

Math Formulas

The first step toward calculating the area and volume of your lake is to determine its shape. It may not look exactly like any of the examples here, so select one that is closest. After picking a shape, calculate the area and volume using the appropriate formula.

The number of equations you can complete for lake dimensions depends upon the amount of information you have about your lake. If you do not know the average depth of your lake, make an educated guess and do the calculations as a practice exercise. You may also use averages for the length and width.



Illinois
Environmental
Protection Agency

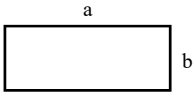
Bureau of Water
P.O. Box 19276
Springfield, IL 62794-9276
217/782-3362

A Log Book of Your Lake

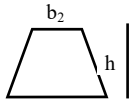
Area:
Area is measured in square units

$$\pi = 3.141592\dots$$

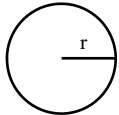
$$\text{Rectangle} = a \times b$$



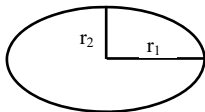
$$\text{Trapezoid} = 1/2 \times h \times (b_1 + b_2)$$



$$\text{Circle} = \pi \times r^2$$

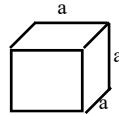


$$\text{Ellipse} = \pi \times r_1 \times r_2$$

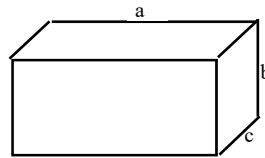


Volume:
Volume is measured in cubic units

$$\text{Cube} = a^3$$

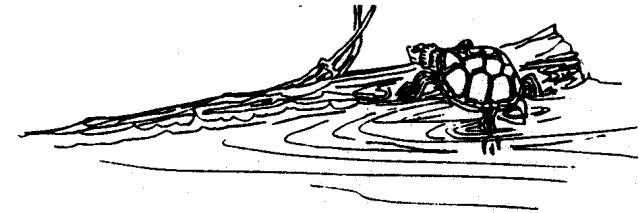
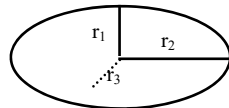


$$\text{Rectangular prism} = a \times b \times c$$



$$\text{Sphere} = (4/3) \pi \times r^3$$

$$\text{Ellipsoid} = (4/3) \pi \times r_1 \times r_2 \times r_3$$



Your Name: _____

School: _____

Date: _____

Lake/Pond: _____

Observations

What type of lake is it?

Impoundment—A standing body of water created by the blockage of a flowing watercourse, as with a berm or dam.

Reservoir—An impoundment often used for water supply or flood control.

Oxbow—A generally horseshoe-shaped lake formed when a meandering stream cuts a new and straighter channel.

Glacial—Lakes formed by the actions of glaciers.

Wetland—Areas where water covers the soil or is

present either at or near the surface of the soil all year

or for varying periods of time during the year,

including during the growing season. (U.S. EPA)

Describe the exact location where you are making

your observations. (Example: I am facing south on the

northeast corner of the lake, 20 feet from a picnic pavilion; use

a compass)

What is the season? How can you tell?

1. A non-free flowing body of water less than 6 acres in size is a

2. A _____ is a non-free flowing body of water greater than 6 acres in size.

3. The non-living components of an ecosystem or habitat are _____ features.

4. Many birds, like the Mallard, _____ south to escape the winter.

5. An _____ is a generally horseshoe-shaped lake formed when

a meandering stream cuts a new and straighter channel.

6. Late summer and fall is a time when many plants disperse their

7. _____ is the study of how organisms interact with their environment.

8. Some insects make their homes inside plant leaves and stems. These bumps

are called _____

9. A standing body of water created by the blockage of a flowing watercourse, as with a berm or dam is an _____

10. A _____ uses energy from the sun and forms the basis of every food web.

11. We experience seasons because the Earth rotates on its _____.

12. The condition of deep sleep that some animals enter during winter is called _____.

13. The living organisms in an ecosystem are known as the _____ features.

14. A _____ disc is an 8 inch diameter black and white disc that is used to determine the transparency or clarity of a lake.

15. Water _____ is a set of tests that scientists conduct to determine water quality.

16. An area within which all water flows to the lowest spot and collects is known as a _____.

17. A _____ is an area which has standing water at least part of the year.

18. _____ lakes are formed by the actions of glaciers. An animal known as a _____ does not have a

19. _____ backbone and is visible to the unaided eye. _____ is an impoundment often used for water supply or flood control.

Answers on next page

Thanks to Robert Savannah, U.S. Fish and Wildlife Service for many of the line drawings.

Vocabulary Word Find

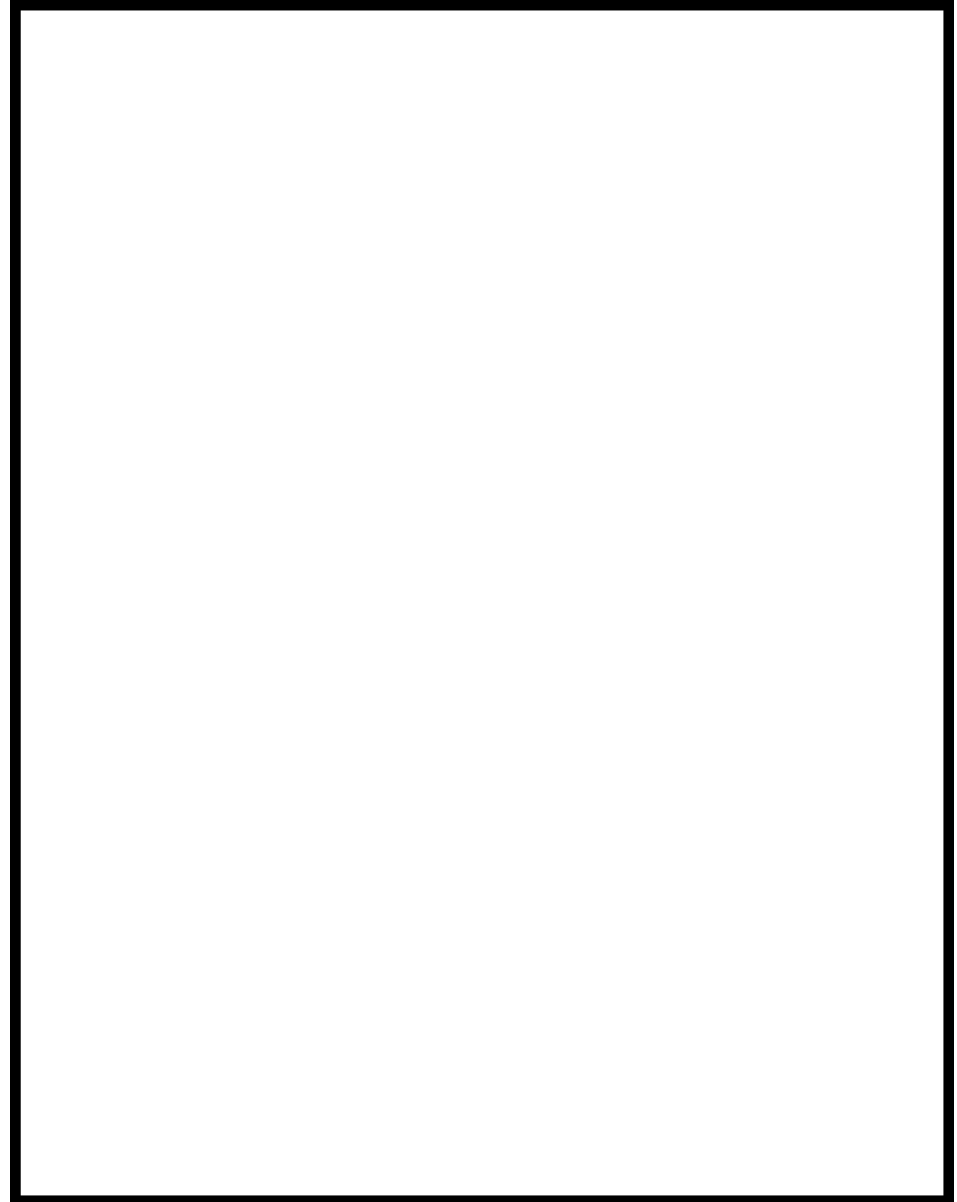


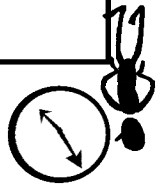
ABIOTIC
AXIS
BIOTIC
ECOLOGY
GALLS
GLACIAL
HIBERNATION
IMPOUNDMENT
LAKE
MACROINVERTEBRATE

MONITORING
MIGRATE
OXBOW
PLANT
POND
RESERVOIR
SECCHI
SEEDS
WATERSHED
WETLAND

Draw your lake:

Add all information that you have about your lake. This can include adding creeks or rivers flowing in and out of the lake, as well as major roads, parks, and other areas of interest around the lake. Also indicate which direction is north.





Monitoring

Measure the abiotic (nonliving) components of the ecosystem.

Date/time: _____
 Air temperature (C°/F°): _____

Soil temperature (C°/F°): _____
 Depth (feet): _____

Water temperature (C°/F°): _____
 Depth (feet): _____

Last rain: _____
 Date/time: _____

How much precipitation (cm/in): _____

Weather now: _____

Wind speed (mph) and direction: _____

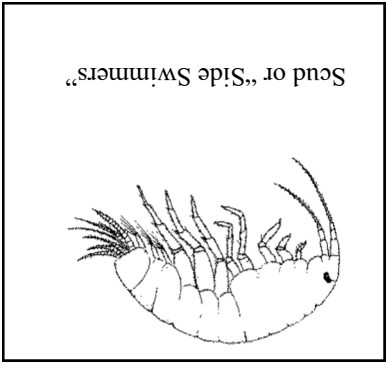
Water clarity (inches): _____

Water color: _____

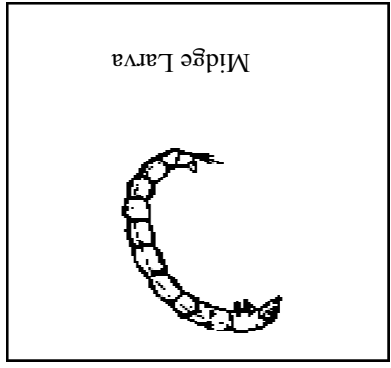


Other observations: _____

Group III: These organisms are **fairly tolerant** (somewhat not sensitive) to pollution and can be found in moderately polluted water.

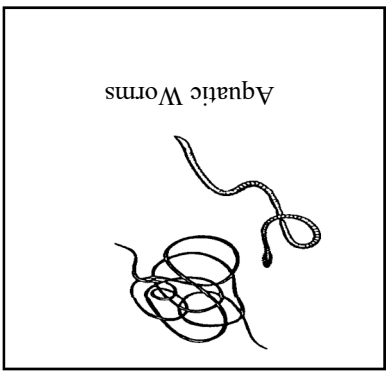


Scud or "Side Swimmers"

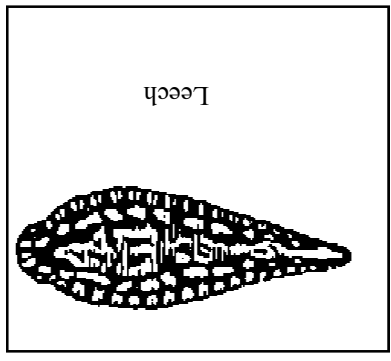


Midge Larva

Group IV: These organisms are **tolerant** (not sensitive) to pollution and can be found in any water quality.

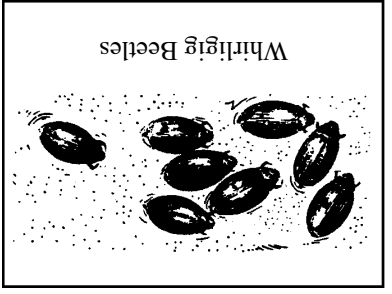


Aquatic Worms

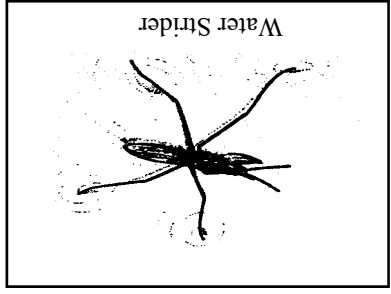


Leech

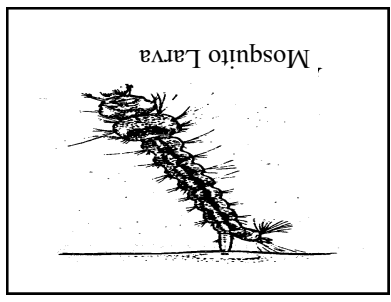
Other "macros" that may be present



Whirligig Beetles



Water Strider

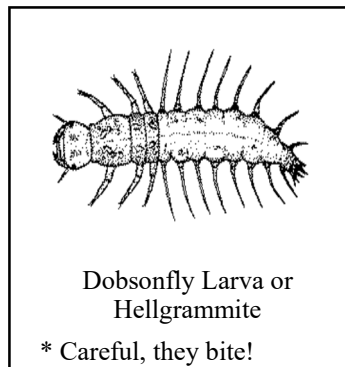
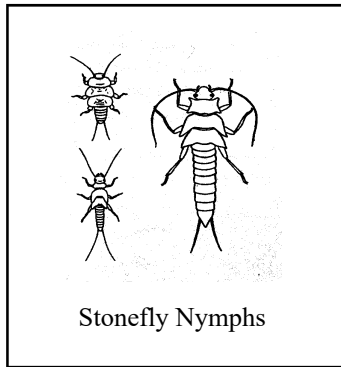


Mosquito Larva

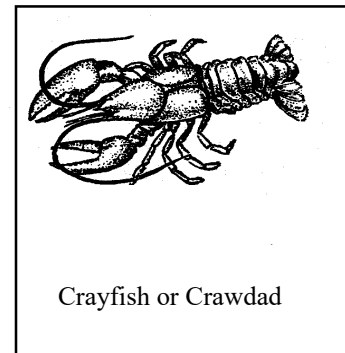
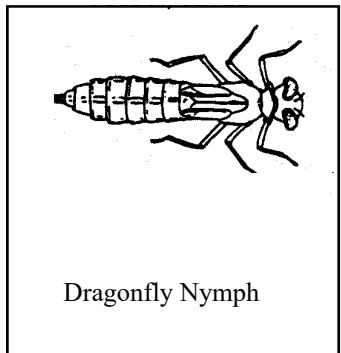
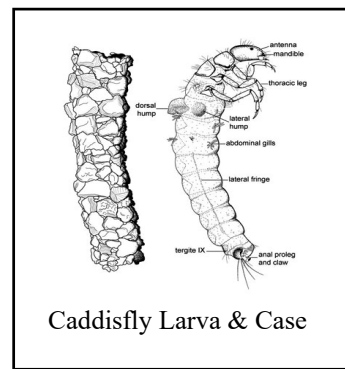
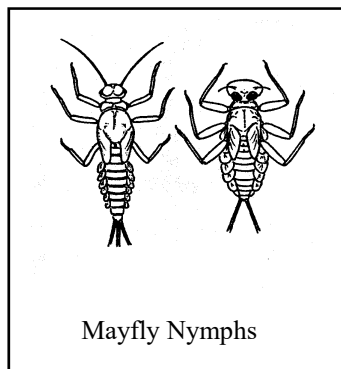
* Hint * More macros may be found in streams leading into lakes and/or ponds.

Macroinvertebrates - Organisms that lack backbones and are visible to the unaided eye. Some “macros” can help to determine the water quality by their tolerance, or intolerance, to pollution. A high macroinvertebrate biodiversity indicates good water quality.

Group I: These organisms are **intolerant** (very sensitive) to pollution and indicate good water quality.



Group II: These organisms are **moderately intolerant** (somewhat sensitive) to pollution and indicate fair water quality.



Let's Think Math!

Note: see back page for formulas

Lake dimensions (averages)

*Don't forget to include your units of measurements!

Width:

Length:

Depth:

Area:

Volume:

Watershed dimensions

Area:

How does your lake size compare with your watershed size?

Area ratio:

Land use around the lake:

Agriculture _____ %

crops: _____ %

livestock: _____ %

Homes: _____ %

Roads/Parking Lots: _____ %

Forest: _____ %

Prairie: _____ %

Other: _____ %



Is your lake natural or manmade? _____

*Did you know that approximately 95% of Illinois lakes are manmade? Out of the remaining 5% that are natural, 2% are glacial and approximately 3% are oxbows.

If your lake is manmade...
When was it built? _____

Why was it built? _____

What was there before the lake? _____

How has it changed (or currently affects) the ecology of the area? _____

How has it changed (or currently affects) the economy of the area? _____

Collect a Water Sample!

After collecting the water sample, what did you find? Do any of the organisms match the macroinvertebrates on the next two pages? Draw or describe what you found. A magnifying glass or microscope could be useful.

Animal Investigations!

Are there animals in or around your lake? How do you know? Describe some evidence of the animals listed or drawn on the previous page.



Hint: Look for examples of animal tracks, feeding signs, burrows and nests



What are the lake uses?



Describe

- Boating
- Fishing
- Swimming
- Drinking Water
- Hiking
- Agriculture
- Hunting
- Other

Is there a nature preserve, animal sanctuary, fish hatchery, park, campground, or landmark associated with the lake? _____

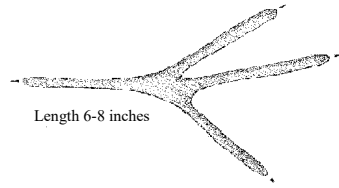
What else could your lake be used for?

Animal Tracks

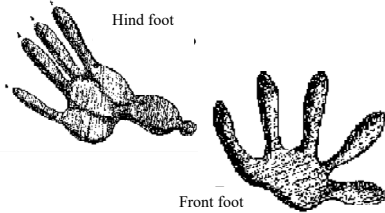
striped skunk
long front claws for digging



great blue heron



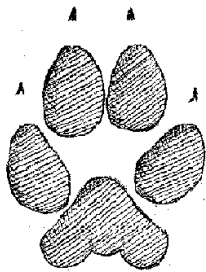
opossum



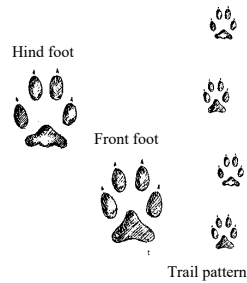
snake



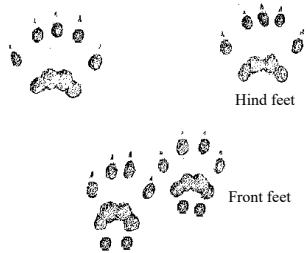
coyote



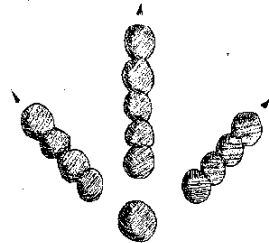
gray fox



gray squirrel

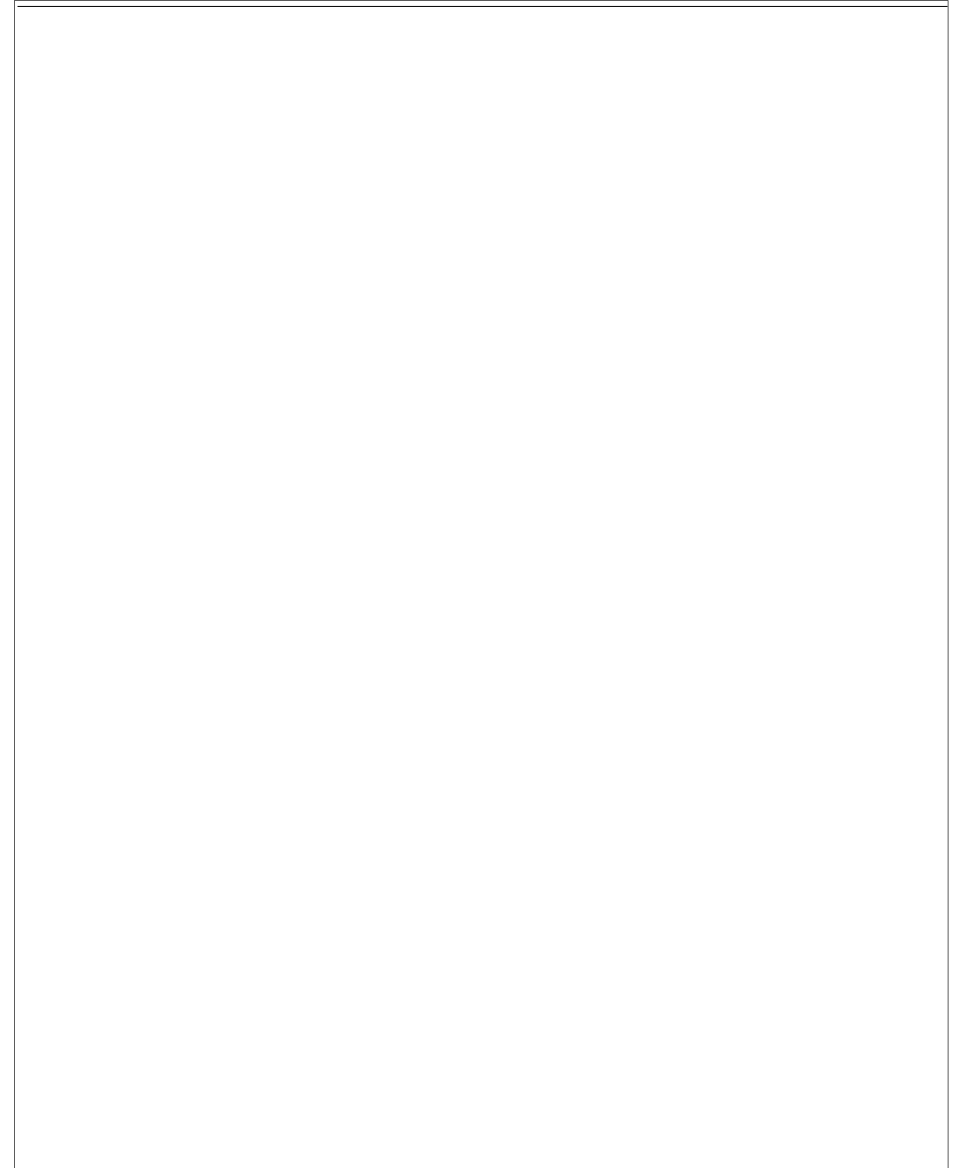


wild turkey



Draw your lake! Include things that are found in and around it

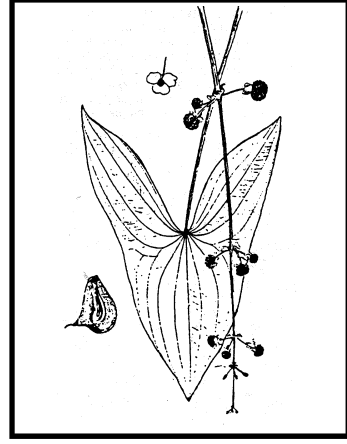
Note: There are examples of plants and animals on the following pages.



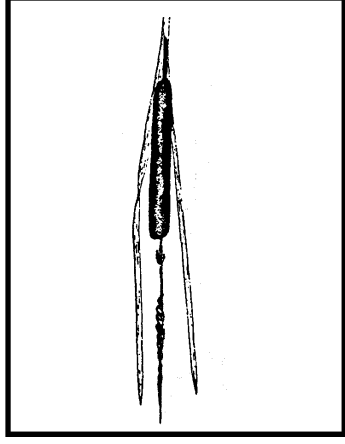
Aquatic Plants

Are these plants in your lake? Describe the location, number, color, etc., below for each plant.

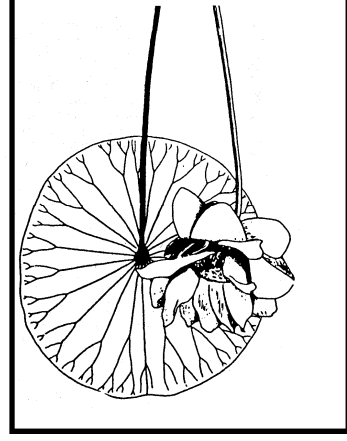
Emergent Plants—Plants that grow above water in the shallow areas of lakes and ponds and along the shoreline.



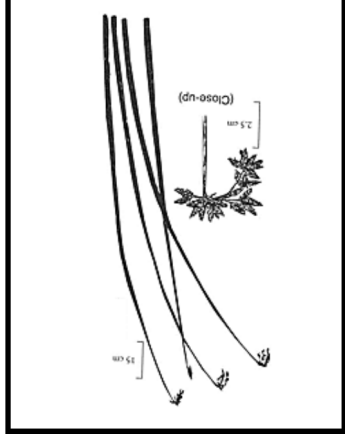
Arrowhead



Cattail



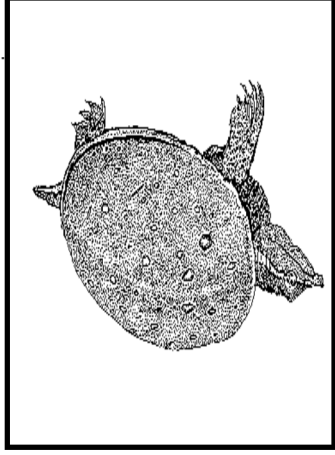
American Lotus



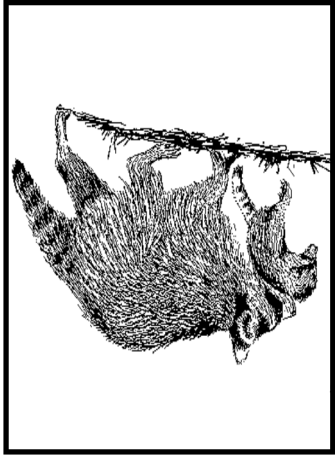
Bulrush

Other Animals In and Around the Lake

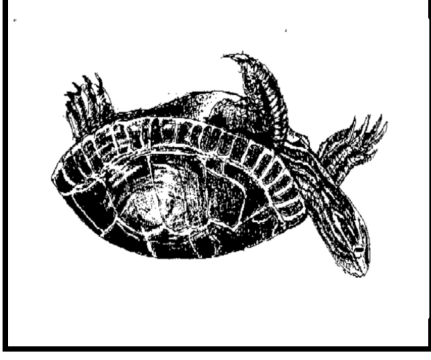
Spiny Softshell Turtle



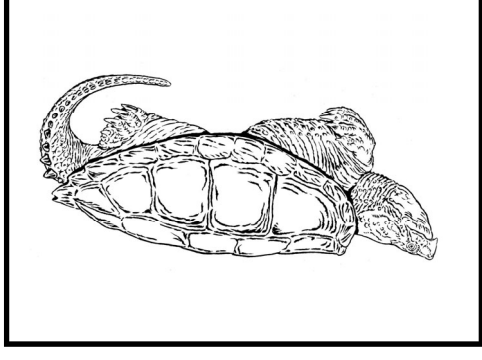
Raccoon



Painted Turtle



Common Snapping Turtle



Birds of the Lake

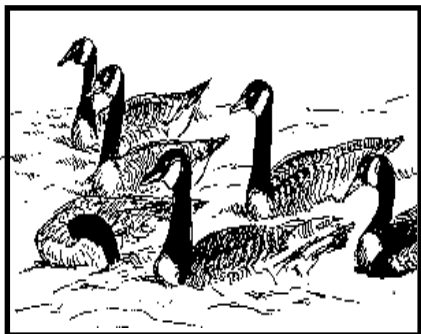
Snowy Egret



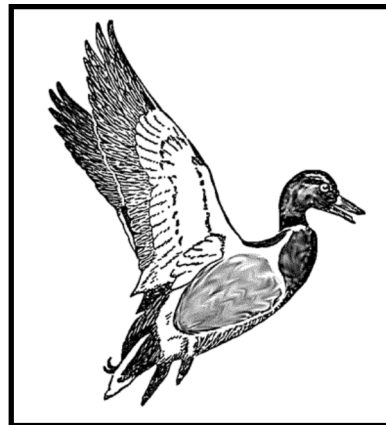
Great Blue Heron



Canada Geese



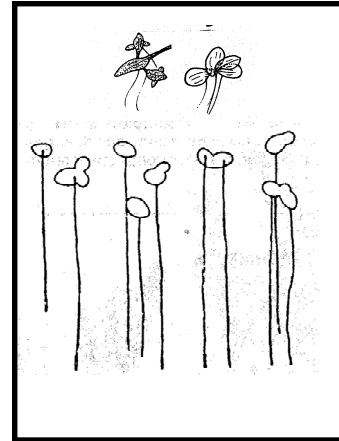
Mallard Duck



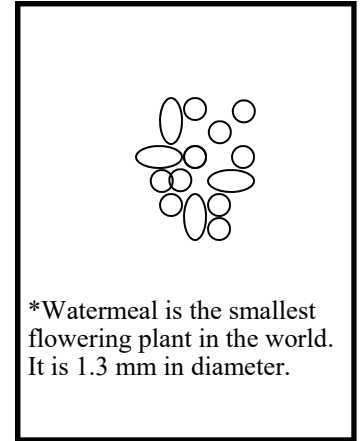
Aquatic Plants

Free Floating Plants—Plants that are not attached to anything and freely float on the surface of the water.

Duckweed



Watermeal



Submersed Plants—Plants that have most of their leaves growing below the water surface.

Common Elodea

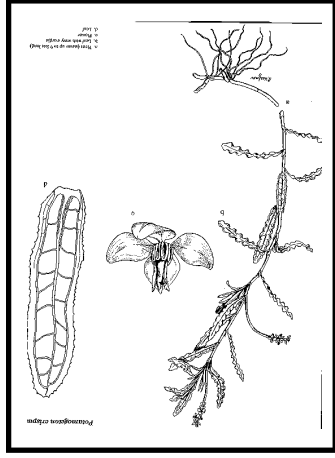


Illinois Pondweed

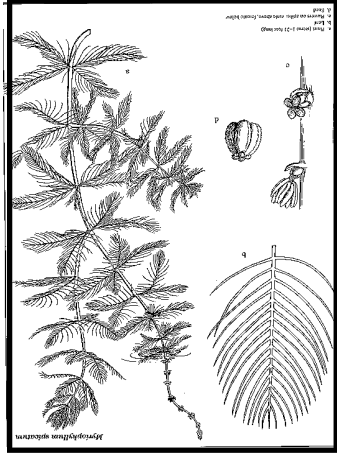


Aquatic Plants

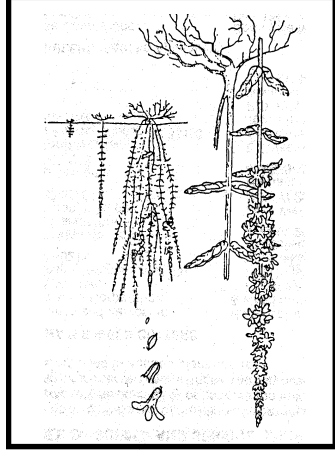
Invasive Plants—Plants that are not native to an area and are capable of causing harm.



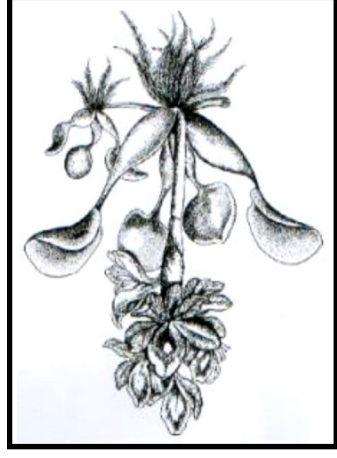
Curly Leaf Pondweed



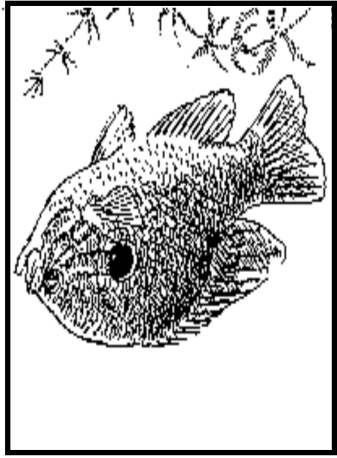
Eurasian Water Milfoil



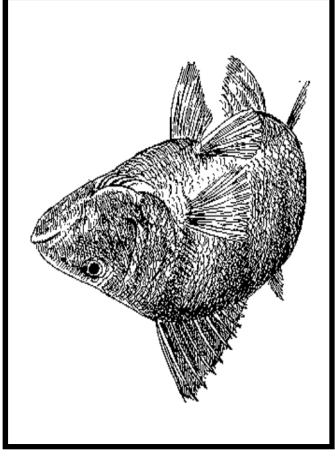
Purple Loosestrife



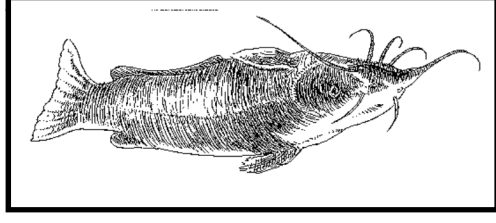
Water Hyacinth



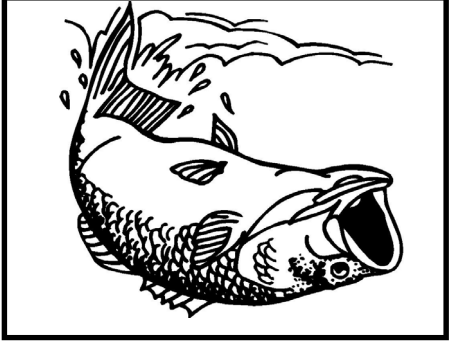
Sunfish



Walleye



Yellow Bullhead



Largemouth Bass

Fish