasized in the simulation. The major purpose of this activity is for students to dynamically experience some of the important factors which affect the survival of migratory water bird populations.

Procedure

1. Select a large playing area about 70 feet in length. Place the paper plates in two patches on the playing field as shown below:



   Choose the number of plates so that you have one plate for each three students at each end of the field. Designate one of these areas the "wintering habitat" and the other the "nesting habitat". This means you have two sets of plates; one set at the nesting habitat and one set at the wintering habitat.

2. Explain to the students that they are water birds and will migrate between these two areas at your signal. Tell them that the paper plates represent "wetlands". These wetlands provide suitable habitat for water birds. At the end of each journey, the students will have to have one foot on a paper plate in order to be allowed to continue. If they cannot get their foot on a plate, that means they have not found any suitable habitat. They "die", and have to move—at least temporarily—to the sidelines and watch. During migration, the birds (students) may want to "flap their wings", moving their arms like birds in flight.

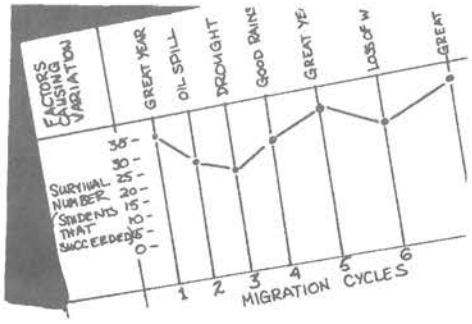
3. Explain to the students that many factors will limit the survival of populations of migration water birds. Some involve changes in the wintering and nesting habitats. There will be times of abundant food, water, shelter and space suitably arranged to meet the habitat requirements of the birds. There will be other times when the habitat is stressed, with many factors limiting the potential for survival. Sometimes the area of available habitat is reduced. Tell the students that for the purposes of this activity only three water birds can occupy a "habitat haven" (paper plates) at any one time.

4. Begin the activity with all the students at the wintering habitat. Announce the start of the first migration. Have the students migrate in slow motion until they become familiar with the process. Then they can speed up. On the first try, all the birds will successfully migrate to the nesting habitat.

5. Explain that there has been no loss in the area of available habitat. Thus, a successful nesting season is at hand.

6. Before the students migrate toward the wintering habitat, turn over one plate from wintering region. Explain that a large wetland area has been drained and used for agricultural purposes. Repeat the instruction to migrate and send the water birds to the wintering habitat. Have the three students that will be displaced stand on the sideline. Tell the students that these three died as a result of loss of habitat. Remind any "dead birds" that they will have a chance to get back into the activity. They can come back as surviving hatchlings when favorable conditions prevail and there is habitat available in the nesting ground.

NOTE: The series of migration cycles can be graphed as shown below. Many teachers have chosen this method to record the cycles.



7. Before the next migration to the nesting region, turn over four plates in the nesting habitat. This represents a catastrophic loss. Tell the students that this is the result of an oil spill in the local river, severely damaging shoreline habitat. Instruct the students to migrate.

NOTE: This results in a large number of students waiting on the sidelines to reenter in the nesting habitat. Before many cycles are repeated, provide them with an opportunity for re-entry. Each time give the students examples of changes in the habitat conditions that could have taken place making it possible for them to survive. Two students can be made permanent monitors to turn the paper plates over as you instruct them.

8. Repeat the process for eight or ten migration cycles to illustrate changes in habitat conditions with resulting effects on the birds. Give examples of factors that might influence the birds' survival.

   Some limiting factors are a natural and dynamic part of any environment. This is true of factors favoring survival as well. However, the significant difference in the case of the survival of populations of migratory aquatic birds seems to be the loss or degradation of huge areas of suitable habitat, much of it as a result of human intervention, e.g. draining wetlands, and pollution of water supplies.

   Be sure to create one or more "disaster" years to illustrate catastrophic loss of large areas of available habitat. Remember that, overall, the availability of suitable habitats for migrating aquatic birds is diminishing—the activity should end with fewer areas of available habitat than can accommodate all the birds. There is general agreement that the greatest long-term threats to the survival of populations of migratory water birds are the loss and degradation of habitat.

Factors Limiting Survival of Populations of Migratory Birds

- wetland drainage
- drought
- pollution and contamination of water
- urban expansion
- conversion of wetlands to farm land
- conversion of natural waterways to canals
- illegal hunting
- lead shot in food supply
- disease

Factors Favoring Survival of Populations of Migratory Birds

- preservation of wetlands
- high rainfall
- restoration of habitat
- dynamic balance with predators
- human action aimed at protecting and restoring wetlands, including through education
- regulation of hunting and human predation

9. In discussion, ask the students to identify the apparent causes of the birds' population decline from year to year. Ask them to try to imagine what seems to be the major factors contributing to habitat loss and degradation. Ask them to make predictions about the effects of these factors. Distinguish between short-term and long-term effects. Distinguish between catastrophic effects and gradual changes. Ask the students to support their hypotheses with evidence, seeking additional information through research if necessary.

10. Ask the students to summarize what they have learned about some of the many factors that affect the success of aquatic bird migration. List and discuss human-caused factors and environmental factors. Compare similarities and differences between these limiting factors. Highlight those which the students identify as posing the most significant long-term threat to the survival of migrating water birds.

11. What kinds of things can and should be done to protect and restore habitats for migrating water bird populations? Discuss potential trade-offs related to any recommendations.

Extensions

1. Waterfowl survival does not just depend on the abundance and quality of end destinations. Migration success also depends upon wetland stops between winter and summer habitat. To simulate the importance of these resting areas, do the activity as written above but this time add wetland resting stops between the nesting habitat and winter habitat. Migrating birds will have to make several stops between their ultimate destinations.

2. Pick a species of water bird. Find out more about its characteristics. Conduct this activity again with each student representing a specific kind of water bird!

3. Explore the major factors affecting habitat loss and degradation , or gain and restoration, in your area. Research the causes for long-term habitat loss, as well as any major efforts underway to prevent these increasing losses.

4. Using a map, plot the major migratory routes of North American birds.

5. Visit a national wildlife refuge, state wildlife area, bird observatory, private sanctuary, or other habitat for migratory water birds.

6. What other animals migrate? Are the problems they face similar to those of migratory birds?

7. Find out who J.N. (Ding) Darling was and what he did for migrating water birds.

8. Find out about Ducks Unlimited. It's one example of a private organization dedicated to providing and protecting habitat for migratory water birds.

9. There are national laws and international treaties protecting migratory species. Find out about some of these. What is their history? Are they effective? Are there problems enforcing them? What migrating species, if any, are unprotected by such laws?

10. Find out how wetlands have changed or remained the same in your community/state throughout the last 100 years. Are there wetland regulations or zoning laws in your community?

Evaluation

1. Name two human activities and two environmental factors that might interfere with water bird migration. For each activity and factor, describe the possible effects on the water birds.

2. Distinguish between effects on individual birds and effects on populations of birds. Indicate if an effect is short-term or long-term.

3. Why is suitable habitat important for migrating water birds? Include in your response a description of the different kinds of habitat that are needed by migrating water birds.

4. True or false: Habitat loss is a greater threat to the survival of migrating populations that for stationary populations of wildlife. Explain your answer.

This activity taken from "Aquatic Wild"

Trumpeter Swan, By Chance

Trumpeter Swan / Wetlands Education Curriculum

Objective

Students will be able to identify the factors that trumpeter swans need for survival and identify the factors that hinder the survival of trumpeter swans.

Materials

Large playing area and 22 index cards - labeled trumpeter swan (2), food (4), water (4), shelter (4), space (4), pesticides (1), loss of habitat (1), and illegal hunting (2).

Background

Trumpeter swans are adapted in many ways that increase their chances of survival. Yet, whether a trumpeter swan reaches adulthood and reproduces is mainly a matter of chance.

Over 95% of the wetlands had been drained in Iowa when the last free wild nesting pair occurred on Twin Lakes in Hancock County in 1893. Loss of precious habitat plus the exploitation and unregulated harvest for skins, down, quills, meat, and the fashionably millinery trade of the 1800s extirpated nesting trumpeters from Iowa's borders. By the early 1930s, only 69 swans remained in the entire continental United States.

Even with the lack of former wetland areas, there is enough suitable habitat remaining to allow trumpeters to once again reside in Iowa. The education and cooperation of many Iowans will create a better understanding of the critical issues involved with the restoration projects. In future years, as everyone notices the population of trumpeter swans, society can contemplate the values of wetlands and the need for humans to become involved with the process of helping endangered plants and animals.

Grades:	3-6
Subjects:	Science, Health
Duration:	45 minutes
Group Size:	25 students
Setting:	Indoors or Outdoors

Procedure

1. Have the group discuss the requirements of any living organism - food, water, shelter, and space. Explain that although trumpeter swans have many adaptations to help them meet the challenges of life, many never reach adulthood.

2. Ask the group about possible hazards that could hinder the life cycle of a trumpeter swan.

3. Proceed to the game area and explain the rules of "Trumpeter Swan, By Chance"; during the game, two group members will act like trumpeter swans and everyone else will play the part of either a requirement or a hazard. NOTE: The object of the game is for the trumpeter swans to survive by receiving the requirements and avoiding the hazards.

4. Designate four bases within the game area (preferably the outside corners). All group members, regardless of their role, must stay on the outside of the playing area and always rotate around the bases. NOTE: Group members can rotate in either direction, but be careful of collisions during the activity.

5. Have each group member draw one index card from a hat or bucket. Tell each person to keep their role a secret from everyone else, and have them hold their cards so the roles can be used for future drawings.

6. Have the group run, walk, jog, crawl, etc. around the bases. During their activity, count slowly to ten. When the time has expired, have the group stop, then quickly proceed to the closest base.

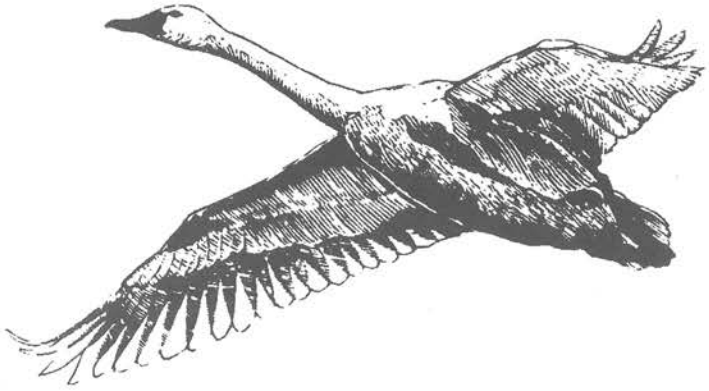
7. After the group settles into one of the four bases, have the two trumpeter swans raise their hands. The bases without trumpeter swans cannot win - they represent wetland areas that do not contain swans. To win, the bases with the trumpeter swans need to have at least one of each four requirements and must be without any hazards. Even if there is one hazard, a base cannot win. NOTE: If both swans happen to be at the same base, the base needs to have at least two of each four requirements and must still be without any hazards.

8. The game may have to played several times before a winning base appears. Before playing a new game, have each group member exchange cards with another person.

Extensions

Have the group create new cards to either assist or hinder the trumpeter swan life cycle. With "common-sense" creativity, the group will be able to understand several key concepts for trumpeter swan survival, as well as realize that survival chances increase with positive environmental influences.

This activity adapted from "Trees Are Terrific", Ranger Rick's NatureScope, National Wildlife Federation, 1400 16th St. NW, Washington, DC 20036-2266.



Water Canaries

Trumpeter Swan / Wetlands Education Curriculum

Objective

To teach students how to identify several aquatic organisms; and assess the relative environmental quality of a water system based on measures of pH, water temperature, dissolved oxygen and the presence of diversity of organisms.

Materials

Sampling equipment such as dip nets, seine nets, sieves, white trays, and assorted containers; magnifying lenses or microscopes; eye droppers; forceps; Hach water testing kit; thermometer; identification books (e.g. The Golden Guide to Pond Life); student worksheet (found at end of activity).

Background

In the early days of coal mining, canaries were taken into mines. Since canaries were more sensitive than humans to the presence of dangerous gases in the air, their discomfort or death indicated whether or not the air was safe to breathe. Although this practice no longer exists, it stands as an example of how animals have differing sensitivities to environmental factors.

In streams and ponds the presence or absence of certain organisms called indicator species reveals much about the quality of the water. These creatures comprise a biotic index. That is, their absence or presence tells us something about water quality. Water with a rich and varied range of aquatic creatures is usually a "healthy" environment, whereas water with just a few different species usually indicates conditions that are less "healthy". Healthy is used here to indicate an environment supportive of life forms. In some cases the actual biomass or amount of living material will increase due to pollution, but the diversity inevitably goes down.

Grades:	5-12
Subjects:	Science, Health, Math
Duration:	1-2 hours
Group Size:	Dependent on amount of equipment; may work in small groups
Setting:	Pond, lake, stream, marsh, or other water system

Bluegill are a fish species that is very sensitive to pesticide pollution. Therefore, periodic die-offs of bluegill during the growing season (particularly spring) might suggest runoff of pesticides. There are many aquatic insects and invertebrates that might also be seen at your site including: water boatman; whirligig beetles; scuds; side swimmers; larvae of mayflies, dragonflies, and damselflies; midge larva; copepods; snails; and leeches. Some of these insects and invertebrates are also sensitive to pesticide contamination. Some very sensitive organisms are in the class crustacea, including daphnia and copepods. Sensitive organisms in the class Insecta are the larvae of mayflies, damselflies, and dragonflies. The loss of some of these organisms can ultimately lead to the loss of species higher on the food chain, like fish and birds, that depend on the aquatic organisms for food. For example, young bluegill feed heavily on daphnia and will suffer if the daphnia die off.

Another water quality problem is the runoff of fertilizers like nitrogen and phosphorous into water systems. Nutrient inputs from fertilizers typically do not kill aquatic life outright like pesticides, but it can indirectly reduce the diversity of the water system. High nutrients promote the growth of algae. Some algae, like the single-celled green type, are good for the system because they are a food source for zoo plankton like daphnia which are in turn food for other organisms. This algae makes the water appear green in color. Other algae, however, like the filamentous blue-green type, shade the water too heavily so that many organisms can not survive. If you have ever stuck your hand in the water and ended up with a fist full of green "slime", this was most likely filamentous algae. Ultimately, the filamentous algae dies off leaving a new problem in the form of very low dissolved oxygen resulting from its decomposition. Most aquatic organisms breath via gills, which extract dissolved oxygen from the water. The bacteria and other decomposers that break down the dead mats of algae use-up a lot of dissolved oxygen. In fact, when enough algae dies off at one time and decomposition begins, dissolved oxygen levels in the water may drop so low that fish and other aquatic life do not have enough oxygen to breath and die. Fishery biologists call this phenomenon "summer-kill".

The major purpose of this activity is for students to be able to recognize indicators of environmental quality in streams, ponds, lakes, or other aquatic habitats.

Procedure

Use whatever water source you have available—preferably a pond, lake, marsh, or stream. Advise the students in advance to dress for the setting. Old shoes, shorts or jeans would likely be best. Brief the students on habitat courtesies. Alert them to ways to minimize the potential for damaging the habitat and encourage care in their collection techniques. Emphasize that all the wildlife is to be returned to its habitat unharmed. You may choose whether or not to take some of the organisms to a location to observe under microscopes.

Talk to the students about the information in the background. Then start by observing the water. Look for organisms like fish and plants on the surface and in the depths. Using the sampling equipment (nets, trays, assorted containers, etc.), have the students collect as many different forms of animal life as possible. Have them collect from the sediment at the bottom of the pond, as well as the surface of the water. Tell them to look on rocks, sticks, plants and other substrates in the pond. Place the animals to be observed in the white trays for viewing and drawing. The whiteness of the trays allows details to be seen in the animals collected. Keep an adequate amount of water in the trays and place them in a cool shady spot. Change the water as often as needed to keep the animals cool. You may want to put some of the smaller organisms and samples of algae in collection jars to view under microscopes.

Have the students identify and draw on Worksheet I the aquatic insects and invertebrates they found. Use the field guide to identify any organisms not on the worksheet. Ask them to fill in the number of each kind found and describe the actual location where the animal was found. Once these observations are completed, carefully return the animals to their natural habitat. (NOTE: If you choose to take some of the animals to the area where the microscopes are, be sure there is adequate water that can be kept as cool as the natural setting. Any shallow transparent dish and an overhead projector make for exciting viewing.) Transport them in a 3-5 gallon bucket, however, to sustain them.

Now it is time to test the water for other indicators of quality. Divide the students into groups if using more than 1 Hach test kit. Using the Hach water test kits and thermometers, have each group determine the pH, dissolved oxygen, and the temperature of the water, as well as the air temperature. With younger students, the teacher may wish to do the pH and dissolved oxygen test for the class. Directions for how to perform the tests are included in the Hach kit. Record the data on student Worksheet II, and go through the information with the students. Help the students understand that the values for pH, dissolved oxygen, and water and air temperature affect the diversity of life forms found in aquatic environments.

The students should understand that biologists examine hundreds of sites in order to try to understand and predict what their evidence suggests is going on in natural systems. Summarize the study with a reemphasis that the diversity of specific animals is a useful indicator of habitat quality as well as an overall indicator of environmental quality.

Extensions

Encourage the students to discuss their observations. Were a lot of different aquatic organisms found? Talk again about the concept of diversity of life- that is, a variety of different kinds of plants and animals is usually an indication of a healthy ecosystem. Do they think that this water system is healthy based on the diversity of organisms they observed? Talk to the students about their measures of water quality. How did their measures "measure up" to the ranges given on Worksheet II. Help them realize that predictions of animal diversity can be made from measurements of pH, dissolved oxygen and water temperature. Likewise, certain indicator species can tell you about pH, dissolved oxygen and water temperature. Talk to them about the effects of pesticide and fertilizer runoff on pond life. Based on what they have observed, do they think there is a problem with this at their water system? Ask whether they would expect the same variety of life in other locations. What could farmers do to protect ponds from contamination (e.g. buffer strips, reducing pesticide use, conservation tillage, etc.).

This activity taken from "Sustainable Agriculture and Wildlife: Piecing Together a Habitat Puzzle", Iowa State University Extension, Iowa 4-H Education and Natural Resources Center and Iowa Wild Aquatic Supplemental Teacher's Resource Manual, Iowa Department of Natural Resources.

Water Canaries Student Worksheet

Name(s) of Collector(s): _____

Date: _____

Location: _____

Air Temperature: _____ °F

Water Temperature: _____ °F

pH (acidic or basic): _____

Dissolved Oxygen: _____

Color / Odor of Water: _____

Weather: _____

_____

Animal #	Where Animal Was Found	Description	# Found	Animal Name

Wetland Metaphors

Trumpeter Swan / Wetlands Education Curriculum

Objective

Students will be able to describe the characteristics of wetlands and show their understanding of the importance of wetlands to wildlife and humans.

Materials

A large pillowcase, bag, or box; sponge; small pillow; soap; eggbeater or mixer; small doll cradle; sieve or strainer; paper (coffee) filter; antiacid tablets; small box of cereal; 3 x 5 cards with pictures that could be used to show other wetland metaphors (a zoo could represent the idea of wildlife diversity in a wetland, a lush vegetable garden could represent the idea of a productive wetland in which food is abundant, a vacation resort could represent the idea of a resting or wintering place for migrating waterfowl).
NOTE: A metaphoric approach such as this allows a variety of objects to suggect some appropriate linkage to the basic characteristics of wetlands.

Background

Wetlands are many different things to many different people. Some people have never heard or thought about wetlands. Others are working actively to protect wetlands because of their importance.

Wetlands include areas like freshwater and saltwater marshes, wet meadows, swamps, lagoons, bogs and prairie potholes. All wetlands, whether coastal or inland, provide special habitats that serve areas far beyond their boundaries. Wetlands are uniquely important to plants, animals, humans and the total environment.

Because of the abundance of food, vegetative cover (shelter), and water found there, most wetlands are rich with diverse wildlife species.

Grades:	1-12
Subjects:	Science, Language Arts
Duration:	30-60 minutes
Group Size:	Any
Setting:	Indoors or Outdoors

Coastal and inland marshes, for example, provide breeding, resting and wintering habitats for thousands of migratory birds—including ducks, geese, swans, cranes and shore birds. Many species of fish that are important for commercial and personal use by humans reproduce and spend part, of all, of their life cycle in fertile wetlands adjacent to larger, more open bodies of water. These fish species include bass, salmon, walleye, perch and pickerel. A wide variety of reptiles, amphibians, insects and crustaceans also breed and live in wetlands. Frogs, toads, turtles, salamanders, snakes, dragonflies, water striders, clams and crayfish flourish in wetland habitats. Many mammals—from muskrats and beaver to whitetail deer and moose—also depend on wetland areas. Wetlands are often referred to as "nurseries" because they provide critical breeding and rearing habitats for countless numbers and kinds of wildlife.

Wetlands also have the unique ability to purify the environment. They act as natural filtering systems and have been shown to be extremely effective. They trap and neutralize sewage waste, allow silt to settle, and promote the decomposition of many toxic substances.

The importance of vegetation associated with wetlands cannot be overlooked. Plants absorb nutrients and help keep nutrient concentrations from reaching toxic levels. Plants slow down water flow causing silt to settle out. Through photosynthesis, plants add oxygen to the system and provide food to other life forms. Of great importance to humans are the flood control characteristics of wetlands. When runoff from rains and spring thaws is high, wetland areas absorb excess water until it gradually drains away down streams and rivers and through the soil. Acting as buffers, healthy wetlands prevent flooding and erosion. In dryer periods, wetlands hold precious moisture after open bodies of water have disappeared.

The many activities that take place in wetlands make them among the most productive ecosystems in the world.

As remarkable and resilient as wetlands are, these unique areas have limits. Their destruction and/or abuse can have devastating effects on wildlife, humans and overall environmental quality.

Many of the major attributes of wetlands can be explored through the use of metaphors. To use a metaphor is to apply a word or phrase to an object or concept which it does not literally denote in order to suggest a comparison between the two. A metaphor represents a concept or idea through another concept or idea. "A tree is a home" and "Books are windows of thought" are two examples. In this activity a variety of everyday objects are used to represent the natural functions of wetlands.

Wetland habitats are being converted to other uses (agriculture, roadways, housing developments) or otherwise being destroyed (drained for pest control or polluted) at the rate of about a half million acres per year. And although many wetlands are protected by federal and state laws, there still appears to be a significant need to create a greater understanding of the importance of wetlands as ecosystems and as wildlife habitat.

The major purpose of this activity is for students to develop an appreciation and understanding of wetlands through the power of metaphor, linking the characteristics and natural functions of wetlands to the familiar realm of everyday life.

Procedure

1. Prepare a "Mystery Metaphor Container" (pillowcase, bag or box). It should be possible for a student to put his or her hand into the container and pull out an object. You may want to collect as many as one metaphoric object per student, but at least have enough for one per group of four students. Put the container aside to use later.

2. Discuss the variety of wetlands found in your local area, state, country , etc. Then invite the students to sit quietly and close their eyes. Ask them to picture a wetland. Have them examine what it looks like. Have them look carefully at the plants and animals, including insects and small creatures. What does the air feel like? How does it smell?

   OPTIONAL: Play a tape recording of natural sounds from wetlands. Some are available commercially in record and nature stores.

3. Invite the students to tell what they imagined. Compile a list of their offerings. Encourage discussion and mutual sharing.

4. With their list as a point of reference, help the students identify which plants and animals are actually most likely to be found in a wetland. If possible, have them classify the plants and animals according to the kind of wetland in which they would be found. State or federal wildlife officials and representatives of private conservation or nature-related organizations can be helpful. The series of golden nature guides from Western Publishing Company, Inc. are also useful.

5. Next provide the students with background information to serve as an overview of the basic ecological activities that characterize the wetland habitat. For example:
   - sponge effect—absorbs runoff
   - filter effect—takes out silt, toxins, wastes, etc.
   - nutrient control—absorbs nutrients from fertilizers and other sources that may cause contamination downstream
   - natural nursery—provides protection and nourishment for newborn wildlife

   Suggest that these activities and many more that they could probably think of are taking place in wetlands all the time.

6. Now bring out the "Mystery Metaphor Container". Tell the students that everything in the container has something to do with a wetland. Have the students divide into groups of four. Announce that when it is their turn, you want a representative of each group to draw an object from the container. Then, as a group, they must figure out how the object could represent what a wetland is or does.

7. Have the designated student reach into the container and withdraw one object. When each group has an object, ask them to work as a team to describe the relationships between their metaphoric object and the wetland. Encourage the students to build on each other's ideas. You can also assist by strengthening their connections. NOTE: Allow the students time to discuss their ideas with each other before doing so in front of the entire class.

8. Ask each group to report their ideas to the class.

9. Following discussion and review of the functions represented by each metaphor, ask the students to summarize the major roles that wetlands perform in contributing to habitat for wildlife. List the ways in which wetlands are important to humans. Why do humans convert wetlands to other uses? Ask them

if their own attitudes about wetlands are different now. If yes, how? If no, why not?

10. For the final part of this activity, encourage the students' understanding of how the wetlands' condition depends upon each of us. Many kinds of wildlife depend upon wetlands. Our own well-being requires wetland ecosystems. Strengthen the students' understanding of the connectedness that humans have to wetlands. Recreation, aesthetics, utilitarian uses, environmental quality and nature study are but a few of the connections we each have with wetlands.

Object	***Metaphoric Function***
sponge	*absorbs excess water caused by runoff; retains moisture for a time even if standing water dries up (e.g. sponge placed in a small puddle of water absorbs water until saturated, then stays wet after standing water has evaporated)*
pillow or bed	*is a resting place for migratory birds*
mixer or egg beater	*mixes nutrients and oxygen into the water*
cradle	*provides nursery that shelters, protects and feeds young wildlife*
sieve or strainer	*strains silt, debris, etc., from water*
filter	*filters smaller impurities from water*
antiacid	*neutralizes toxic substances*
cereal	*provides nutrient-rich foods*
soap	*helps cleanse the environment, as wetlands do*

Extensions

1. Personally visit a wetland to verify the appropriateness of the metaphors explored in the classroom. Identify and discuss any limitations to the appropriateness of these metaphors. Identify what seem to be the most compelling attributes of the metaphors in helping you understand the characteristics and nature of the wetland. Expand on your understanding of these metaphors. Identify new and appropriate metaphors!

2. Investigate local, county, state and federal regulations and laws that govern uses of wetlands.

Evaluation

For Younger Students:

1. Draw a picture of a wetland and explain what you draw.

2. Name three reasons wetlands are important.

3. Wetlands are sometimes called nurseries because so many young animals grow up in them. Name some animals that spend part of their lives in wetlands.

For Older Students:

1. Explain why wetlands are called one of the world's most productive ecosystems.

2. Wetlands are important to a range of organisms in the animal kingdom, from zooplankton to humans. Select five species of animals and describe how wetlands are important to each.

This is activity taken from "Aquatic Project Wild"

Year of the Trumpeter Swan

Trumpeter Swan / Wetlands Education Curriculum

Objective

Students will be able to learn about the annual life cycle of a trumpeter swan, along with developing appreciation for trumpeter swan activities throughout the flyways at various times during the year.

Materials

Timeline chart showing the months of the year (butcher paper or chalkboard space), paper, pencils, several bird books, migration text books, and any other available resources.

Background

Wildlife management has been an important method for humans in order to control and enhance the various animal species of the world. With management, research about animal behaviors during the year by humans can be learned first-hand. For instance, certain waterfowl migrate to specific locations each year because of the food surplus, the amount of shelter, and/or the availability of large breeding areas. Cottontail rabbits tend to inhabit wildlife areas that have several large scattered wood piles.

By understanding animal behavior, humans can better learn to manage their activities so as to cause minimum damage to the environment. They also gain a better understanding of what it takes for a species to survive.

The annual life cycle of a trumpeter swan is complex, such as any animal, but it can be used as an excellent learning experience for young wildlife managers.

Grades:	5-9
Subjects:	Science, Environmental Concepts, Migration
Duration:	1 hour
Group Size:	Any
Setting:	Indoors

Procedure

1. Using the charts of the months of the year, have the group members brainstorm what they already know about trumpeter swans. When do the swans migrate? What do the trumpeter swans do during the winter? When do the young hatch?

2. With the common knowledge of the group, try to complete as many of the charts as possible. Also, make a list of the questions the group would like answered.

3. Using various texts, brochures, and any other available resources, ask the group to research answers to their questions. What would it be like to be a trumpeter swan? When would you migrate? How long does it take to travel from place to place? When would you nest? What do you eat and where would you find it?

4. After the group has completed their research, complete the time line. Using the group's information and time line, discuss the life of a trumpeter swan.

5. Ask the group members to write a trumpeter swan 'perspective'. They could write a "Year of the Trumpeter Swan" journal individually or with several different groups representing certain months of the year.

Extensions

1. Based upon the group's research and experience, compare their results with the Iowa DNR - Wildlife Diversity Program; the group can also send their information to the Iowa DNR - Wildlife Diversity Program for possible inclusion in next year's calendar.

2. Journals could be compiled into a book for the school library, high school science department, and the participating group members.

What Do You Think?!

Trumpeter Swan / Wetlands Education Curriculum

Objective

Students will be able to formulate opinions concerning the various environmental issues affecting the world's population.

Materials

Chalkboard; index cards numbered one through ten; several environmental issue statements (issue statements have been included for those wanting to eliminate research).

Background

In today's world, everyone has an opinion on most every topic — politics, human rights, taxes, religion, school. It seems every topic is controversial to some degree, but by discussing the different viewpoints, solutions and/or compromises can be developed.

For the world's natural resources, people have to get involved. Unlike other debatable issues, the environment affects humans "indirectly." Since efforts to save the rainforest seem inappropriate for an Iowan, how can a Californian justify the banning of hog lots in rural America. Successful debates have been thoroughly discussed and interrelated to everyone — locally, nationally, and globally.

Students are the catalysts for educational issues. They tend to have unique ideas and enthusiastic comments that stun even the most noteworthy experts. This activity will allow students to express their feelings and foster a better understanding of the various opinions toward controversial issues.

Grades: 10-12
Subjects: Science, Social Studies
Duration: 45 minutes
Group Size: Any
Setting: Indoors

Procedure

1. Ask one student to affix the index cards to the chalkboard in numerical order. During this time, describe several environmental issues that have been debated recently in the news. Provide possible arguments relating to the issues, but keep an unbiased atmosphere.

2. Explain to the students that the index cards represent certain degrees of attitude, with "strongly agree" being ten and "strongly disagree" being one. The neutral attitude may be designated by the number five index card.

3. Read one environmental issue statement and allow sufficient time for each student to align himself / herself under the appropriate index card.

4. Select one student to express his / her feelings concerning the issue statement. Encourage the student to provide factual information, as well as personal experiences. Continue with another student, choosing one that contrasts with the other.

5. Complete as many issue statements as possible during the allotted time, choosing a new student for each issue statement.

Issue Statements

1. Draining wetlands is an appropriate method for agricultural production, regardless of the effects on the environment.

2. State tax dollars should not be used for wildlife restoration projects.

3. Are trumpeter swans an important part of Iowa's wildlife history?

4. Hunting is the most important aspect of Iowa's conservation issues relating to wildlife management.

5. Landowners should NOT be regulated with conservation laws, administered by the national, state, or local governments.

6. Farmers are America's environmentalists, protecting the natural resources as much as possible.

7. Wetlands are NOT an important part of the Midwestern ecology.

8. Individuals harming wildlife, in any sense, should be punished to the highest extent of the law.

9. In my opinion, there are certain species of wildlife that need to be exterminated completely.

10. My family has always practiced "good" conservation ethics.

Extensions

Have each student clip newspaper articles relating to controversial environmental topics. The issues can be directly involved with the local community or based on a national crisis. Students can then develop a collage, using the articles. From each collage, a discussion or debate can be administered, focusing on the various opinions of each student.

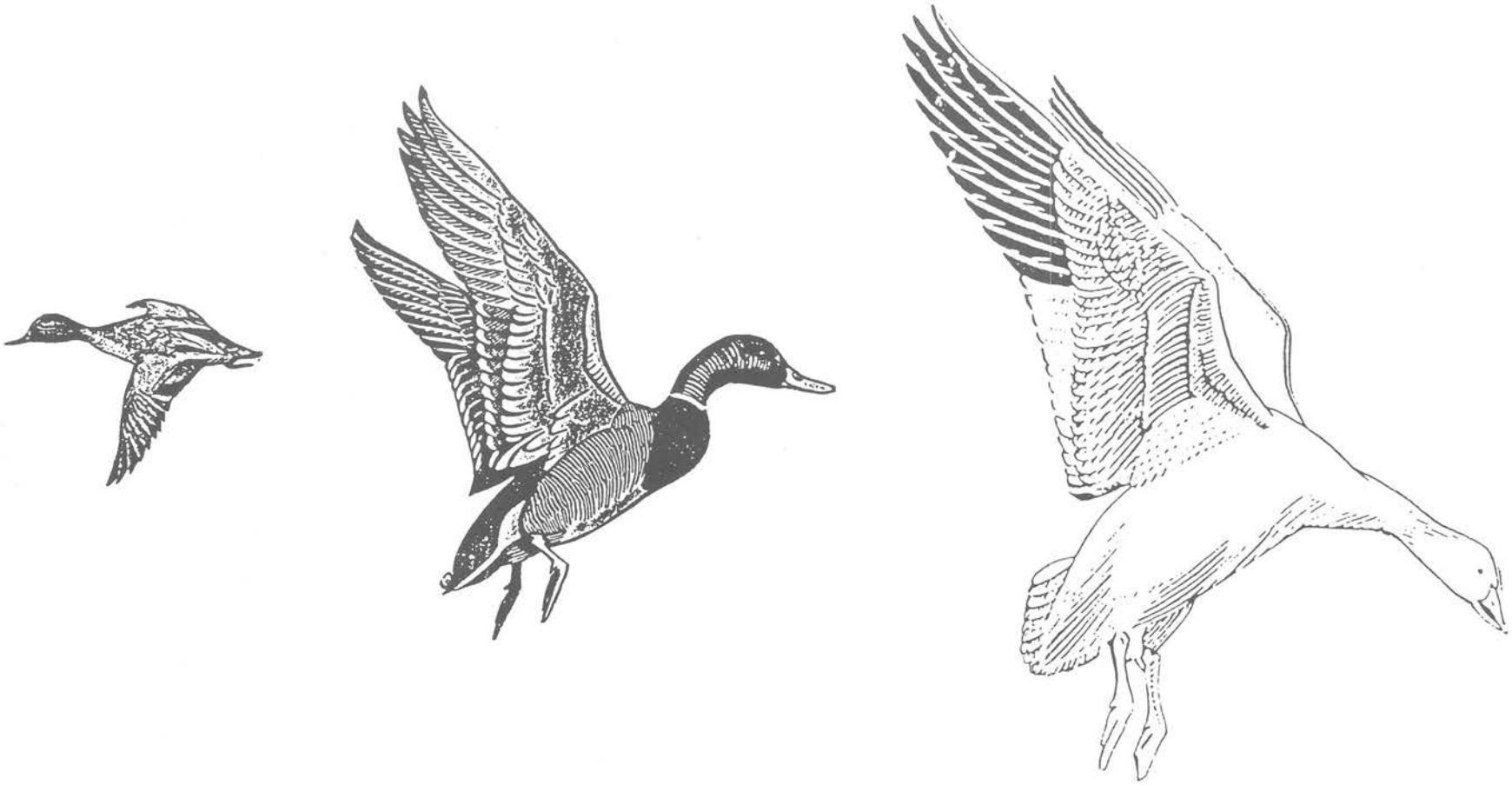
Can You Visualize the Size of A Trumpeter Swan?

Make transparencies of the next two pages to show your students!

Trumpeter Swan ... Size Comparison to other Iowa waterfowl.

Greenwing Teal	12 - 16" length	14 - 22" wingspan	10 - 14 ounce
Mallard	19 - 28" length	32 - 40" wingspan	2.5 - 3.5 pounds
Snow Goose	26 - 30" length	55 - 60" wingspan	4.5 - 6 pounds
Trumpeter Swan	58 - 72" length	7 - 8 ft. wingspan	25 - 30+ pounds

Scale for drawings: 1.5 inches = 1 ft.



Trumpeter Swan ... Size Comparison to other Iowa waterfowl.

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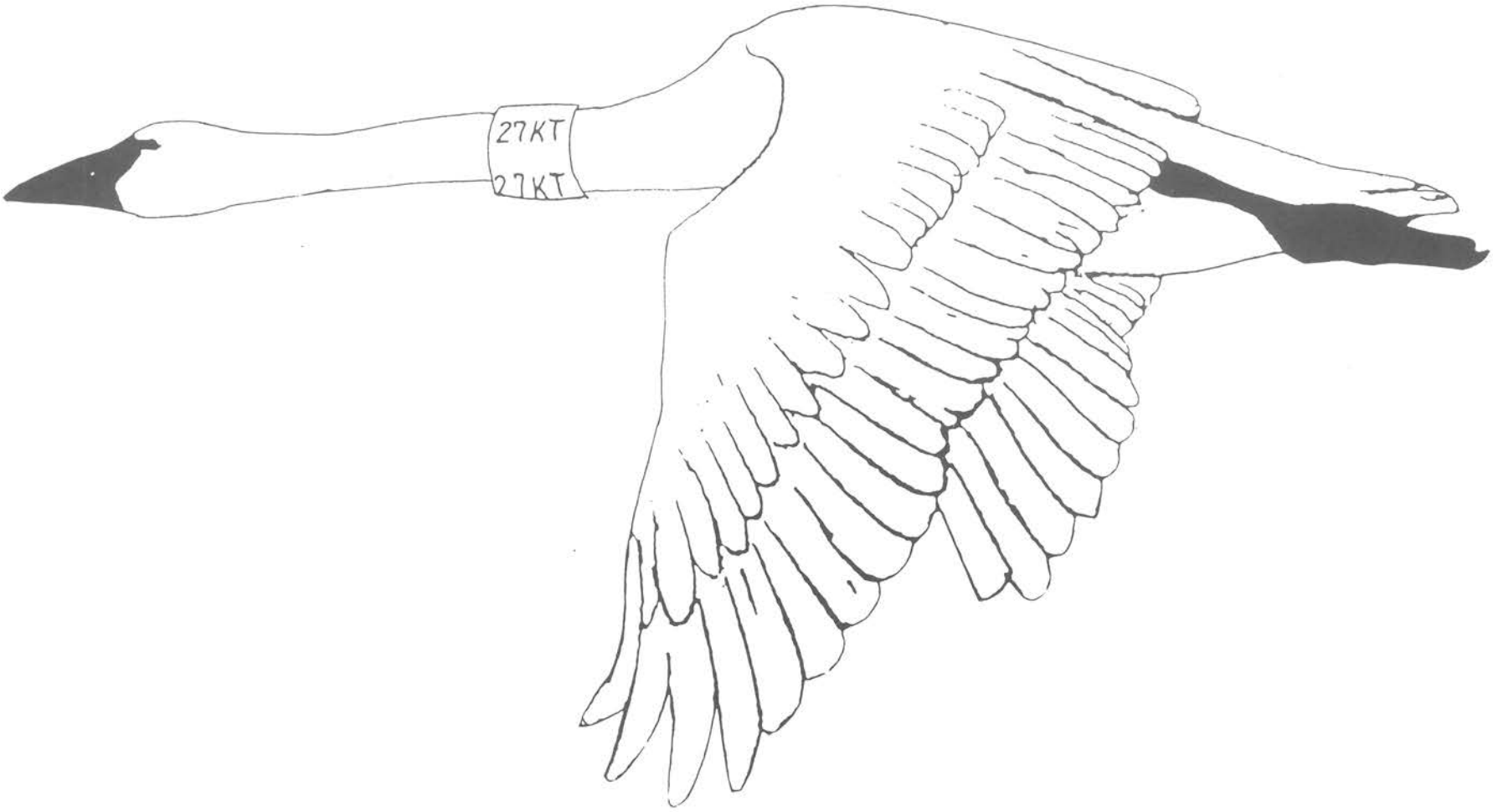

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Trumpeter Swan	58 - 72" length	7 - 8 ft. wingspan	25 - 30+ pounds

Scale for drawings: 1.5 inches = 1 ft.

Glossary

adaptation: the process of making adjustments to the environment.

aquifer: underground pores and hollows which store water.

biological community: a community of living things, their interactions and diversity.

brood: the offspring of a bird or mammal.

clutch: a nest of eggs or a group of young.

cob: a male swan.

cygnet: a swan less than one year of age.

emergent vegetation: plants which grow in shallow water and rise above the water's surface. Examples include cattails, bulrushes, and sedges.

endangered: a species which is in danger of extinction throughout all or a significant portion of its range.

extinct: the condition of having been removed from existence.

extirpated: the extinction of a species in a specific area.

fledge: the development of flight feathers on a bird enabling it to fly.

groundwater: water that seeps to the Earth's surface or comes up from a spring.

habitat: the arrangement of food, water, shelter or cover, and space suitable to an animal's needs.

homing: the ability to return to a specific place each year to breed.

hydric soil: soil that is constantly wet and lacks oxygen.

imprint: learning that takes place during a young animal's life relating to home, food, and safety.

incubate: the process by which an adult bird keeps its eggs or young warm by covering them with its body.

invertebrate: an animal without a backbone.

juvenile: young swan that is not old enough to breed.

lek: an area used by a bird during mating season for displaying.

limiting factor: influences in the life history of any animal, population of animals, or species. The minimum amount of food, water, shelter and space an animal needs to survive.

lore: the part of a swan's bill directly in front of the eyes.

migrate: the seasonal movement of animals between nesting and wintering areas.

molt: the process by which a bird loses old feathers and grows new, strong feathers.

pair bonds: actions taken by a cob and pen to strengthen their relationship while raising a brood.

pen: a female swan.

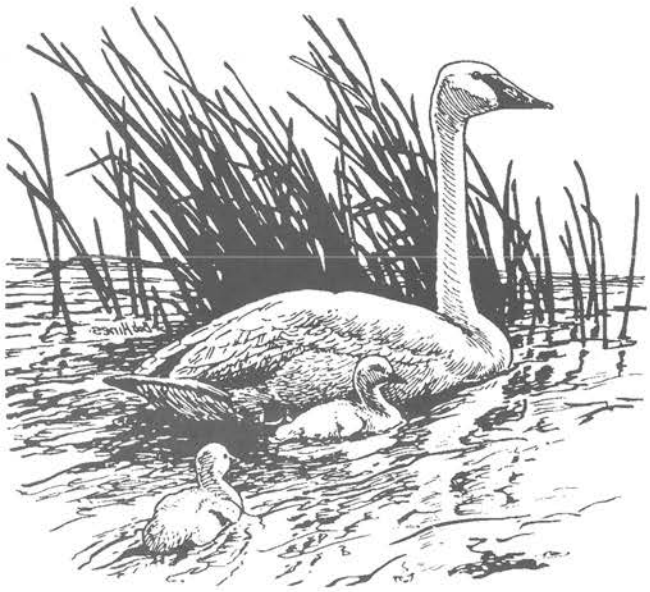
pesticide: any chemical preparation used to control populations of organisms perceived to be injurious.

predation: the act of preying upon.

predator: an animal that kills and eats other animals.

submergent vegetation: plants which grow below the surface of the water.

threatened: a species present in its range but in danger because of a decline in numbers.



Trumpeter Swan

Swansorship Program

The monies raised from this project will go towards the overall effort of the Iowa Trumpeter Swan Restoration Program

Mated Pairs $500

Sponsors will receive:

- a certificate of appreciation
- an annual update on the life and travels of your adopted swan
- an 11x14 photo of a mated pair of trumpeter swans
- a copy of the *Wildlife Diversity News*

Trumpeters $100

Sponsors will receive:

- a certificate of appreciation
- an 8x10 photo of a trumpeter swan
- a copy of the *Wildlife Diversity News*

Cygnets $50

Sponsors will receive:

- a certificate of appreciation
- a 5x7 photo of a cygnet
- a copy of the *Wildlife Diversity News*

Nest Builders $20

Sponsors will receive:

- a certificate of appreciation
- a copy of the *Wildlife Diversity News*

Wetland Boosters $10

Sponsors will receive:

- a certificate of appreciation
- a copy of the *Wildlife Diversity News*

Name _____

Organization _____

Address _____

_____

Phone _____ **Swansorship Type** _____

Make checks payable to: Trumpeter Swan Trust Fund

Please return to: Bremer County Conservation Board
P.O. Box 412
Tripoli, IA 50676

Trumpeter Swan

Swansorship Program

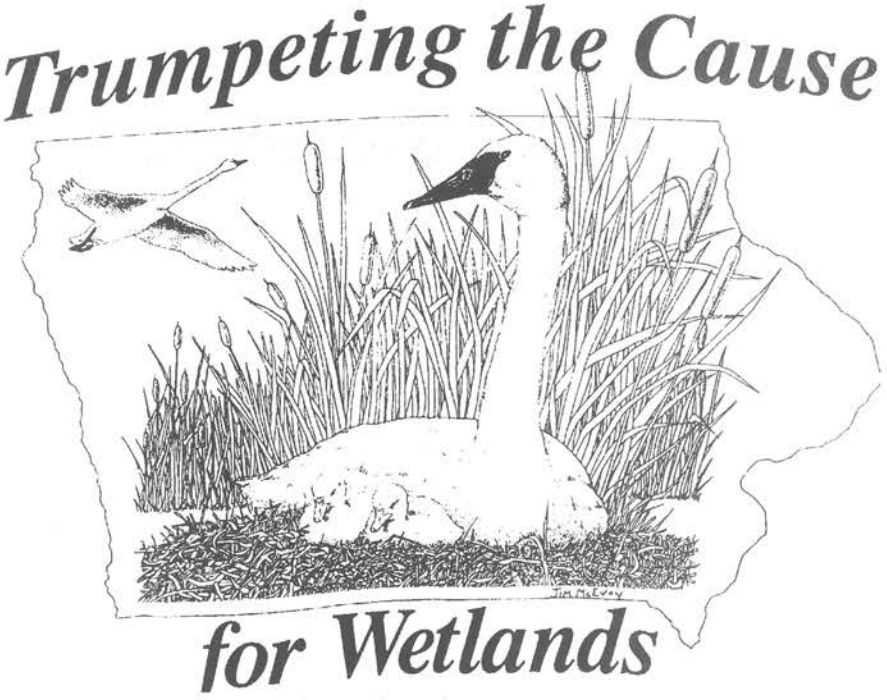
Fundraising Ideas

The previous page tells what your class will receive when they sponsor a swan. Some fundraing ideas are listed below so that you or your class can sponsor a swan in your area and become an integral part of the *Iowa Trumpeter Swan Restoration Program*. These ideas are not inclusive, so be creative and thanks for ***Trumpeting the Cause for Wetlands!***

- Fall Leaf Pick Up
- Auction for Labor
- Bake Sale
- Pop Can Fundraiser
- Pop Can Mountain
- Pennies for Swans
- School Carnival
- School Garage Sale/Student Garage Sale
- Match funds with local civic groups
- Match funds with local conservation groups
- Trumpeter Swan T-Shirt and Sweatshirt Sales

Trumpeting the Cause for Wetlands

Iowa Trumpeter Swan Restoration Shirt Order



Name _____

Address _____

City _____ State _____ Zip _____

Make checks payable to:
ISU Furharvesters Club; c/o Trumpeter Swan Project

Order from: Iowa Wildlife Federation
c/o Trumpeter Swan Project
3125 Douglas Avenue
Des Moines, Iowa 50310

ALL PROFITS GO TO THE IOWA TRUMPETER SWAN RESTORATION PROJECT. EXCELLENT GIFT IDEA. WORTHY CAUSE.

Grey t-shirt, 5 colored logo, sizes available: Adult S, M, L $12 + $3 P/H; Adult XL, XXL $14 + $3 P/H (Logo size approximately 8" x 12".)

Adult sizes only	**S**	**M**	**L**	**XL**	**XXL**
Please mark quantity ordered					

Appendix A
Bibliography

Field Identification

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Conant, R. 1975. *A field guide to reptiles and amphibians of Eastern and Central North America.* Houghton Mifflin Co., Boston, MA. 429 pp.

Dunn, J., and E. A. J. Blom. 1983. *Field Guide to the Birds of North America.* National Geographic Society. Washington, D.C.

Lyons, Janet, and S. Jordan. 1989. *Walking the Wetlands: A Hikers Guide to Common Plants and Animals of Marshes, Bogs, and Swamps. John* Wiley & Sons, Inc., New York, NY.

Magee, Dennis W. 1981. *Freshwater Wetlands* (plants). University of Massachusetts Press, Amhearst, MA.

Niering, William A. 1989. *Wetlands, an Audubon Society Nature Guide.* Alfred A. Knopf, Inc. New York, NY.

Peterson, R. T. 1980. *A Field Guide to the Birds East of the Rockies.* Houghton Mifflin Co., Boston, MA.

Robbins, C. S., B. Bruun, and H. S. Zim. 1983. *Birds of North America.* Second edition. Golden Press, New York, NY.

Birding Areas

Petersen, P. C. 1979. *Birding Areas of Iowa.* Cedar Rapids. 151 pp. A detailed listing of birding areas, presented by county or area of the state, telling how to get to the area and what to expect to see.

Jackson, Laura. 1995. *Iowa Wildlife Viewing Guide.* Falcon Press Publishing Co., Inc., Helena, MT. 95 pp.

Birds of Iowa

Brown, W. H. 1971. *An Annotated List of the Birds of Iowa.* Iowa State J.Sci. 45:387-469.

Dinsmore, J. J., T. H. Kent, D. Koenig, P. C. Petersen, and D. Roosa. 1984. *Iowa Birds.* Iowa State University Press, Ames, IA. 356 pp.

Stokes, D. W. 1979. *A Guide to the Behavior of Common Birds.* Little Brown Co., Boston, MA.

Children's Books

Cox, R. K., and Barbara Cox. 1980 *Usborne First Nature - Birds.* Usborne Publishing.

Ford, Barbara. 1975. *How Birds Learn To Sing.* Messner. New York, NY. Freedman, Russell. 1977. *How Birds Fly.* Holiday House. New York, NY. Garelick, Mary. 1979. *It's About Birds.* Holt. New York, NY. *Mark Trail: Story of a Fish in Trouble,* Dept. of the Interior, Fish and Wildlife Service, Publications Unit, Mail Stop: 130 Webb Building, 4401 North Fairfax Dr., Arlington, VA 22203. fax 703-358-2283.

May, Julian. 1970. *Why Birds Migrate.* Holiday House. New York, NY.

McCauley, Jane R. 1983. *Baby Birds and How They Grow.* National Geographic Society. Washington, D.C.

My Wetlands Coloring Book, U.S. Environmental Protection Agency, Region 6, 1445 Ross Avenue, Dallas, TX 75202-2733.

Save Our Species: Endangered Species Coloring Book, Endangered Species Protection Program, US-EPA, 401 M St., SW, Washington, D.C. 20460. (publication 21T-3048). *Stretch Saves the Inland Bays*, Jerry "Crabmeat" Thompson, Delaware Dept. of Natural Resources and Environmental Control, P.O. Box 1401, Dover, DE 19903.

Wetlands Coloring Book, art by Jack Elrod (of "Mark Trail"), U.S. Fish and Wildlife Service, Government Printing Office, Washington, D.C. 20402-9325.

Sources For Bird-related Activities

Borrow art work which displays and interprets the functions of wetlands, its plant and animal life, etc. Call EPA Region 4, at 404-347-3871.

Charles, Cheryl. (Ed.). 1987. *Aquatic Project Wild: aquatic education activity guide.* Western Regional Environmental Education Council. 240 pp.

Dept. of the Interior, U.S. Fish and Wildlife Service, Publications Unit. The *Mini Page - Endangered Species.* U.S.F.W.S., 130 Webb Building, 4401 North Fairfax Dr., Arlington, VA 22203. fax 703-358-2283.

Jones, Gail. *Project Estuary.* North Carolina National Estuarine Research Reserve, NC Division of Coastal Management, P.O. Box 27687, Raleigh, NC 27611-7687.

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Sisson, Edith A. 1982. *Nature With Children of All Ages.* Prentice-Hall, Inc. Englewood Cliffs, NJ.

Texas Water Commission. 1990. *WET instruction handbook.* Texas Water Commission. LP 90-08. Austin, TX. 77 pp.

U.S. Fish and Wildlife Service. *Wetlands Values Packet* South Dakota Cooperative Wildlife Research Unit, P.O. Box 2206, South Dakota State University, Brookings, SD 57007.

Periodicals, Journals, and Articles of Interest

American Birds. Published bimonthly by the National Audubon Society. For information, write: American Birds, 700 Broadway, New York, NY 10003.

The Auk. Published quarterly by the American Ornithologists' Union. For information, write: The American Ornithologists' Union, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.

The Condor. Published quarterly by Coopers Ornithological Society, P.O. Box 1897, Lawrence, KS 66044-8897.

Iowa Bird Life. Published quarterly by the Iowa Ornithologists' Union.

National Geographic. October 1992 (Vol.-182, No. 4), *Our Dissapearing Wetlands,* by John G. Mitchell.

The Wilson Bulletin. Published quarterly by the Wilson Ornithological Society Museum of Zoology, University of Michigan, Ann Arbor, MI 48104.

Audio/Video Program Sources

A Swamp Ecosystem, National Geographic Society, Educational Services, Dept. 88, Washington, D.C. 20036.

Coastal Growth: A Delicate Balance. Virginia Institute of Marine Science, Gloucester Point, VA 23062.

Conserving America: Wetlands, the National Wildlife Federation, 1400 16th St. N.W., Washington, D.C. 20036-2266.

Fabulous Wetlands, starring "Bill Nye, the Science Guy" (all ages), 7 min., with other short subjects, Washington State Dept. of Ecology, Wetlands Section, MS PV-11, Olympia, WA 98504. Cost, $15 or borrow to make copy.

It's Happenin' Today on the Chesapeake Bay, (watershed/pollution). Features Billy "B" Brennan songs, avail. from Echo Hill Outdoor School, 13655 Blooming Neck Rd., Worton, MD 21678 $10 + $ 2.50 S/H.

The Marsh Community. Encyclopedia Britannica Educational Corp., 425 N. Michigan Ave., Chicago, IL 60611.

Monsters In The Bathroom (for young children; includes the 'Freddie the Fly-Eating Frog song), Bill Harley, Round River Records, 301 Jacob St., Seekonk, MA 02771.

Ring of Bright Water, a man and his pet otter, 107 min., WGBH Educational Foundation, Box 64428, St. Paul, MN. 55164-0428. (Signals catalog item #19522, 1-800-669-9696) $15

Rocky Mountain Beaver Pond, National Geographic, 1145 17th St. N.W., Washington, D.C. 20036-4688, 1-800-447-0647, catalog item # 51322 $20

Romp In the Swamp (fun songs for kids of all ages), Billy "B" Brennan, Jenson Publications, 2770 South 171st St., New Berlin, WI 53151.

Slides, programs and videos are available for purchase from the Laboratory of Ornithology, Cornell University, Ithaca, NY 14850.

Songbirds slide program available for loan free of charge. The Iowa Department of Natural Resources, Wallace State Office Building, Des Moines, IA 50319.

Solitudes Series audio cassettes and compact discs. Natural sounds of wetlands and other habitats. Moss Music Group, Inc. 48 West 38th St., New York, NY 10018.

Wetlands, Cooperative Extension Forestry and Wildlife Office, 103 Nutting Hall, University of Maine. Orono, ME 04469. $10.

Why Wetlands, Federation of Ontario Naturalists, 355 Lesmill Rd., Don Mills, Ontario M3B 2W8.

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Cowardin, L.M., V. Cartet, F.C. Golet, and E.T. LaRoe. 1979. *Classification of wetlands and deepwater habitats of the United States.* U.S. Fish and Wildlife Service, OBS-79-31. Washington, D.C. 103 pp.

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Tiner, R.W., Jr. 1984. *Wetlands of the United States: Current status and recent trends.* USFWS National Wetlands Inventory. Washington, D.C. 59 pp.

Posters

Energy Flow in a Wetland, National Science Teachers Association, 1742 Connecticut Ave., N.W., Washington, D.C. 20009

The Difference Between Endangered and Extinct is Forever, Dept. of the Interior, Fish and Wildlife Service, Publications Unit, Mail Stop: 130 Webb Building, 4401 North Fairfax Dr., Arlington, VA 22203. fax 703-358-2283.

Endangered Means There's Still Time, (posters 1 and 2) Dept. of the Interior, USFWS, Publications Unit, Mail Stop: 130 Webb Building, 4401 North Fairfax Dr., Arlington, VA 22203. fax 703-358-2283.

Wetlands and Wildlife poster, full-color, 17 x 22 inch image of a wood duck in a natural setting. Can be obtained from Soil Conservation Service offices, or to order a larger quantity call Mary Cressel at 202-720-0558.

Wetlands, Water, Wildlife, Plants, and People, (Black and White) Dept. of the Interior, USFWS, Publications Unit, Mail Stop: 130 Webb Building, 4401 North Fairfax Dr., Arlington, VA 22203. fax 703-358-2283.

Wetlands-We Need 'Em... Wildlife Needs 'Em Too, Dept. of the Interior, USFWS, Publications Unit, Mail Stop: 130 Webb Building, 4401 North Fairfax Dr., Arlington, VA 22203. fax 703-358-2283.

Wetlands Are Wonderlands!, EPA Headquarters, EPA Wetland Protection Hotline, Mail code: A-104-F, 401 M Street N.W., Washington, D.C. 20460. 1-800-832-7828.

Brochures

Daffy-Our Wetlands Need You Now!, Dept. of the Interior, USFWS, Publications Unit, Mail Stop: 130 Webb Building, 4401 North Fairfax Dr., Arlington, VA 22203. fax 703-358-228a

Join Us In A Partnership for Wetlands-North American Waterfowl Management Plan, Dept. of the Interior, USFWS, Publications Unit, Mail Stop: 130 Webb Building, 4401 North Fairfax Dr., Arlington, VA 22203. Fax 703-358-2283.

National Wildlife Refuge-A Visitors Guide, Dept. of the Interior, USFWS, Publications Unit, Mail Stop: 130 Webb Building, 4401 North Fairfax Dr., Arlington, VA 22203. fax 703-358-2281

EPA Wetlands Fact Sheets, EPA Headquarters, EPA Wetland Protection Hotline, Mail code: A-104-F, 401 M Street N.W., Washington, D.C. 20460. 1-800-832-7828.

More Information:

U.S. EPA Wetlands Protection Hotline, 1-800-832-7828, wetlands info., free publications, resource referrals, etc.

U.S. Fish and Wildlife Service, Chesapeake Bay Estuary Program, 180 Admiral Cochrane Dr., Suite 535, Annapolis, MD 21401. Free wetlands info and brochures, some wetlands-related educational materials.

Equipment Sources

Delta Education, 1-800-442-5444.

Carolina Biological Supply, 1-800-334-5551.

LaMotte Chemical Products Co., P.O. Box 329, Chestertown, MD 21620.

Ben Meadows Co., Inc. (soil probe, soil color book, forestry supplies, etc.), P.O. Box 80549, Chamblee, GA, 1-800-628-2068.

Three Rivers Resources (books, field guides, environmental education curriculum, music, videos), P.O. Box 548, Tripoli, IA 50676. (319) 882-3659.

Maps

Topographic maps— National Cartographic Information Center, U.S. Geological Survey, 507 National Center, Reston, VA 22092.

National Wetland Inventory (NWI) maps— same as above but direct the mail to USGS/ESIC; for ordering information, call 1-800-872-6277.

Habitat improvements

"Audubon Society Guide to Attracting Birds ", Stephen Kress, Charles Scribner's Sons, Macmillan Publishing Co., NY, 1985.

"Wildlife Management Techniques Manual ", 4th ed., Stanford D. Schemnitz, ed., the Wildlife Society, Bethesda, MD, 1980.

Reference Material

Dictionary of Federal Land Management Agency Wetlands Contacts, may be obtained by contacting: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402-9325. (202) 783-3238.

Appendix B
Agency and Conservation Resources

Federal Agencies and Conservation Groups

U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, TX 77553
409-766-3001

U.S. Environmental Protection Agency
Region 7
Wetlands Protection Section
726 Minnesota Avenue
Kansas City, KS 66101
913-551-7042

U.S. Environmental Protection Agency National Wetlands Protection Hotline 1-**800-** 832- 7828

U.S. Fish and Wildlife Service
Regional Office, Private Lands Dept.
Bishop Henry Whipple Federal Building
1 Federal Drive
Fort Snelling, MN 55111-4056

Natural Resources Conservation Service - U.S. Department of Agriculture
Each Iowa county has a local office.

The Nature Conservancy
1815 North Lynn Street
Arlington, VA 22209
703-841-5300

Sierra Club
730 Polk Street
San Francisco, CA 94109
415-776-2211

National Audubon Society
950 Third Avenue
New York, NY 10022
212- 832-3200

Ducks Unlimited
Memphis, TN
901-758-DUCK

The Trumpeter Swan Society
3800 County Road 24
Maple Plain, MN 55399

Pheasants Forever, Inc.
P.O. Box 75473
St. Paul, MN 55175

Izaak Walton League
707 Conservation Lane
Gaithersburg, MD 20878-2983

National Wildlife Federation
Dept. 334
1400 16th St., N.W.
Washington, DC 20036-2266

The Wildlife Society
5410 Grosvenor Lane
Bethesda, MD 20814-2197
301-897-9770

North American Association for Environmental Education (NAAEE)
PO Box 400
Troy, OH 45373

National Association for Interpretation
P.O. Box 1892
Ft. Collins, CO 80522
970-484-8283

State Agencies and Conservation Groups

Iowa Department of Natural Resources - Wildlife Diversity Program
1436 255th St.
Boone, IA 50036
515-482-2823

The Wildlife Diversity program is in charge of developing research, management, and educational programs for the 400 species of wildlife that are not hunted or trapped. Activities have included otter, peregrine falcon, and swan reintroduction, Bald Eagle Appreciation Days, kestrel box program, research on endangered species, population surveys, and the Breeding Bird Atlas. The Wildlife Diversity Program is mainly financed by the Chickadee Checkoff on the Iowa state income tax form. The WDP has a variety of publications available, call for a listing. Donations are welcome to offset costs -associated with mailing and handling materials.

Iowa Natural Heritage Foundation
c/o Wetlands For Iowa
Insurance Exchange Building, Suite 444
505 Fifth Avenue
Des Moines, IA 50309-2315

The Iowa Natural Heritage Foundation builds partnerships and educates Iowans to protect, preserve and enhance lowa's natural resources for future generations. The Foundation's current priorities include permanent land protection, trail and greenway establishment, and promotion of improved land management.

Iowa Wildlife Federation, Inc.
3125 Douglas, Suite 103
Des Moines, IA 50310

State chapter of the National Wildlife Federation. IWF helps in the distribution of the National Wildlife Week packets and dissemination of other NWF materials.

Iowa Association of Naturalists
2473 160th Road
Guthrie Center, IA 50115

The Iowa Assoc. of Naturalists is an organization of people interested in promoting the development of skills and education within the art of interpreting the natural and cultural environment. **IAN** members are actively involved as professionals or volunteers interpreting natural and cultural resources in Iowa.

Iowa Conservation Education Council
33 Curtiss Hall
Iowa State University
Ames, IA 50011

The Conservation Education Council (ICEC) is one of the largest organizations of conservation educators. Members include: classroom teachers, college educators, governmental agency employees concerned with conservation education, private individuals, and students in conservation education. ICEC provides many services to its members. The quarterly newsletter, ICEC Agenda, contains news of upcoming workshops and program ideas, plus articles relating to the many branches of conservation education in Iowa.

Iowa Ornithologists Union
1601 Pleasant St.
West Des Moines, IA 50265

The purpose of the Iowa Ornithologists Union (IOU) is to encourage interest in the identification, study, and protection of birds in Iowa. The IOU serves as a forum for exchange of information and ideas about field identification, bird watching locations, habitat, distribution, and keeps records on Iowa bird sightings and counts. The IOU publishes a quarterly newsletter.

The Wildlife Society
Iowa Chapter
1436 255th St.
Boone,IA 50036
515-432-2823

The Wildlife Society (TWS) is an organization of professional wildlife managers and researchers. TWS disseminates the most current information on wildlife habitat management techniques and results. TWS also publishes a scientific journal and periodic newsletters highlighting upcoming conferences and events.

Iowa Wildlife Rehabilitators Association
PO Box 217
Osceola, IA 50213

The Iowa Wildlife Rehabilitators Association (IWRA) is a nonprofit membership organization incorporated for the support of professionalism in wildlife rehabilitation and conservation education. The IWRA promotes high standards of ethics and conduct, disseminates information through publications and meetings, promotes networking between private organizations and governmental agencies, promotes public awareness and the need for a greater concern for our environment.

Wildlife Care Clinic
College of Veterinary Medicine
Iowa State University
Ames, IA 50011
515-294-4900

The Wildlife Care Clinic (WCC) is a nonprofit wildlife rehabilitation center. The WCC treats small mammals and birds, excluding raptors, that are injured, orphaned, or ill in an effort to release them back into the wild. The clinic is funded entirely by donations and is always in need of volunteers.

Iowa Falconers Association
519 Walnut
Wilton, IA 52778

Membership dedicated to the conservation of birds of prey and the art of falconry.

County Conservation Boards

The Iowa County Conservation Board Program, established in 1955, is recognized as one of the most successful county conservation programs in the United States. Iowa county boards are authorized to acquire, develop, and maintain areas devoted to conservation and public recreation. These boards also serve as a primary natural resource management agency in their respective counties, help educate local residents about environmental issues, and manage county wildlife conservation efforts. Many CCBs have naturalists. The naturalist's address is listed when possible.

Adair CCB
705 NE 6th
Box 26B
Greenfield, IA 50849

Adams CCB
RR 3, Box 132
Corning, IA 50841
515/322-4793

Allamakee CCB
868 3rd St. NW
Waukon, IA 52172
319/568-2137

Appanoose CCB
RR 4
Sharon Bluffs Park
Centerville, IA 52544
515/856-8528

Audubon CCB
1887 215th St.
Audubon, IA 50025
712/563-4690

Benton CCB
2113 57th St. Trail
Vinton, IA 52349
319/472-4942

Black Hawk CCB
Hartman Reserve Nature Ctr.
657 Reserve Drive
Cedar Falls, IA 50613
319/277-2187

Boone CCB
610 H Ave.
Ogden, IA 50212
515/353-4237

Bremer CCB
P.O. Box 412
Tripoli, IA 50676
319/882-4742

Buchanan CCB
1874 125th St.
Hazelton, IA 50641
319/636-2617

Buena Vista CCB
3013 Hwy C13
Peterson, IA 51047
712/295-7985

Butler CCB
Heery Woods Nature Center
28727 Timber Rd.
Clarksville, IA 50619
319/278-1130

Calhoun CCB
515 Court St.
Rockwell City, IA 50579
712/297-8323

Carroll CCB
RR 1, Box 240A
Carroll, IA 51401
712/792-4614

Cass CCB
P.O. Box 371
Atlantic, IA 50022
712/243-3542

Cedar CCB
Courthouse
Tipton, IA 52772
319/886-6930

Cerro Gordo CCB
3501 Lime Creek Rd.
Mason City, IA 50401
515/423-5309

Cherokee CCB
629 River Rd.
Cherokee, IA 51012
712/225-5959

Chickasaw CCB
107 Pine St.
New Hampton, IA 50659
515/394-4714

Clarke CCB
P.O. Box 217
Osceola, IA 50213
515/342-2783

Clay CCB
420 10th Ave. SE
Spencer, IA 51301
712/262-2187

Clayton CCB
RR 2, Box 65A
Elkader, IA 52043
319/245-1516

Clinton CCB
Box 161
Grand Mound, IA 52751
319/847-7202

Crawford CCB
RR 1, Box 310A
Denison, IA 51442
712/263-2070

Dallas CCB
Forest Park
1477 K Ave.
Perry, IA 50220
515/465-3577

Davis CCB
203 S. Madison
Bloomfield, IA 52537
515/664-2138

Decatur CCB
RR 1, Box 97A
Leon, IA 50144
515/446-7307

Delaware CCB
RR 1, Box 243G
Manchester, IA 52057
319/927-3410

Des Moines CCB
Starr's Cave Nature Center
3299 Irish Ridge
Burlington, IA 52601
319/753-5808

Dickinson CCB
1924 240th St.
Milford, IA 51351
712/338-4786

Dubuque CCB
13768 Swiss Valley Rd.
Peosta, IA 52068
319/556-6745

Emmet CCB
P.O. Box 155
Estherville, IA 51334
712/362-2510

Fayette CCB
18525 Lane Rd.
Fayette, IA 52142
319/422-5146

Floyd CCB
Box 113
Charles City, IA 50616
515/257-6214

Franklin CCB
Box 164
Hampton, IA 50441
515/456-4375

Fremont CCB
1213 Fifth Ave.
Shenandoah, IA 51601-1595
712/246-1736

Greene CCB
114 S. Chestnut
Jefferson, IA 50129
515/386-4629

Grundy CCB
P.O. Box 36
Morrison, IA 50657
319/345-2688

Guthrie CCB
RR 2, Box 4A17
Panora, IA 50216
515/755-3061

Hamilton CCB
2490 Briggs Woods Trail
Webster City, IA 50595
515/832-9570

Hancock CCB
875 State St.
Garner, IA 50438
515/923-2720

Hardin CCB
Calkins Nature Area
Iowa Falls, IA 50126
515/648-3825

Harrison CCB
RR 1, Box 113
Woodbine, IA 51579
712/647-2785

Henry CCB
2522 Fremont Ave.
Mt. Pleasant, IA 52641
319/986-5067

Howard CCB
Courthouse
Cresco, IA 52136
319/547-3634

Humboldt CCB
Courthouse
Dakota City, IA 50529
515/332-4087

Ida CCB
RR 1, Box 31D
Ida Grove, IA 51445
712/364-3300

Iowa CCB
2550 G Ave.
Ladora, IA 52251
319/655-8466

Jackson CCB
201 W. Platt
Maquoketa, IA 52060
319/652-3783

Jasper CCB
115 N. 2nd Ave. East
Newton, IA 50208
515/792-9780

Jefferson CCB
RR 3, Box 11B
Fairfield, IA 52556
515/472-4421

Johnson CCB
2048 Hwy. 6 NW
Oxford, IA 52322
319/645-2315

Jones CCB
12515 Central Park Rd.
Center Junction, IA 52212
319/487-3541

Keokuk CCB
204 S. Stone
Sigourney, IA 52591
515/622-3757

Kossuth CCB
2407 Hwy. 169
Algona, IA 50511
515/295-2138

Lee CCB
P.O. Box 218
Montrose, IA 52639
319/463-7673

Linn CCB
1890 County Home Rd.
Marion, IA 52302
319/398-3505

Louisa CCB
P.O. Box 261
609 Hwy. 61 N.
Wapello, IA 52653
319/523-8381

Lucas CCB
Box 78
Chariton, IA 50049
515/774-2314

Lyon CCB
311 1st Ave. E.
Rock Rapids, IA 51246
712/472-2217

Madison CCB
Box 129
Winterset, IA 50273
515/462-3536

Mahaska CCB
2254 200th St.
New Sharon, IA 50207
515/673-9327

Marion CCB
Cordova Park
1378 Hwy G28
Otley, IA 50214
515/627-5935

Marshall CCB
1302 E. Olive St.
Marshalltown, IA 50158
515/754-6303

Mills CCB
RR 1, Box 36
Pacific Junction, IA 51561
712/527-9685

Mitchell CCB
415 Lime Kiln Rd.
Osage, IA 50461
515/732-5204

Monona CCB
RR 2, Box 139A
Onawa, IA 51040
712/423-2400

Monroe CCB
Lake Miami Park
RR 1
Lovilia, IA 50150
515/946-8112

Montgomery CCB
RR 2, Box 207
Red Oak, IA 51566
712/623-4753

Muscatine CCB
2007 Saulsbury Rd.
Muscatine, IA 52761
319/264-5922

O'Brien CCB
5660 460th St.
Paullina, IA 51046
712/448-2254

Osceola CCB
1511 Skyline Ave.
Ocheyedan, IA 51354
712/758-3709

Page CCB
Courthouse
Clarinda, IA 51632
712/542-3864

Palo Alto CCB
3259 355th Ave.
Ruthven, IA 51358
712/837-4866

Plymouth CCB
25601 C60
Hinton, IA 51024
712/947-4270

Pocahontas CCB
702 NW 7th St.
Pocahontas, IA 50574
712/335-4395

Polk CCB
Jester Park
Granger, IA 50109
515/999-2557

Pottawattamie CCB
223 S. 6th
Courthouse Annex
Council Bluffs, IA 51503
712/328-5638

Poweshiek CCB
2550 G Ave.
Ladora, IA 52251
319/655-8466

Ringgold CCB
RR 1, Box 83A
Mount Ayr, IA 50854
515/464-2787

Sac CCB
2970 280th St.
Sac City, IA 50583-7474
712/662-4530

Scott CCB
Wapsi River EE Center
31555 52nd Ave.
Dixon, IA 52745
319/843-2855

Shelby CCB
Elk Horn Recreation Area
RR 1
Elk Horn, IA 51531
712/764-8345

Sioux CCB
Oak Grove Park
4051 Cherry Ave.
Hawarden, IA 51023
712/552-1047

Story CCB
RR 2, Box 272E
Ames, IA 50010
515/232-2516

Tama CCB
2283 Park Rd.
Toledo, IA 52342
515/484-2231

Taylor CCB
Courthouse
Clarinda, IA 51632
712/542-3864

Union CCB
318 N. Pine St.
Box 291
Creston, IA 50801
515/782-7111

Van Buren CCB
RR 2, Box 81
Keosauqua, IA 52565
319/293-3589

Wapello CCB
1339 US Hwy 63
Bloomfield, IA 52537
515/682-3091

Warren CCB
1565 118th Ave.
Indianola, IA 50125
515/961-6169

Washington CCB
Box 889
Washington, IA 52353
319/653-77657

Wayne CCB
Box 171
Corydon, IA 50060
515/872-2004

Webster CCB
Kennedy Park
RR 2
Fort Dodge, IA 50501
515/576-3230

Winnebago CCB
34496 110th Ave.
Forest City, IA 50436
515/565-3390

Winneshiek CCB
2546 Lake Meyer Rd.
Fort Atkinson, IA 52144
319/534-7145

Woodbury CCB
3801 Memorial Dr.
Sioux City, IA 51103
712/258-0838

Worth CCB
503 1st Ave. N.
Northwood, IA 50459
515/324-1524

Wright CCB
Conservation Park Building
1720 O'Brien Ave.
Clarion, IA 50525
515/532-3185