UNIT 1
Iowa's Waters

The major types of waters in Iowa include lakes, ponds, streams, rivers, and wetlands. Iowa waters tend to be very productive – they are very rich in plant and animal life. This is due largely to the richness of Iowa soils; however, run-off from agricultural and urban areas also contains nutrients which can increase plant growth, sometimes to the extent it is undesirable.

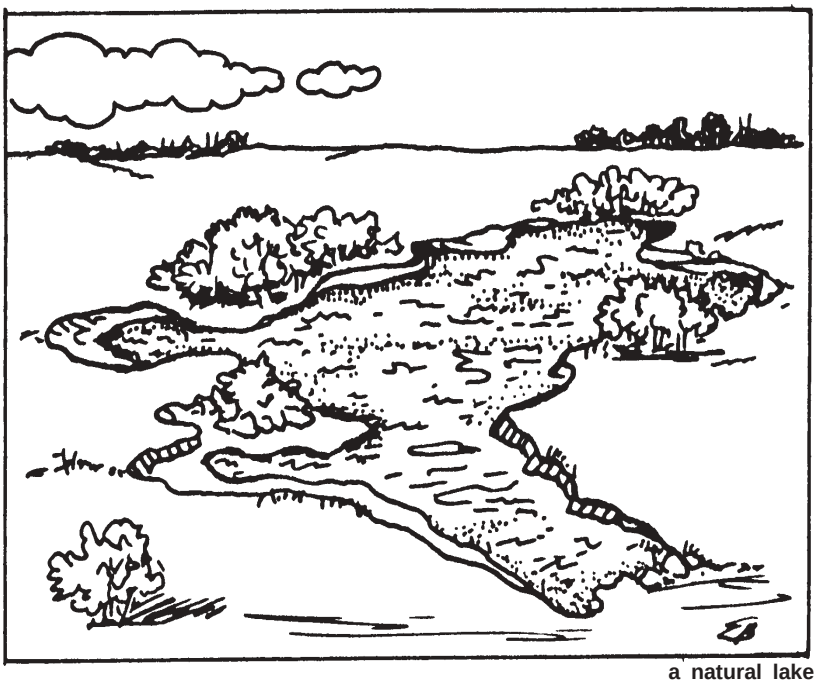
Lakes

Natural lakes formed by glaciation are common in the northwestern and north-central parts of the state. Many of the more shallow lakes and prairie **"potholes"** have been drained and/or filled in for agriculture, but 31 major natural lakes with a combined surface area of almost 29,000 acres and 17 marsh-like lakes with over 3,000 acres of combined surface area are still present in Iowa.

Most of our natural lakes are "middle-aged" and have partially filled with windblown and water-carried sediments, remains of water plants, and soils from eroding shorelines.

Marshes are older lakes that have filled with more sediment and plant remains. These waters generally have good water quality, but this can rapidly decline as a result of shoreline development or loss of soil and nutrients from unprotected land in the lake's watershed. (See *Unit 4* for additional information about these impacts.)

A second type of natural lake, the **oxbow**, is formed when river channels change course and sediments block the ends of a meander in the old channel. Larger oxbows are found along the Missouri and Mississippi Rivers and smaller, pond-like oxbows are found along many interior rivers and streams.



a natural lake

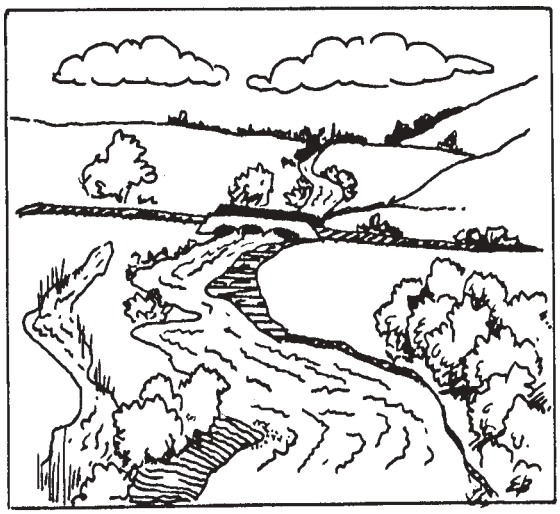
Constructed lakes include recreational lakes, municipal water supplies, river impoundments, and surface mine lakes. Over 100 lakes have been constructed in Iowa for recreation. These generally are small; less than one-fourth are over l00 acres.

Iowa streams and rivers have more than 200 dams that provide water for a variety of purposes. Many are used for municipal water storage. Some are used for flood control, others for recreation. These range in size from 15-acre Mitchell Lake to Lake Red Rock, which has a surface area of some 19,000 acres at normal pool level.

Ponds

There are more than 87,000 ponds statewide. Most are in the southern half of the state because clay soils found there readily form a water-tight basin. (Soils in northern Iowa tend to be more porous.) Ponds generally are less than 10 acres in size. Water quality and habitat in a pond are especially dependent on management of the **watershed** (land that drains into the pond). Ponds with well-managed watersheds can support excellent fish populations and are very important fisheries. Ponds also provide reliable water sources for livestock and wildlife.

Rivers and Streams



an Iowa river and oxbow

Rivers and streams are the most widely distributed of Iowa's naturally-occurring aquatic resources. Volume and size of a river or stream depend on the size of its watershed and amount of rainfall. Iowa rivers range in size from intermittent streams that flow for only short periods of time, to the Mississippi, which drains nearly one-third of the continental United States. The mixtures of plants and animals living in these waters is as varied as their sizes.

Interior Rivers and Streams

Iowa has over 19,000 miles of interior rivers and streams. There are 87 cold water streams located in northeast Iowa with a combined length of 266 miles. The 25 largest interior rivers in Iowa extend over 3,500 miles and each is fed by numerous smaller creeks and streams (tributaries). All interior rivers in the state are part of either the Mississippi or the Missouri River systems.

Our flowing waters are subject to violent and sudden fluctuations because of the nature of our soils, intensive farming of small grain crops, and drainage. Headwaters of streams usually are quite clear and less subject to water fluctuations. Lower stream reaches tend to be more turbid and subject to greater agricultural and industrial pollution.

Streams and rivers naturally **meander**, changing their course over time. Pools and riffles between meanders support diverse aquatic life. **Channelization** (straightening of a stream) and replacement of surrounding natural vegetation with row crops eliminates habitat and, thus , much of the aquatic life disappears from the area.

Water in channelized streams flows faster, increasing erosion and deepening the channel. The chain reaction destroys the natural integrity of stream channels and often results in major damage to bridges. Likewise, floods are more severe.

Most of Iowa's interior rivers and streams have channelized stretches–some 3,000 miles of Iowa rivers have been lost to channelization.

Iowa is known as the "land between two rivers." The Mississippi and Missouri Rivers make up most of the east and west borders, respectively. (The Big Sioux and Des Moines Rivers make up small portions of the northwest and southeast borders.)

Mississippi River

The Mississippi River borders Iowa for more than 300 miles and drains two-thirds of the state. It originates in Lake Itasca, Minnesota, and flows some 2,350 miles to the Gulf of Mexico. Through the ages it has formed chutes, side channels, and sloughs while carving a valley two to six miles wide. It first served as a corridor for settlement by native Americans from the South and later as a major mode of transportation for Euro-American settlers.

The Upper Mississippi River (from the entrance of the Missouri – above St. Louis–to Minneapolis) was a mosaic of braided channels with rapids and shallow areas. Water levels were unpredictable and the river was vulnerable to drought and floods. In 1824, Congress authorized "improvement" of the river for navigation through removal of snags and other obstructions. In 1907, work began to form a six foot navigation channel in the Upper Mississippi. The Mississippi became a major transportation route and the U.S. Army Corps of Engineers (Corps) constructed locks and dams for navigation on the Upper Mississippi between 1930 and 1940. A nine-foot channel now is maintained by the Corps for barge navigation.

The level of the river along the Iowa border is controlled by 11 locks and dams. Damming the Mississippi raised water levels so many chutes between islands, and even islands themselves, were inundated. It also changed the habitat structure from a continuous, flowing body of water to a series of "lake-like" **pools** (stretch of river between two navigation dams). Each pool is numbered in reference to the dam at its downstream end. Example: Lock & Dam 12 in Bellevue, Iowa creates Pool 12 above it.

Missouri River

The Missouri River was dubbed the "Big Muddy" by early explorers because its shifting sands were swirled by relatively fast-moving currents through a broad series of braided channels. The Missouri River Valley bordering Iowa contained lush hunting grounds used by the Dakota, Iowa, Oto, Winnebago, Sac, Fox, and Pottawattami. Many fur companies established trading posts along the Missouri. Buffalo, elk, and deer (along with many species of small game and wild fowl) were common in the river valley. A variety of fish were plentiful in the river.

Engineering work for navigation and flood control have had a profound effect on the Missouri. Work began as early as 1876, but accelerated channel stabilization occurred in the late 1920s and early 1930s. Between 1923 and 1976 the river channel was altered from its former braided appearance to a narrow, single channel with a series of gentle bends and well armored shoreline. This reduced the channel area by nearly 35,000 acres along Iowa alone. Dikes and other structures regulate flows instead of locks and dams. The Corps maintains a nine foot channel for commercial river traffic.

Islands, sand bars, brush piles, etc. disappeared after channelization. Habitat diversity is nearly non-existent. Sport and commercial fishing have suffered greatly. Commercial fishing yielded 50,000 to 80,000 pounds of fish each year between 1940 and 1955. Reports in 1996 showed an annual harvest just over 21,500 pounds, compared to almost three million pounds harvested from the Mississippi.

☺☺☺

Meandered Stream
(natural)

Channelization
(stream straightening)

Faster water

Deeper channel

Lost Habitat

Fewer Critters
Erosion of roads, bridges
Worse floods

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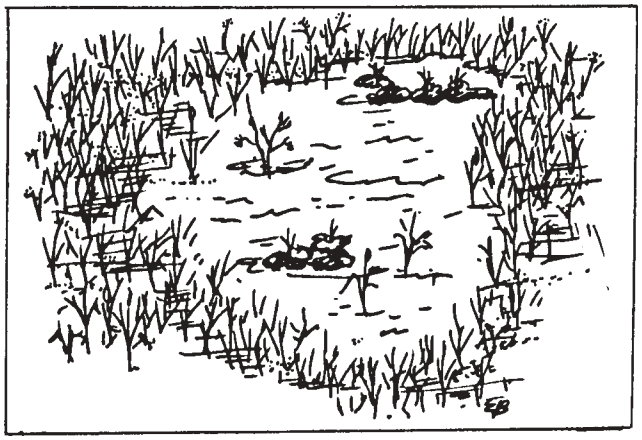
Stream channelization initiates a chain of events

Wetlands



an Iowa wetland

Wetlands are areas where soil is saturated for various lengths of time during the growing season. They are transitions between terrestrial and aquatic systems. All wetlands have three things in common: hydric soils, a hydrology, and the presence of hydrophytes (water plants).

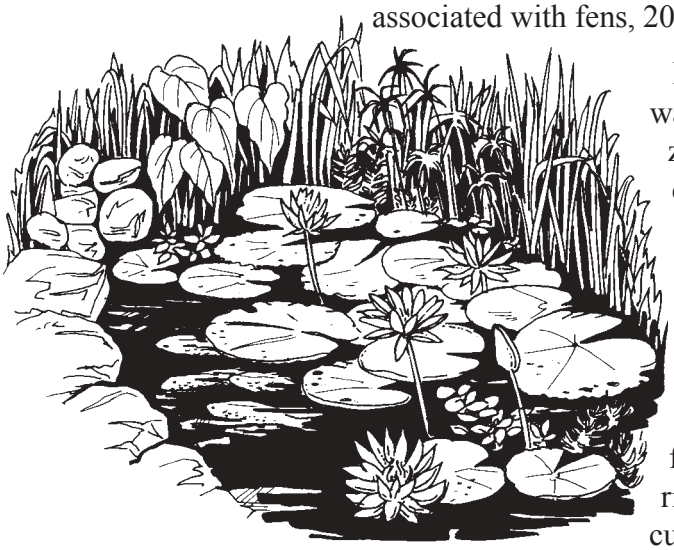
Hydric soils form when soil is saturated and decomposition is slow due to low oxygen. They are characterized by a thick, dark layer of organic soil just below the topsoil, with a gray layer beneath mixed in with splotches of brown, orange, or yellow.

Wetland **hydrology** is the presence of water on or near the soil surface for most of the growing season. **Hydrophytes** (water plants) are specially adapted to living with their roots in wet soils.

Marshes are open and unforested. They are dominated by cattails, sedges, and grasses. Iowa marshes include prairie potholes formed during the last ice age, when the Des Moines Lobe of the Wisconsin glacier melted (approximately 10,000 years ago). As the glacier receded, it gouged thousands of shallow depressions. This area of the northern Great Plains in the U.S. and southern Canada, known as the **Prairie Pothole** region, is ecologically diverse and economically important.

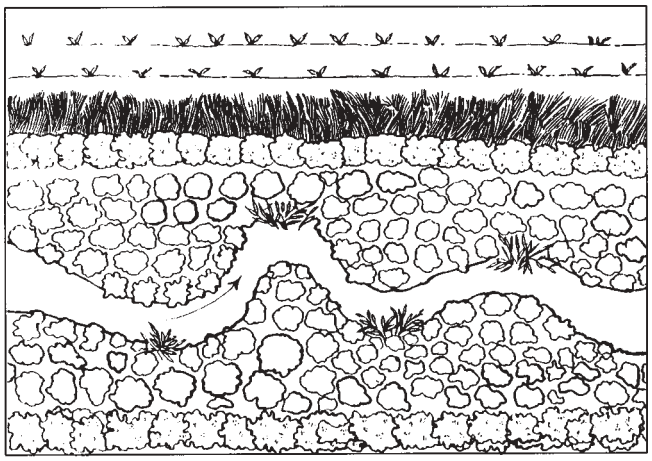
Other wetlands include: **wet meadows** (dominated by sedges with very shallow water levels or are just saturated to soil level) **bogs** and **fens** (unique wetlands with **peat**–partially decomposed organic material); and **wet prairies** (soils almost always organic and saturated). Most Midwestern wet prairies have been drained and now are farmed.

Fens are formed only under very specific conditions. Of the 200 species of plants associated with fens, 20 are endangered or threatened.



From creeks and streams to major rivers, all flowing waters have a **riparian zone** (floodplain). Riparian zones vegetation traps sediment, agricultural chemicals, and animal waste. Cottonwood, green ash, silver maple, willow, and many other trees, shrubs, and grasses stabilize stream banks and prevent erosion from storms and snow melt. Streambank vegetation provides shade, moderating temperature, humidity, and light for stream creatures during summer. Forest animals come to drink and find food, shelter, and hiding places. In Iowa, many riparian zones have been cleared and replaced by cultivation, converted to pasture, or developed. Loss of this zone of vegetation has caused serious environmental problems. See the supplemented activity, "Riparian Retreat" for information about benefits of riparian areas.

It is estimated Iowa had four million acres of wetlands in the mid-1800s (includes oxbows, floodplain wetlands, and natural lakes). As humans realized how rich soils under wetlands and prairies were, these areas soon were drained or filled and converted to cropland, urban areas, housing complexes, industrial areas, railroads, and highways.



Vegetation in riparian zones provides habitat and protects streams by trapping sediment and other pollutants.

Iowa has lost approximately 99 percent of its original wetlands. Wetlands were, and still are, considered by many to be waste areas. Until recently, drainage of wetlands for agriculture was promoted by state and federal programs.

In 1990, approximately 27,000 acres of wetlands remained in Iowa. Since the mid 1980s several programs have emerged to assist in the protection and restoration of wetlands. From 1987-1996, nearly 27,436 acres of land were acquired through the Prairie Pothole Joint Venture in a 35 county area of Central Iowa. Acquisitions included 2,651 acres of existing wetlands and 4,449 acres of restorable wetlands. For information about other programs to restore wetlands see *Unit 4*.

Watersheds

Activites in the watershed (land that drains into a lake, marsh, or stream) determine water quality. Water dissolves soil, fertilizers, chemicals, etc. As it moves across the land it picks these up and carries them to the water body. Water also is very heavy and has tremendous power as it falls from the sky and moves across the land. It can move huge amounts of materials during heavy rainfall events or rapid melting of ice and snow, so bare soil is very succeptible to erosion. A study of waters in Iowa must include a look at their watersheds.

Teacher Aids

Posters: Aquatic Life, Life in a Stream
Fact Sheet: Characteristics of Iowa's Waters
Audiovisual Program: Iowa's Waters
CD: Biodiversity of Iowa: Aquatic Habitats

Other Materials

Audiovisual Programs: ***(contact your area education agency for availability)***

Iowa's Precious Water
Lakes, Rivers and Other Water Sources
Mississippi: It's Role in American History
(The) Mississippi River: Ol' Man River and the Twentieth Century
There Once Was A River Called Missouri

Reference Materials:

McClure, N. "Wetlands. " Pub # 92-49. Publications Office, P.O. Box 47600, Olympia, WA 98504.

Schultz, R.C., Isenhart, T.M. and J.R Colletti. 1995. "Riparian Buffer Systems in Crop and Rangelands." In "Agroforestry and Sustainable Systems: Symposium Proceedings." p. 13-27. USDA Forest Service General Technical Report RM-GTR-261.

"Steward of Our Streams: Riparian Buffer Systems. " Iowa State University Extension Bulletin Pm- I 626a/ January 1996.

Popular Literature:

Caduto, M.J. 1990. Pond and Brook. University Press of New England.

Nature Club. Ponds and Streams. Troll. (ages 7- 10) Science books that introduce children to the mysteries of nature. Fun-filled activities help teach the marvels of nature.

Niering, W.A. 1987. Wetlands of North America. Thomasson-Grant. (adult) An informative introduction to the continent's freshwater marshes, coastal wetlands, swamps, and bogs.

Norris Wood, J. and K. Dean. Nature Hide & Seek - Rivers and Lakes. Knopf. (ages 5-9) Meet many of the planet's freshwater habitats and the animals that live in or near them. The species are artfully camouflaged in a panoramic gatefold illustration.

Our Planet: Rivers. Troll. (ages 8-11) The marvels of nature are presented hand-in-hand with the issue of environmental conservation.

Demonstration Models:

Stream Table and EnviroScape contact Aquatic Education Program, 2473 160th Road, Guthrie Center/IA 50115 (641/747-2200; email: AquaticEd_Info@dnr.iowa.gov) for listing of organizations/agencies with models available for loan.

Other:

IDNR Fisheries Bureau homepage (www.iowadnr.gov/fish/index.html)

Fish and Wildlife Service home page (www.fws.gov)

U.S. Army Corps of Engineers homepage (www.mvr.usace.army.mil)

WILD Aquatic Activities (grade level)

Alice in Waterland (5-8)
Blue Ribbon Niche (5-8)
Dragonfly Pond (5-8)
Glass Menagerie, The (9-12)
How Wet Is Our Planet? (5-8)
Marsh Munchers (K-4)
Puddle Wonders! (5-8)
Riparian Retreat (5-8)
To Dam or Not to Dam (5-8)
Water Wings (5-8)
Watershed (5-8)
Wetland Metaphors (5-8)
Where Does Water Run?(5-8)

** Supplemental information provided for italicized activities.*

Fact Sheet: Characteristics Of Iowa's Waters

Resource	Characteristics	Formed By:	Location	Importance/Uses
Lake	■ Standing water ■ Surface area > 10 acres ■ Marsh plants along shores with much open water ■ Sunlight doesn't reach bottom in all areas	■ Natural: Glaciers ■ Natural: Rivers Oxbows ■ Constructed	NW & N-Central Iowa Along all major rivers Statewide, most in S. Iowa	■ Provide a variety of fish and animal habitats ■ Store water for wildlife, domestic, and/or industrial use ■ Flood control ■ Recreation
Pond	■ Standing water ■ Surface area < 10 acres ■ Sunlight reaches bottom in all areas ■ Marsh plants along shore; some open water	Constructed: bulldozer used to dig or to dam up a valley	S. Iowa	■ Water for livestock and wildlife ■ Recreation
Stream/ Creek	■ Flowing water ■ Often dries up during dry times of the year	Natural: erosion of soil by runoff water	Statewide	■ Water and habitat for livestock, and wildlife ■ Recreation ■ Waste disposal ■ Drainage of watershed ■ Supplies water to surrounding land
River	■ Flowing water ■ Usually has some water throughout year	Natural: erosion of soil by runoff water	Statewide	■ Water and habitat for livestock, wildlife, people, and industry ■ Recreation ■ Waste disposal ■ Drainage of watershed ■ Supplies water to surrounding land ■ Transportation
Wetland	■ Standing water (may be wet soil) ■ Very shallow, broad ■ Open water usually < 6'deep ■ Highly productive ■ Water table close to surface	Natural: formed as all lakes & ponds fill in; Prairie potholes are old glacier lakes	NW & N-Central Iowa also along rivers & lakes statewide	■ Remove nitrogen, phosphorus, & silt from water ■ Recharge groundwater supplies ■ Decrease erosion by slowing runoff ■ Stores water during times of heavy rainfall ■ Important habitat to waterfowl and other kinds of wildlife