WETLANDS

About 10,000 to 12,000 years ago much of what we now call Illinois was covered with glaciers. The climate was very cold. However, as temperatures warmed over the years, the glaciers began to melt and break up. Chunks of the glaciers settled into low-lying valleys. When the chunks finally melted, the water filled some valleys to form lakes and marshes. When all of the glaciers melted, there was a tremendous amount of water flowing across the state toward the ocean. This water cut out the channels of our rivers. When all the ice was melted, Illinois had 10 million acres of lakes, marshes and swamps and the great Mississippi and Illinois rivers. These diverse aquatic habitats are referred to as wetlands. Today only about 10 percent (approximately 1.25 million acres) of our original wetland acres remain. Most of the other 90 percent have been destroyed by human activities. The primary reason for loss has been conversion of land for agricultural purposes, though in some areas urban and/or industrial development has been predominantly responsible for wetland destruction and degradation. Under Section 404 of the Clean Water Act, the loss of wetlands in some instances must be mitigated (replacement of or substitution for the lost wetland) by the construction of a like amount of wetlands elsewhere. However, created and restored wetlands cannot recreate the biological and hydrologic complexity of their natural models.

Wetland I.D.
Wetlands are areas that are either covered with shallow water or have soils saturated (soaked to capacity) with water for periods during the growing season. The three characteristics of wetlands are the presence of: periodic water; hydric soils (soils that lack oxygen); and hydrophytic plants (plants that grow in water or in saturated soil).

Wetland areas include marshes, fens, swamps, bogs and certain riparian areas. They are fed by runoff, rainfall, seepage from ground water or a combination of all these sources. Wetlands consist of living and nonliving things. They are an important part of the watershed. Since there is little free oxygen in wetland environments, the wetland plant life is specially adapted to these conditions, as is the wildlife.

A wetland community can consist of large varieties of living things characteristic to the region and type of wetland. They are specifically adapted to living in a wetland environment by their individual form, function and behavior and are directly or indirectly connected in complex relationships within the wetland system.

Wetland Value
Wetland value and versatility are far reaching. They serve important environmental functions. Some examples of their usefulness are:

- Storm water and flood control. Wetlands absorb large amounts of storm water and reduce flooding by storing and slowing down the water force.
- Habitat for threatened and endangered plants and animals. In Illinois, more than 40 percent of these species depend on just 2.6 percent of the landscape which is still wetland.
- Improvement of water quality. Wetland vegetation slows sediment build up and absorbs as much as 90 percent of high nutrient levels which can cause further management problems if they reach other wetland areas.
- Habitat. Wetlands provide food, water and shelter for a variety of plants and wildlife.
- Aesthetics and recreation. Increased biological diversity can provide for diversity of recreational activities and enhance the aesthetic qualities of the site. Wetlands help support fishing, hunting, trapping and wildlife observation. Even though the actual value of wetlands cannot be easily measured in dollars, recent data show that these activities contribute more than $1.6 billion annually to the Illinois economy.
- Education and research. The rich ecosystems of wetlands are natural locations for biological research and observation.

Wetlands are resources that serve as vital connections between dry land and permanent water. They are often transition areas, changing in response to weather conditions and precipitation patterns. During a dry year a wetland may not be very wet. During a year with heavy rains, that same area may fill and hold water for extended periods. Wetlands may perform different functions in a dry year than in a wet one. This ability is what makes them so unique and so valuable.

Wetland Locations in Illinois
Several types of wetlands exist in Illinois. They include: forested wetlands; perennial and intermittent; open lakes and lake shores; ponds; marshes; and swamps. Some of the less common Illinois wetlands are wet prairies, scrub-shrub wetlands, bogs and fens. Most wetland areas in Illinois are in the northeastern and southern parts of the state and along the Illinois

River; however, all counties in Illinois have wetland areas, with the number of acres varying from 1,014 acres in Stark County to 35,502 acres in Clinton County.

Wetland Threats

Natural processes and human actions contribute to the continued loss of wetlands in Illinois.

- Soil Erosion – Soil from exposed land is carried by rainwater into wetlands. This run-off soil makes the wetland water muddy. The muddy water blocks the flow of sunlight plants need to conduct photosynthesis. As a result, animals are deprived of plant food. The thick blanket of sediment is too unstable for plants to take root in. As plants die, animals suffer from a lack of oxygen due to decreased production and increased decomposition. Also, an abundance of sediment can choke aquatic organisms. As sediment builds up on the bottom, the wetland becomes smaller which increases the risk of flooding during heavy rains.
- Habitat Destruction – Historically, wetlands were considered mosquito-filled wastelands and obstacles to development. Many wetlands were drained or filled to make space for urban or industrial development, destroying necessary habitat for plants and animals.
- Violation of Protection Laws – State and federal laws protect wetlands and their inhabitants. Violation of these laws may increase water pollution which kills plants and animals, affects drinking water and decreases wetland size. When laws are broken, every part of the wetland ecosystem is damaged.
- Chemical Pollution – Some people spray pesticides, herbicides and insecticides to control pests, fungi and insects on their plants. They also treat plants with fertilizers to help them grow. Fertilizers can enhance the growth of bacteria, algae and plants. These chemicals make their way into the soil. When rainwater erodes the soil, the chemicals are carried with the soil into wetlands. Plants and animals take in the chemicals from the water. Chemicals are passed from one animal to the next in the food web. People are also affected by chemical pollution. When we eat fish from a stream that is polluted with chemicals, we absorb some of those chemicals.

MORE AQUATIC HABITATS

Bog

A bog is characterized as an area where more than 50 percent of the vegetation is herbaceous, standing water is present and the soil pH is acidic. Restricted drainage and the presence of sphagnum moss create acidic conditions. Bogs are found almost exclusively in glaciated depressions in northeastern Illinois.

Volo Bog, in northeastern Illinois, is the only Illinois example of a “quaking” bog, or one that is open at the center. This bog was formed during the Wisconsinian glacier 15,000 years ago. The glacier pushed large pieces of ice into the earth, forming kettle holes. Of the two kettle holes at Volo Bog formed by the glacier, one has filled in and the other has become considerably shallower than its original 50 foot depth. Since the original kettle holes were poorly drained, dead plant material accumulated and became peat. The development of peat resulted in water that was acidic.

The transition from open water to land, or succession, is readily evident in a bog. As additional plants die and settle to the bottom of the bog, a floating mat of vegetation forms along the edges and the amount of open water decreases. Without management, bogs eventually fill in.

Along the edge of Volo Bog grow cattails, arrowhead and duckweed. Moving toward the center of the bog, the next distinct zone in the bog is the tall shrubs, such as poison sumac and winterberry holly. Further in toward the center of the bog are the tamarack trees. These unique conifers shed their leaves each fall. Tamaracks grow where the floating mat has become thick enough to support their weight. A low shrub zone area follows, which contains many young trees and shrubs growing amid cattails, orchids, bog buckbean and sphagnum moss.

The vegetation close to the open water area is a mat of herbs. This mat is very thin and cannot support much weight. Many of the same herbaceous plants from the previous zones grow here. The final zone is open water, which is all that remains of the original glacial lake.

Bogs are home to unique plants. With only one open bog remaining in Illinois, many of the plants in this habitat are rare, threatened or endangered. The pitcher plant is a carnivorous plant that consumes insects, mites, spiders and small frogs. The leaves of the plant form a tube that prey cannot escape from. Digestive enzymes dissolve the prey. Leatherleaf has thick leaves that are retained during the winter and protect the plant from excessive water loss. Orchids can live on the hummocks through a symbiotic relationship with fungi that decompose plant materials and share it with the orchids. A variety of aquatic organisms reside in Volo Bog, including dragonflies, leopard frogs, bullfrogs, snails and red-winged blackbirds.

Wet Prairie
A wet prairie, also commonly referred to as a wet meadow, is characterized as an area having more than 50 percent of the vegetation being herbaceous, standing water present seasonally during the growing season and neutral pH. Historically, wet prairies existed in the northern two-thirds of Illinois and were most commonly found in the flood plains of major streams and rivers. Today, these communities remain as scattered relics throughout that range. As Illinois was settled, crossing the vast expanses of wet prairie became a chore for many pioneers. “Corduroy” roads, logs laid side-by-side, were built across many wet prairies to assist with the passage of wagons. Some pioneers crossed the prairies at night to avoid biting flies. Wet prairies were often mowed and the hay used for feed and bedding material for farm animals.

Many wet prairies were drained. Some people felt that stagnant pools of water held diseases. Others desired to drain them and convert them to agricultural fields. Large numbers of ducks inhabiting these prairies were considered a nuisance to surrounding grain fields. Landowners used a variety of techniques to drive ducks off these prairies.

Wet prairies have a lower plant diversity than other prairie communities. The most common plant in wet prairies is cord grass, or slough grass. Wetter sections of these prairies consist of hummocks created by bluejoint grass. Other typical plants include white lady’s-slipper orchid, ferns, sedges, wild blue iris, swamp milkweed, swamp rose and marsh fen.

Historically, wet prairies were havens for a variety of birds, including ducks, geese, swans, rails, prairie-chickens, sandhill cranes, warblers, red-winged blackbirds and herons. Turtles, frogs and muskrats were other common wet prairie inhabitants. With the decline in this habitat type, at least six animal species and eight plant species have been listed as Illinois endangered or threatened species. Some of the finest examples of remaining wet prairies can be found at Matanzas Prairie in Mason County, Green River State Fish and Wildlife Area in Lee County, Goose Lake Prairie in Grundy County and Chauncey Marsh in Lawrence County.

Marsh
A marsh is characterized as an area where more than 50 percent of the vegetation is herbaceous and the soil has neutral pH. Less than 30 percent of marsh vegetation is woody. With standing water present throughout the growing season, marshes are highly productive communities. Marshes occur throughout Illinois, with the most extensive communities occurring at the edges of bottomland lakes and sloughs and along the Illinois and Mississippi rivers.

The deeper the water level in a marsh, the lower the plant diversity. Marshes are dominated by tall grass plants, such as cattails, bulrushes and sedges. Other typical plants may include wild rice, white water lily, jewelweed, arrowhead and pondweed. Marshes are highly productive habitats and support hundreds of species of animals, such as frogs, toads, salamanders, turtles, muskrats, mink, swallows, ducks, herons and fishes. A good example of an Illinois marsh is Chauncey Marsh Nature Preserve in Lawrence County.

Swamp
A swamp is characterized as an area where more than 50 percent of the vegetation is woody, adapted to living in water and greater than 20 feet tall. Surface water is usually present in swamps. Illinois swamps are the northernmost remnants of a community that once covered most of the southern United States. Many of the plants and animals found in southern Illinois swamps are at the northern extent of their range, often resulting in a listing as threatened or endangered species.

Swamps are rich and biologically diverse habitats. For instance, the Pine Hills/La Rue Swamp area in southern Illinois contains 43 percent of all the plants species known from Illinois. The dominant tree of swamps is the bald cypress. Some individual trees may be as old as 1,000 years and have orange-tipped knees up to 10 feet high. Water tupelo is another common swamp tree. Cypress and tupelo swamps have a water depth of approximately two feet. Floating or submersed plants like pondweed, coontail and duckweed can be seen in the water. Bordering the swamp and adjacent forests are maples, elms and oaks.

Swamps are rich in wildlife diversity. Historically, bison, elk, black bears, cougars and wolves were found in the Cache River area. By the 1850s these species were no longer present. Today, animals typical of the area include herons, waterfowl, black vulture, red-shouldered hawk, barred owl, flycatchers, warblers, squirrels, bats, foxes, mink, muskrat, beaver and cottontail and swamp rabbits. Signs of bobcat and river otter may be found. A wide variety of frogs, turtles and snakes live in swamps. Good examples of swamps in Illinois include the La Rue Swamp Nature Preserve in Union County and Heron Pond-Little Black Slough Nature Preserve in Johnson County.

Fens

A fen is a type of wet meadow that is fed by an alkaline water source, such as a calcareous spring or seep. The presence of calcium and magnesium makes the soil alkaline. More than 50 percent of the vegetation in a fen is herbaceous. Standing water is present. Fens are most commonly found in northeastern Illinois and in isolated areas along the Illinois River valley. Twelve of the known 125 fens in the United States occur in Illinois. Examples of fens can be seen at Turner Lake Fen in Lake County, Spring Grove Fen Nature Preserve in McHenry County and Ferson's Creek Fen Nature Preserve in Kane County.

Fens frequently occur on a hillside and are often called "perched bogs" or "hanging bogs." Some fens were historically mowed. Typical plants include pitcher plant, turtlehead, skunk cabbage, beaked spikerush, wild marsh timothy, hoary willow, rushes, dwarf birch and cotton grass. Sandhill cranes and other wetland-dependent birds nest in fens. Some plants attract insects that specialize in fens, such as the Baltimore checkerspot butterfly, that feeds on turtlehead plants.

Wetland Issues
Drainage and siltation from agricultural development and lack of periodic burning have contributed to the loss and degradation of wetlands. Alteration of ground water, including pollution, impacts many wetlands. With the diversity of unique plants in some wetlands, plant piracy is often a problem. Exotic species, such as glossy buckthorn and purple loosestrife, threaten to destroy some wetlands.

Current Wetland Management Practices
Restoration of wetlands often requires re-establishing historic water levels, re-vegetation, improving water quality, controlling erosion, reducing wave action or construction of water-retaining structures. Prescribed burns, control of exotic species and brush removal encourage desired plants and slow the process of succession. Vegetation control practices can also include use of chemical and mechanical techniques and biocontrol using insects. Land acquisition programs have been undertaken to preserve many unique communities.

WATERSHEDS AND WATER QUALITY

What is a Watershed?
A watershed is a land area that delivers runoff water, sediment and other dissolved substances to a stream channel, lake, reservoir, major river and its tributaries or other bodies of water. It includes atmospheric, surface and subsurface water and the pathways that water follows. A watershed impacts lives on a daily basis. A watershed defines geographic, political, social and cultural boundaries by connecting and/or dividing. Many different relationships ensue within a watershed--biological, ecological and hydrological as well as human patterns including travel, exploration, commerce and communication. A watershed shapes and is shaped by the land, and humans play a large role in changes made to a watershed. Commercial or private developments can drastically change the appearance and the essential functions of a watershed in a particular area.

Everyone is responsible for the health of a watershed and the water systems within a drainage basin. Individual actions, both positive and negative, add up. Watershed investigations are conducted for many reasons but monitoring pollution is high on the priority list.

Pollution
Various forms of pollution can contaminate water quality. Chemical pollution is the introduction of toxic substances into an ecosystem. Examples include acid rain or contamination of water supplies by pesticides. Thermal pollution is the variance of temperatures above or below the normal condition of the water that can occur in water located next to power plants or industrial complexes. Organic pollution is the process of oversupplying an ecosystem with nutrients. This process can occur when an influx of fertilizers enters a water system. Ecological pollution includes the stresses ordinarily created by natural processes. Examples of ecological pollution include adding a substance that is not a naturally occurring substance in the ecosystem or increasing the amount or intensity of a naturally occurring substance or altering the level or concentration of biological or physical components of an ecosystem. Wherever water is located, it may be contaminated by thousands of different substances and conditions. Most of the time, this contamination alters the water in such ways that it becomes hazardous to wildlife, wildlife habitat and humans, sometimes directly, other times indirectly.

Monitoring
The quality of most Illinois bodies of water is monitored by the Illinois Environmental Protection Agency (IEPA). The agency targets watersheds where pollution poses the greatest risk to human health, ecological resources or desirable use of the water. The major sources of pollution for Illinois rivers and streams today are agriculture, point sources, habitat modification, urban runoff and resource extraction. The three leading causes of water quality problems are nutrients, siltation and habitat alteration. Major causes of pollution impacting Illinois lakes included suspended solids, siltation,

organic enrichment and nutrients. Prevalent sources of lake pollution included agriculture, contaminated sediments and hydrologic/habitat modifications. Major sources threatening the water quality of Lake Michigan include atmospheric deposition and contaminated sediments.

EXOTIC SPECIES

The earth is populated by a huge variety of organisms. Species tend to live in one general location and are somewhat restricted from spreading to new areas by ecological barriers such as mountains, oceans, deserts and rivers. Some organisms are not even structured to travel long distances. They are well adapted to the place that they live.

Despite the barriers, some organisms do travel and become established far from their native habitat. For instance, seeds may be blown or carried by ocean currents to new areas. Humans are often involved in relocating species, intentionally or accidentally, to areas where they did not previously exist. For example, between 1960 and 1991 ships and shipping activities alone accounted for 21 percent of the total new releases of exotic species into the Great Lakes. Organisms introduced into habitats where they are not native are called exotic species.

Just because a species is introduced to a new habitat does not mean that it will survive. Climatic factors alone may be enough to ensure that the species will not be successful. However, sometimes a species will thrive in its new surroundings. It may be released from predators, parasites, pathogens (disease-causing organisms) and/or competitors that were present in its native habitat. More than 140 terrestrial and aquatic invaders have become so entrenched in the Great Lakes region that eradication of them is impossible.

Sometimes introducing a species adds economic benefits, such as the fishery provided by rainbow trout. However, often the addition of different species may cause economic and/or ecological catastrophe. These biological invaders can upset the delicate balance existing between native organisms. Sometimes these species will explode in numbers and crowd out native species. Native species may no longer be able to survive. Once established in an area, exotics can rarely be eliminated.

Illinois' aquatic habitats include several exotic species. They have had varying impacts on native organisms.

Purple Loosestrife

Purple loosestrife (*Lythrum salicaria)* is a plant that appeared in the Great Lakes region in 1869. It is believed to have reached Illinois in the mid-1940s or 1950s. It is native to wetlands in Europe and Asia. Originally intended to be an ornamental plant, it has since become a severe pest, spreading along marshes and lake shores. Each plant is capable of dispersing up to 21,000 seeds per square meter and about 2 million seeds annually. Plants may also grow from roots and broken stems. Generally the plant is spread by seed escapes from gardens and nurseries. Once in wetlands, seeds are easily spread by moving water and wetland animals. The plant thrives on moist, disturbed soils, often invading after some type of construction activity. In wetlands, it forms dense, impenetrable stands which are unsuitable for cover, food or nesting sites for many native animals.

Burning, spot spraying and other techniques to control it have been tried with limited success. Several European insects that attack only purple loosestrife are being tested as possible long-term biological controls. In Europe the plant has nearly 100 species of insects that feed on it while in Illinois nothing native is known to eat it. In 1985, Illinois joined with Wisconsin, Minnesota and Indiana in classifying purple loosestrife as a noxious weed and banning its planting.

Zebra Mussel

The zebra mussel (*Dreissena polymorpha)* is native to the Caspian Sea region of Asia. It was accidentally brought to the Great Lakes from Europe by ships in 1986. Since then it has spread through all of the Great Lakes and into many major rivers and inland lakes.

This bivalve mollusk is fingernail-sized with yellow or brown shells marked with wavy bands. Able to reproduce at about age one year, it lives for approximately three years. Female zebra mussels can produce 30,000 to 1 million eggs per year. Breeding occurs between May and October. External fertilization is used, with males and females releasing reproductive cells into the water. Within hours the fertilized eggs develop into free-swimming larvae called veligers that quickly begin to form shells. About 99 percent of the veligers die from environmental conditions or are eaten. After about 10-15 days the postveliger zebra mussels settle to the bottom and attach to a substrate.

Zebra mussels filter water to remove plankton for food. They are often found attached near the incurrent siphon of native mussels, where food is taken into the shell. In this manner they may be assured of a fairly constant food supply. They may filter up to one liter of water per day. This amazing filtering capacity is partly responsible for improved water quality where

zebra mussels are present. The change in water clarity is also responsible for a change in fish populations. The food particles not eaten by these mussels are combined with mucus and discharged as “pseudofeces” onto the lake bottom. This material may benefit bottom feeders while reducing the plankton food chain for upper water species. Zebra mussels are eaten by diving ducks and freshwater drum, but not at a rate that controls the population of these mussels.

Zebra mussels attach to water intake pipes of power companies and water treatment plants. They may also clog the cooling systems of boat engines. The impact is very serious and costs millions of dollars for cleanup and repairs. A survey showed that between 1989 and 1995 zebra mussel problems cost power plants and industrial facilities nearly $70 million. Zebra mussels may attach to living mussels and snails. When there are many zebra mussels attached to these organisms, the mussels may not be able to open their shells to feed or reproduce. Snails have been unable to reproduce due to heavy mussel loads and are possibly the organisms most affected by the zebra mussel. Snail numbers have declined greatly in areas where heavy zebra mussel infestations occur.

Microscopic veligers may be transported in live wells or bilge water. There is concern that veligers may be transported on SCUBA diving gear. Adult zebra mussels can attach to boats or boating equipment that sit in the water.

Rusty Crayfish
The rusty crayfish (*Orconectes rusticus*) is native to streams in Michigan, Indiana, Ohio, Kentucky and Tennessee. Spread by anglers who use them as bait, these crayfish reproduce rapidly and eat large amounts of lake and stream vegetation. Native species of fish and crayfish are thus denied cover and food. Displacement of native crayfish by these aggressive invaders has been well documented. The displaced individuals are either consumed by predators or forced to move to other areas.

The rusty crayfish was first collected in Illinois in 1973 from the Illinois River at Peoria and until 1985 was known from only nine locations. Since then the species has spread throughout the northern half of Illinois and can be found in almost all of the major rivers in that part of the state.

This crayfish is easy to identify by the single rust-brown spot found on each side of the back of the shell. Mating occurs in the fall with oviposition, the egg-laying process, in late spring.

Current Illinois law prohibits the possession and sale of live rusty crayfish. Its strict enforcement represents the only means currently known to slow the spread of the rusty crayfish.

Common Carp
The common carp (*Cyprinus carpio)* was brought to North America by European immigrants in the late 1800s as a food fish. The fish is native to Asia. About 120 healthy fish in the original introduction reproduced to more than 258,000 within a few years. The fish became established in nearly every waterway in the country. Carp are found statewide in Illinois in all types of aquatic habitats.

Carp are easy to recognize by the two pairs of barbels near the corners of the mouth, the downward opening mouth and a sawtoothed spine in both the dorsal and anal fins. Carp eat plant and animal material. Aquatic insects are the most important component of the diet, and they may occasionally eat other fish species’ eggs. Spawning occurs in the spring with eggs scattered over debris and vegetation on the bottom of the water body. Females lay 790,000 to 2 million eggs which hatch in 12 days. The average life span for carp in Illinois is seven to eight years.

Carp become so abundant in some habitats that they are accused of competing for food and space with more desirable fishes. Their feeding habits result in a general deterioration of the habitat through increased turbidity and destruction of aquatic vegetation. Although there is some basis for these complaints, the carp’s detrimental aspects are often overrated. Carp provide a good fight for anglers and some people value the meat.

Rainbow Trout
The rainbow trout (*Oncorhynchus mykiss*) was introduced to Illinois waters as a sport fish species in the 1920s. A native of west coast streams from California to Alaska, it has been transplanted to nearly every state and several other continents. It is currently found in Lake Michigan and other lakes and streams in the state where it has been stocked. It does not naturally reproduce in Illinois waters. These fish survive best where the water temperature remains more or less continuously below 70°F.

Rainbow trout are identified by their adipose fin, small black or brown spots along the upper body and tail and a faint pink line along each side of the silvery body. These trout feed primarily on insects, snails and fishes and live for about six years

in the wild. Rainbow trout generally reproduce from October through February in hatcheries. It takes about 50 days for hatchery trout to complete incubation, and the fish will be reared to 10 inches in about 16 months. Fish are stocked in dozens of Illinois lakes and ponds in the spring and fall.

Spiny Water Flea

The spiny water flea (*Bythotrephes cederstroemi)* is native to lakes in northern Europe. This exotic crustacean was transported in freshwater or mud in the ballast water of ships to Lake Huron in 1984 and spread to the other Great Lakes within three years. These freighters carry grain to Europe but return empty to the United States. To stabilize the empty freighters, large amounts of water are carried in ballast. Small planktonic organisms, and even fishes, are pumped in with the ballast water and may survive the voyage. When ships take on cargo in the United States, the ballast water and anything in it is discharged. Normally, oceangoing ships take on salt water as ballast (and salt water organisms) so a freshwater organism like *Bythotrephes* would not be in the ballast water. However, in the spring, St. Petersburg, Russia, is a freshwater port due to runoff from snow melt, and freshwater organisms may be taken into the ballast tanks.

Even though its average length is only 0.4 inch, young fishes are reluctant to eat this species because of the long spine on its tail. The spine often comprises more than 70 percent of the animal's total length and contains from one to four pairs of thornlike barbs. The head consists of a single large eye filled with black pigment. Also present are a pair of mandibles which are used to pierce and shred prey. The animal has four pairs of legs, with the first pair being longer than the others. The first pair of legs is used for catching prey, whereas the other legs grasp the prey as it is being consumed. Behind the head is a pair of swimming antennae, used for propulsion. The ability to swim allows it to encounter prey frequently and be independent of current movements. Like all crustaceans, the spiny water flea must molt its exoskeleton as it grows. However, this animal is unique in that it sheds only the exoskeleton covering its body but not that over its spine.

The spiny water flea exhibits parthenogenesis. Using this method of reproduction, the female may make up to 10 clones of herself asexually. If weather conditions are optimal, the process may only take two weeks. Since males are not needed for parthenogenesis they are rarely found when food is plentiful, or when environmental conditions are good. Sex of offspring is determined by environmental factors instead of genetics. When conditions begin to worsen, females produce male offspring. These males are able to mate with surviving females to produce resting eggs. The resting eggs are released and fall to the lake bottom where they can survive the cold winter. In spring or early summer, the eggs hatch into females to start parthenogenesis again.

The spiny water flea eats smaller herbivorous crustaceans like *Daphnia*, as many as 20 per day. *Daphnia*, however, are also an important food item for juvenile fishes and some crustaceans. Therefore, the spiny water flea is competing with these organisms for food. Reductions in these prey species' numbers may lead to reductions in the numbers of their predators as well.

In Europe, populations of spiny water fleas are controlled by predation from large fish species. Examination of stomach contents has revealed that adult yellow perch, walleye and salmon consume spiny water fleas. If the spiny water flea turns out to be a preferred food of perch and other fishes, it may actually benefit fish populations.

Spiny water flea eggs and adults may be spread in bilge water, bait buckets and live wells. Also, fishing lines and downriggers will often be coated with both eggs and adults. Collected on a fishing line they look like gobs of jelly with black spots.

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