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ABSTRACT

This instructional guide contains 19 activities and exercises designed to help teachers familiarize their students with the wetland resources of Illinois. Each activity or exercise is ready to be copied and given to students. They include: (1) making a largemouth bass model; (2) building a wetland ecosystem; (3) investigating problems that threaten wetlands; (4) working as a wetland manager; (5) visiting a wetland area; and (6) examining a fictional account taken from the journal of a young boy living and writing in modern day Illinois. The latter is recommended for all students because it provides a broad overview of Illinois' wetland heritage. Although the materials are probably best suited for students in grades 4-8, most of the activities can easily be adjusted to match the skill level of nearly every primary and secondary grade. A recommended list of appropriate exercises and portions of exercises/activities for grades K-12 and instructional strategies are included. (JN)

Special Theme: Wetland Ecology and Management

ILLINOIS NATURAL HERITAGE CONSERVATION EDUCATION KIT IV

Illinois Department of Conservation Illinois State Board of Education 524 South Second Street Springfield, Illinois 62706

ILLINOIS NATURAL HERITAGE Conservation Education Kit IV

About this Educational Kit:
Wetland Ecology and Management is the special theme of this Kit. The nineteen exercises and activities included in this Kit are designed to help teachers familiarize their students with the wetland resources of Illinois. Although the materials are probably best suited for students in grades 4-8, most of the exercises can be easily adjusted to match the skill level of nearly every primary and secondary grade.

Natural Heritage Month:
As Natural Heritage Month in Illinois, April presents itself as a good time for teachers to use the contents of this Kit. Natural Heritage Month includes the observances of Earth Day (usually the third Tuesday), Arbor and Bird Day (the last Friday) and Bird Appreciation Week (the last week). Though the activities and exercises in this Kit can be used in relation to these special days in April, the materials are always topical and can be used at any time of the year.

Clean Streams Month:
May is Clean Streams Month in Illinois. The theme for this special month is "take action for clean water." Since this Kit emphasizes water resources, its activities and exercises can be helpful to teachers undertaking special projects during May. For more information about Clean Streams Month, teachers can contact the Office of Public Participation, Illinois Environmental Protection Agency, 2200 Churchill Rd., Springfield, IL 62706, (217) 782-3397.

Giant Wetland Coloring Page:
A special feature of this Kit is the inclusion of a **wetland coloring page** which features 31 native Illinois plants and animals. The **coloring page** serves as an important visual reference for students as they complete exercises in the instructional guide.

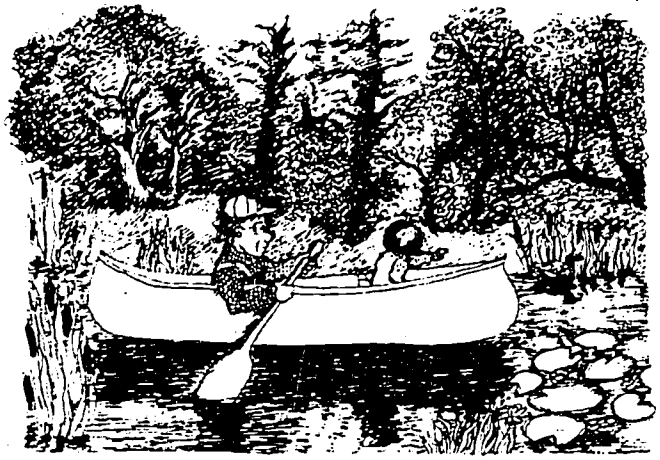
Building a Wetland Ecosystem:
Students are given the opportunity in this Kit to build their own wetland ecosystem by cutting out the plant and animal species as presented on pages 18-48 of the instructional guide. Students can then place the plants and animals together to build a wetland ecosystem. Students can arrange the features of the ecosystem as they please or they can follow the Giant Wetland Coloring Page as a guide. Students are also asked to cut out and label the children drawn in Chapter 12 as representatives of themselves. They can place the children in the ecosystems they build to affirm their role as the caretakers of Illinois' wetlands.

Step into the Wild
A special **"Step into the Wild"** achievement coupon appears at the top of nineteen exercises in this Kit. Students who complete those exercises are asked to cut out the coupons and paste them onto the **Wetland Challenge Page** (3). Students who send in at least one coupon on their Wetland Challenge Pages to the Illinois Department of Conservation at the address shown below will receive a conservation button entitled **"Step into the Wild"** and featuring the river otter. To speed mailing, teachers are asked to gather Challenge Pages and send them in together as classroom sets.

Let us Hear from You
Teachers and resource interpreters who use this Kit are asked to please complete the Teacher Questionnaire included in this Kit. Since this Kit is the fourth in a five part series of conservation/education Kits, the comments and suggestions we receive from the teacher questionnaires will be very helpful as we prepare the remaining Kit. Please help us make these educational materials useful and interesting by completing the questionnaire and mailing it to the address below. Please use the flip side of the teacher questionnaire to order more conservation/education materials from the Department of Conservation. We would like to call your attention to the fact that we will send a classroom set of the **Giant Wetland Coloring Page** to any Illinois teacher or resource interpreter.

Illinois Department of Conservation
life and land together

Communications Program
Division of Forest Resources and Natural Heritage
Lincoln Tower Plaza
524 South Second Street
Springfield, Illinois 62706



This Illinois Natural Heritage Conservation Education Kit was prepared by THE NATIONAL ASSOCIATION OF YOUNG NATURALISTS for the Illinois Department of Conservation. The project is also sponsored by the Illinois State Board of Education and approved by the Illinois Advisory Board of Conservation Education.

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SPECIAL NOTE: This Kit is the fourth in a five part series. Kit V, featuring "Special Habitats Ecology and Management," will be available in the spring of 1985. Due to high demand, teachers should send an advance order for Kit V to the address on page 1 as soon as possible.

Illinois Department of Conservation

Division of Forest Resources and Natural Heritage

This Kit is endorsed by the following organizations as a valuable program for teachers and students seeking to learn more about Illinois' wetland heritage. Teachers are encouraged to write to each of these organizations to obtain more useful conservation education materials.

National Audubon Society

950 Third Avenue
New York, NY 10022

Environmental Education Association of Illinois

7600 Appleton Rd., Belvidere, IL 61008

ILLINOIS department of AGRICULTURE

Illinois State Fairgrounds, Springfield, Illinois 62706

Illinois Environmental Protection Agency

2200 Churchill Rd.
Springfield, IL 62706

Illinois State Board of Education

100 N.First St., Springfield, IL 62777

Illinois Environmental Council

407½ East Adams St., Springfield, IL 62701

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March, 1984 20M P.O. 40476

A Wetland Challenge

Dear Student:

We invite you to a **Wetland Challenge.** There are 19 exercises in this Kit that bear a special **Wetland Achievement Coupon.** We challenge you to complete as many of these exercises as you can. For every exercise you complete, cut out the **Achievement Coupon** and paste it onto one of the circles shown on the **Wetland Challenge Page.** Then mail your page to the Illinois Department of Conservation. If you have at least one coupon on your page, we will send you the special conservation button **"Step Into the Wild."**

As you work to meet this challenge, remember that you are working with one of Illinois' most precious resources, her wetlands. These wetlands are the natural homes of many beautiful plants and animals and they provide all Illinoisans with an opportunity to boat, swim, fish, hunt and observe nature. And don't forget, our wetlands are the holding tanks for one of our most important assets - **WATER.**

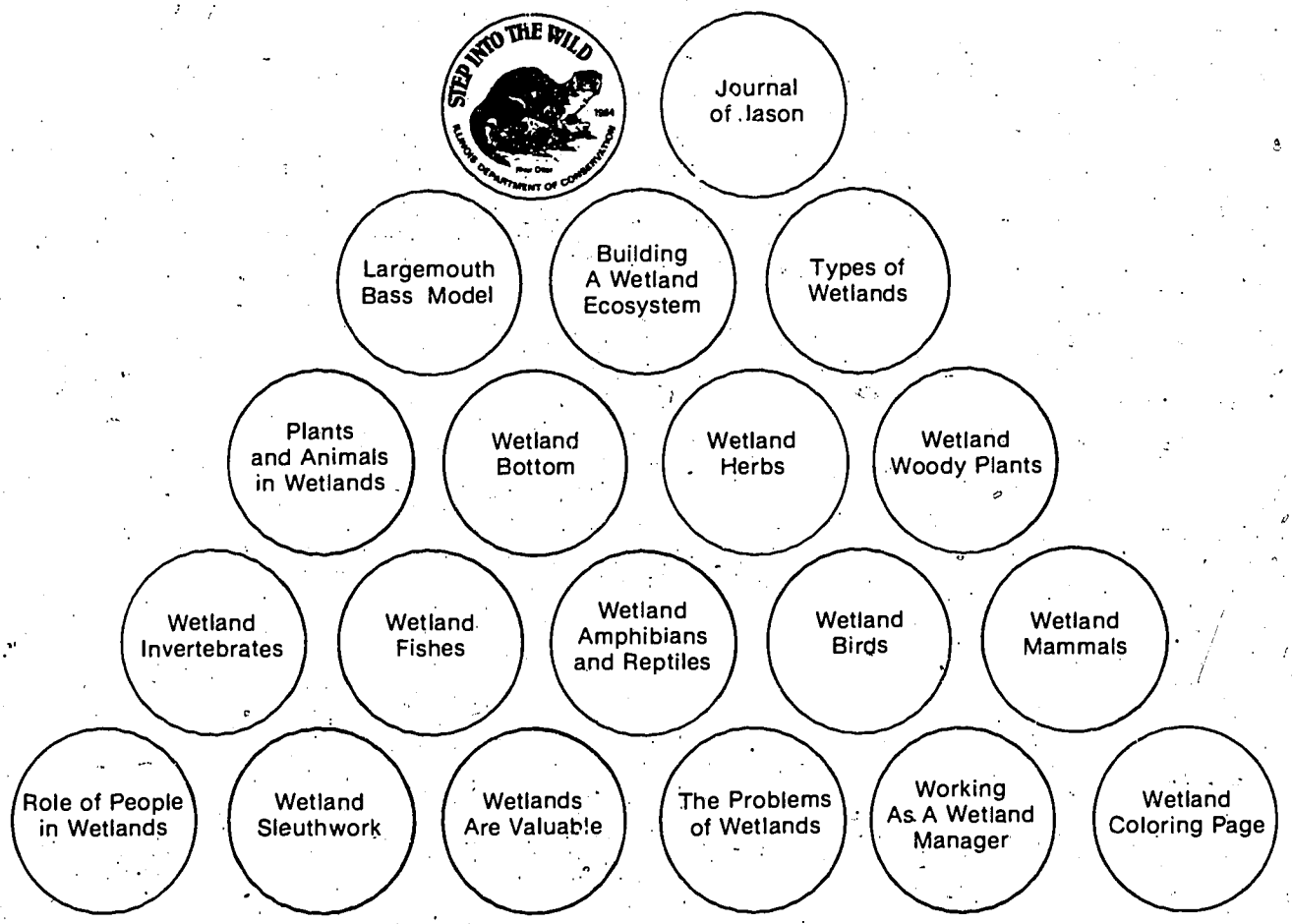
This challenge will not be an easy one and you will have to work hard to succeed. For your first assignment, you will read the journal of a young Illinoisan named Jason. You will also be asked to build your own wetland ecosystem, complete with over 60 plants and

Next you use your spy talents as you conduct sleuthwork investigation. Then as a wetland you will have to examine the proble our wetlands. And you will have to answer questions about what we can all do to help c valuable wetlands.

There is one im thing we want you to keep in mind as you com the exercises in this Kit. Even though you will be co pleting most of these exercises in your classroom and writing your answers down on paper, that doesn' mean that your hard work is only practice. Each tim you learn something new about our wetlands, you are doing something very real and valuable. And whe you share what you have learned about wetlands with others, you are making a concrete contribution to conserving our wetlands. For you see, the more we know about wetlands the more we can do to preserve them. That is what this special kit is all about. So get working and **GOOD LUCK!**

Sincerely,

David Kenney
Director
Illinois Department of Conservation



Background Information for Teachers

Content

This Kit features wetland ecology and management. For the purposes of this Kit, we have broadened the scope of the term wetland to include all natural water habitats, including streams, lakes and ponds. More commonly, wetlands refer to shallow water habitats such as marshes and swamps. Also in order to simplify the materials for students, we have taken the liberty to distinguish rivers from streams. Normally, the term stream is used to describe all moving water systems larger than creeks and brooks. Since space is limited in this Kit, we have focused on the most common types of wetlands in Illinois: rivers, streams, lakes, ponds, marshes and swamps. We recommend teachers also discuss the less common types of wetlands, including wet meadows and prairies, sloughs, bogs, fens, seeps and springs. We have used the swamp ecosystem to familiarize students with forested wetlands but we recommend a brief discussion of floodplain forests as well.

Philosophy

The philosophy behind the development of this Kit is that **understanding leads to appreciation.** In terms of conservation education, we believe that exercises expressing a need for responsible management of natural resources are not enough to instill a sense of that responsibility in each child. Instead, we contend the child must first develop a personal relationship with our natural resources. That relationship can be built by helping the child understand the ecology of ecosystems. That understanding can give the child a sense of mastery as well as a feeling of investment in our natural resources. Once that bond is established, the child can be introduced to his or her role as a caretaker of natural resources. We believe the child will then develop a deeper appreciation of that role because his or her understanding of natural resources will have led him or her to feel a personal stake in their conservation. For those reasons; this Kit is divided into two parts: The first part is devoted to teaching the child about wetland ecology; the second part deals with the management of wetlands and emphasizes the individual's responsibility for that management.

Format

This Kit is designed to be a series of build-it-yourself exercises. In each exercise, the student is asked to put information together with illustrations to build the theme(s) of the exercise. Each exercise is ready to be copied and given to students. In addition, the instructions for each exercise speak directly to the student.

Grade Level Appropriateness

The following is a recommended list of appropriate exercises and portions of exercises for grades K-12. It is only a suggested list. We realize teachers will best be able to access the suitability of exercises for their students.

Kindergarten-3rd Grade - Giant Wetland Coloring Page. Wetland Challenge Page. Journal of Jason. (For Chapters 1-12, teachers can adapt the exercises to make the work easier for younger students. We recommend reading and completing the Work Steps for each exercise as a class. Individual students, or groups of students, should be able, however, to cut out the plants and animals in the Field Guides to build their own ecosystems.) Building A Wetland Ecosystem. Types of Wetlands. Kinds of Plants and Animals in Illinois Wetlands. The Wetland Bottom. Wetland Herbs. Wetland Invertebrates. Wetland Amphibians and Reptiles. (Work Steps 1 and 4.) Wetland Birds. Wetland Mammals. (Work Steps 1 and 4.) The Role of People in Wetlands. (Work Step 1.) Wetland Sleuthwork. (Teachers may choose to use only portions of Sleuthwork and/or adapt strategies.) Wetlands Are Valuable.

Grades 4-6 - All exercises, including the fish model.

Grades 7-9 - All exercises, including the fish model.

Grades 9-12 - All exercises, especially the management exercises on pages 52 through 59. To maximize the challenge of this work for older students, teachers can ask students to follow an alternate strategy for completing the word pictures. Instead of asking the student to copy the clue-and-numbered-sentences onto the blank lines in the word pictures, ask the student to fill in the blank lines with his or her own statement. In other words, ask the student to develop his or her own explanation to approximate the meaning of each clue or numbered sentence.

Special Instructions For Exercises

Giant Wetland Coloring Page: Students can refer to pages 18-48 for clues about the coloration of plants and animals included on the Page. **One Coloring Page is enclosed in this Kit. Classroom sets of the Page can be ordered by completing the Teacher Questionnaire included in this Kit.**

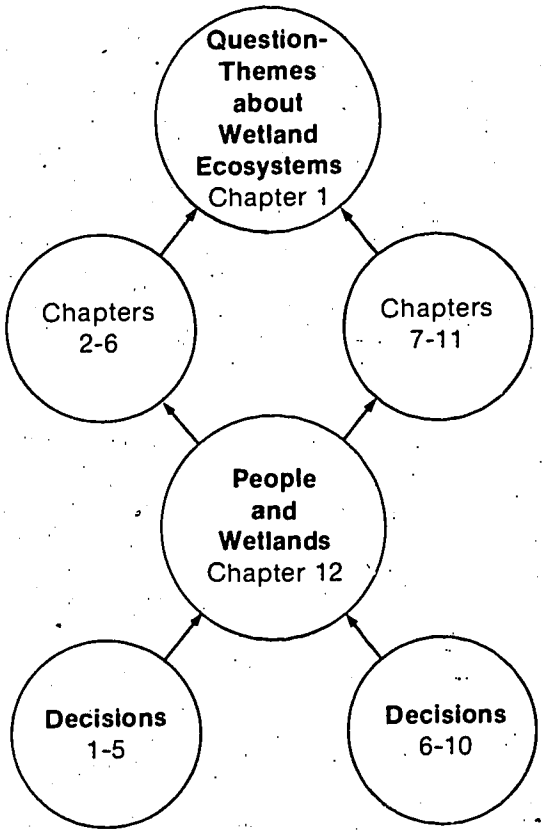
Wetland Challenge Page: (Page 3) Teachers are asked to please send Challenge Pages as classroom sets to the Department of Conservation at the address shown on Page 1 of the instructional guide.

Journal of Jason: (Pages 8-14) This journal is the fictional account taken from a young boy living and writing in modern day Illinois. This exercise is recommended for every student using the Kit because it provides a broad overview of Illinois' wetland heritage. The journal also introduces students through the eyes, spirit and fascination of someone their own age to the wonders of a wetland ecosystem. To tie the journal even more closely to the student's own experience, the journal is based on one that is being completed as an exercise of this Kit. By working on the journal, the student can share this Kit with the fictional youngster, Jason. We recommend completion of the Journal's questions in the same order that Jason is given them by his teacher.

Largemouth Bass Model: (Pages 6-7) This model is easy to put together and the result is a remarkably accurate model of a largemouth bass. The entire pattern page should be glued to construction paper before cut-out. All coloring should be done before cutting and gluing. Use white glue instead of paste. We recommend hanging the model by a string.

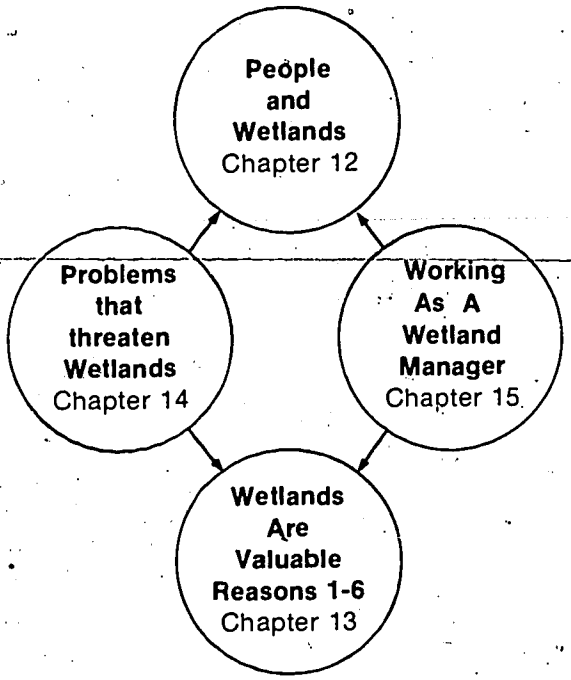
Building a Wetland Ecosystem: (Chapter 1-12 on pages 15-51) Through the individual chapters in this section, the student is introduced to the ecology of wetland ecosystems. **The entire section is organized**

thematically on the basis of the eleven Questions About Wetland Ecosystems in Chapter 1. By matching the clues in front of those questions with the same clues in Chapters 2-11, the student will be able to answer those questions. The intended result is that the student will learn how a wetland ecosystem functions ***while*** working with the components (herbs, woody plants, fish, birds, etc.) of the ecosystem. But the student's work should not stop there. It is our intention to stress the relationship of people with wetland ecosystems. The student first works with that relationship in Chapter 12. Within that Chapter, the student learns that we have a responsibility for the well-being of wetlands because we are the land-use decision makers in Illinois. The student is then given 10 land-use decisions that people have made in regard to wetlands. Next the student matches the clue before each decision with the same clues in Chapters 2-11. The intended result is that the student will learn how our decisions affect wetlands based upon the information he or she has compiled to complete Chapters 1-11. Drawn below is a diagram of the thematic organization of the entire section.



Once students have completed Chapters 1-12, they are given the option to cut out all of the plants and animals in the **Field Guides** to arrange and build their own wetland ecosystems. They are also asked to cut out the children drawn in Chapter 12 and place the children as representatives of themselves in their ecosystems. They can then color the ecosystems. Instructions for this component are included in Work Step #3 of Chapter 2.

WETLANDS ARE VALUABLE, PROBLEMS THAT THREATEN WETLANDS, WORKING AS A WETLAND MANAGER. (Chapers 13-15 on pages 52-59) These Chapters constitute the management portion of the Kit. Chapter 12 (pages 49-51) serves as a link between the ecology portion (Chapters 1-11) and the management portion. Since these management Chapters build upon each other, they should be completed in the order they appear. Drawn below is a drawing of the thematic scheme of this portion of the Kit as well as the tie between it and the ecology portion of the Kit.



Wetland Sleuthwork: (Pages 60-64) This is the outdoor activity of the Kit. The exercise is designed to work in any type of wetland. For best results, the students should be encouraged to use the work they have completed in Chapters 1-11, especially the plant and animal **Field Guides,** to conduct their sleuthwork. ***Teachers are asked to use every precaution to protect the natural habitat of the wetland the class investigates. Also, please be sure to obtain the permission of the landowner before visiting a wetland. The Wetland Sleuthwork Certification Card for each child who completed the exercise is shown below.

This card officially certifies

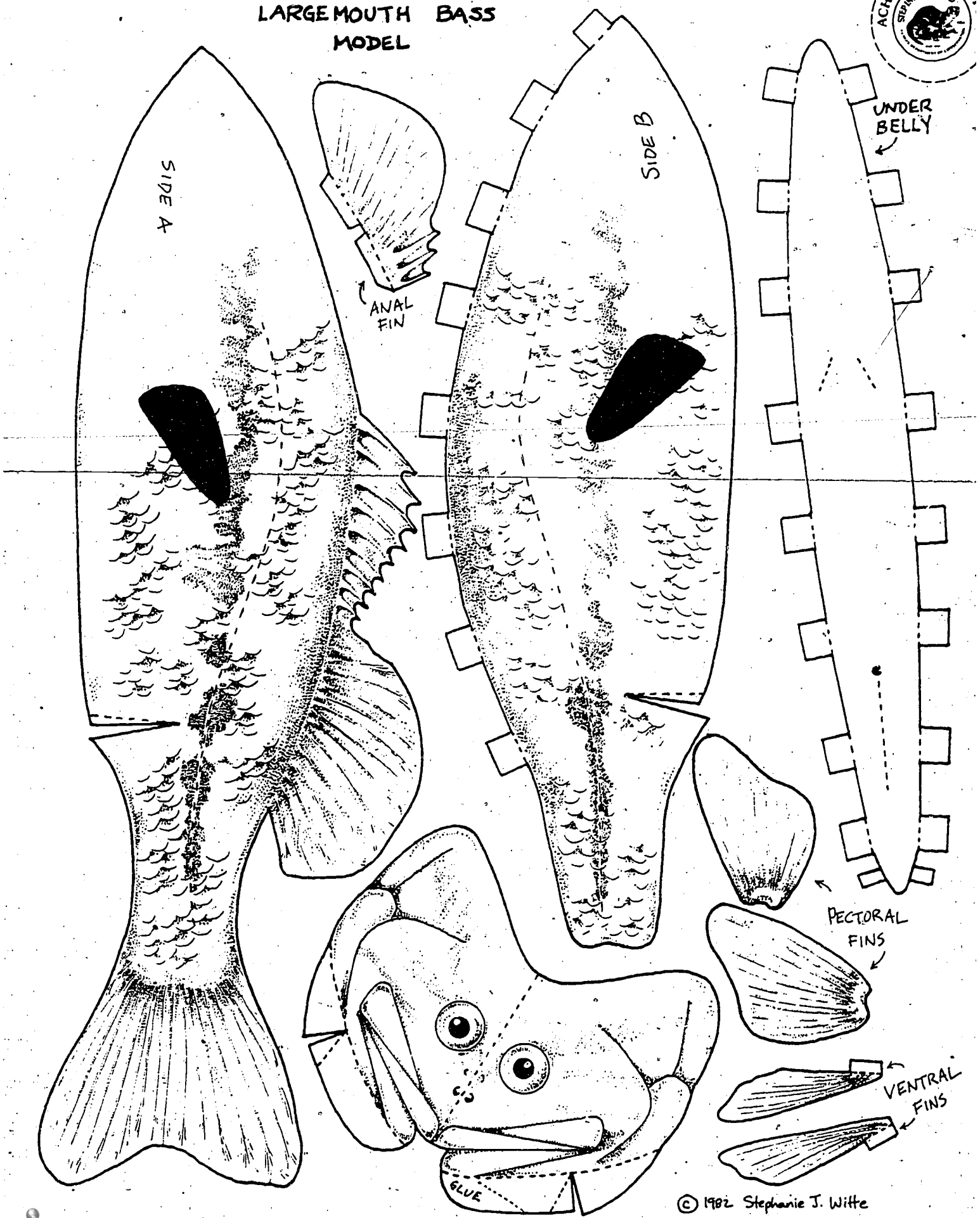
_____

as an Illinois Wetland Sleuth.

Date: _____

Presented by the Illinois Department of Conservation

LARGEMOUTH BASS MODEL

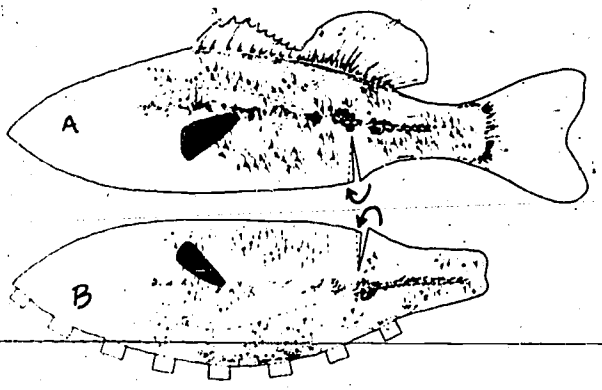


LARGEMOUTH BASS

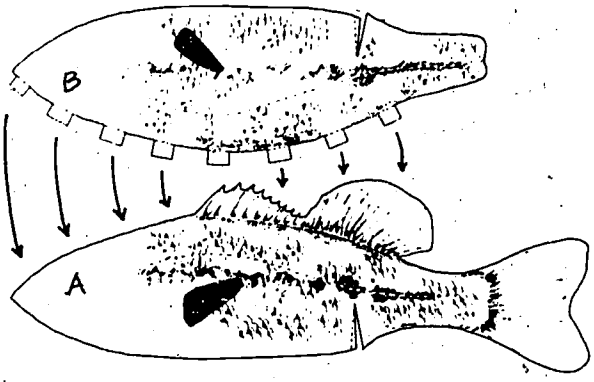
Instructions for Assembly

1. Cut out all of the lines on the solid lines.

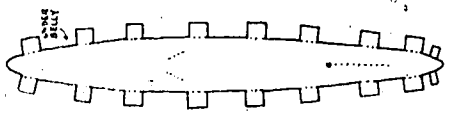
2. On sides A and B, glue the area shown below over to the dotted line.



3. Glue side A to side B. Fold the flaps on side B on the dotted lines. Then glue the flaps to the upper edge of side A.

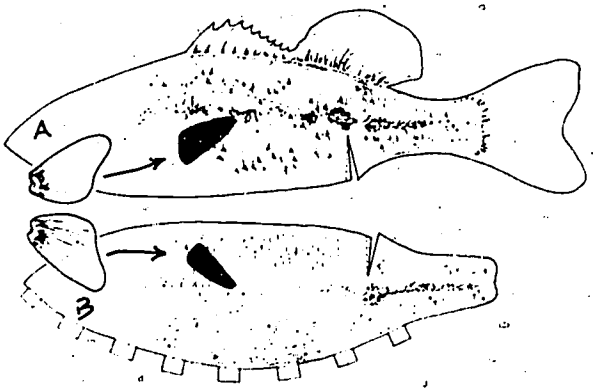


4. Glue underbelly piece to sides. Fold flaps on dotted lines of underbelly and glue to sides.

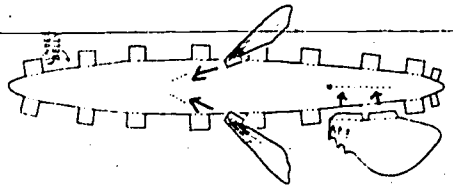


It will look like this :

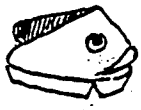
5. Glue pectoral fins over shaded areas on sides A and B.



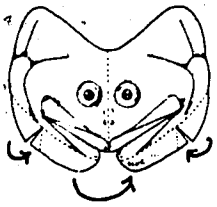
6. Glue ventral fins to short dotted lines on underbelly and glue anal fin on dotted line on underbelly.



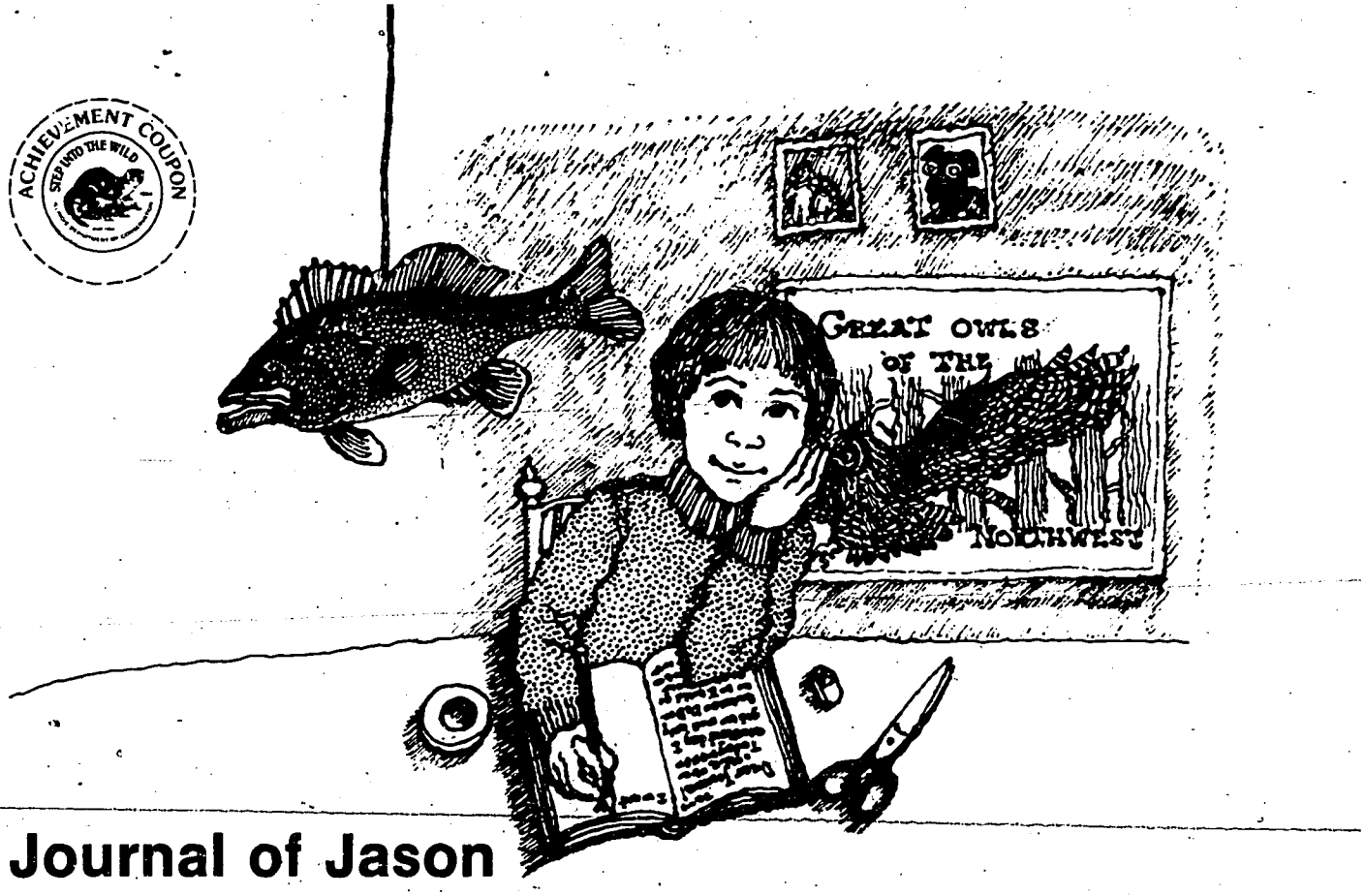
7. Fold head on dotted lines.



8. Glue areas shown below over to dotted lines.



9. Slide head over front and glue in place.



Journal of Jason

Dear Journal: April 18, 1984

Today in school, our teacher, Mr. Weinman, gave us a very special workbook. It's called the "Illinois Natural Heritage Conservation Education Kit IV." This Kit is all about the wetlands of Illinois. If we can complete the assignments in the Kit, the Illinois Department of Conservation will send each of us a really terrific button called "STEP INTO THE WILD". There is a picture of a river otter on the button, and I can't wait to start working to get my button.

The first part of my assignment is to answer these questions:

1. What are wetlands?
2. How were wetlands formed?
3. How many acres of wetlands were in Illinois when it was settled?
4. How many acres of wetlands are in Illinois now?
5. Why are there less wetlands now than when Illinois was settled?

Mr. Weinman said we should interview someone to find the answers. I'm really excited because I know just who to ask. Tomorrow is the beginning of our spring vacation, and I'm going down to the marsh by the river with a pencil and you, Journal.

Dear Journal: April 19, 1984

Today was a great day. Mom and dad woke me up at 5:30 this morning. I was kinda sleepy, but I knew I had to get to the marsh early to catch him. I hopped on my bike and rode down the old river road. When I reached the marsh, I hid my bike behind an old cottonwood tree and walked down the levee road that runs down the middle of the marsh. To tell you the truth, Journal, I was kinda scared. It was still fairly dark and so quiet. I took a deep breath, clutched my binoculars, and kept walking. And then, Journal, I stopped dead in my tracks. "Oh, my gosh, what is that?" I thought.

A great big blue-gray animal was on the levee in front of me. It was tall and slender, and it walked on long, yellow legs. And its neck, oh, Journal, its neck was long like a giraffe's. Its beak was also real long and pointed. Its beak looked like a yellow dagger. The animal was walking very delicately, looking around slowly. And then, Journal, it saw me. We were face to face. Time seemed to stop. I was shivering. What was going to happen?

It moved first. It started running. Scared to pieces, I hit the ground belly first. Then it spread its wings and took to the air. It made a quick circle above me and headed in the direction of the river. I tell you, Journal, all I could do was lie there, quaking in my tennis shoes.

Then something happened that made me wish I'd never left my cozy bed. All of a sudden, a great big hand came down and squeezed my shoulder. Just before I closed my eyes to pretend I was having a bad dream, I saw a gigantic boot step down in the mud beside my face.

"There's no need to be afraid, my little friend," a voice said. "That was one of the most beautiful birds in all of nature. No, Jason, the great blue heron would never harm you. That big ole bird is our friend."

Journal, when the booted person said my name, I breathed a sigh of relief. I looked up and there he was - the very person I had come to see. There was my Uncle Duck. Everybody has always called him Duck because he spends so much time down here along the river with the ducks. Now I know he's also been spending some time with a fantastic bird called the great blue heron.

I jumped right up and gave him a big hug. Then I started blasting questions at him. "Tell me about the wetlands. What are they like? What animals live in them?"

"Whoa," my Uncle Duck said, "Slow down there a minute, and I'll tell you everything you want to know."

We walked over to a big, fallen tree lying on the levee and sat down. My uncle was sipping coffee from a cup; the sun was coming up, and the quiet world of the marsh was exploding with sounds of singing birds. I began to believe my mission was going to be successful.

I showed my uncle my questions and he started talking in his slow, quiet way. "Well, Jason, I've spent a lot of my life in wetlands and I know just what they are like. A wetland is any place where there is both water and land. A wetland can be a river, stream, lake, pond, swamp, or a marsh, like the one we are in now. It's very simple, Jason. If you're out in the country, and you get your feet wet, you're probably at the edge of a wetland.

"Wetlands got started in a very interesting way," my uncle said next. "About 10 or 12 thousand years ago, much of what we now call Illinois was covered by gigantic sheets of ice called glaciers. And, as you might imagine, the weather here was very cold. But then, Jason, the weather started to warm up. The glaciers started to melt and break up. Chunks of the glaciers settled into low-lying valleys. When the chunks melted, the water filled up the valleys to form lakes and marshes. When all of the glaciers melted, there was a tremendous amount of water racing down the state toward the ocean. This water cut the channels of our rivers. When it was all over, Illinois had ten million acres of lakes, marshes, and swamps. We had also our great rivers, like the Mississippi and Illinois."

Then, Journal, I asked Uncle Duck if we still have all of those wetlands. He kinda frowned and said, "No, Jason, we don't. We only have about 10 percent of our wetlands left."

"But what happened to our wetlands, Uncle Duck?" "Where did they go?"

"Most have been drained and cleared away, young man," he said. "You see, when Native Americans lived here, they hunted and fished in the wetlands and they were pleased with them just as they were. So they left them alone in their natural condition. But when our ancestors came to Illinois, they took one look at the wetlands and thought 'wasteland.'

"You see, Jason, the settlers wanted to farm the land. They needed crops to feed their families. They saw the wetlands as wastelands because they could not produce crops on them. Those folks were of a determined mind, and nothing could stop them from clearing the land. No, Jason, nothing could stand up to those people - not even the blood thirsty mosquitos in the marshes or the tough old trees in the swamps. Acre by acre, they drained and cleared most of our wetlands. As the settlers harnessed the land, they drove the Native Americans away from their home in Illinois. Today, our state is rich with farmland that helps feed people all over the world. But I tell you, Jason, a mighty big price has been paid for that accomplishment.

"Of course, farmland is not the only reason why so many of our wetlands have been destroyed. As our state has grown, we've drained and cleared our wet areas to make room for cities, roads, shopping centers, houses and schools. Our state has just about burst its buttons over the last 200 years, and something has had to give. In most cases, Jason, it's been our natural land — our

prairies, forests and wetlands — that have been given up to meet the growing needs of our people."

Now, Journal, isn't that some kind of story? I couldn't believe how much my uncle knew about wetlands. I asked him to help me answer the questions in Part II of my assignment, but he just shook his head. "I've talked about enough for one morning. Now I'm going to take my canoe out into the marsh. But I tell you what Jason, if you come back tomorrow you can go with me."

Dear Journal: April 20, 1984

Today was the best day of my life. Here's what happened. I met Uncle Duck early this morning under the old cottonwood tree. The first thing I did was show him these questions from Part II of my assignment:

Part II

1. What do we mean by the term "wetland habitat"?
2. What do we mean by the term "wetland ecosystem"?
3. What kinds of plants live in wetlands?
4. What kinds of animals live in wetlands?
5. How do animals get food in wetlands?

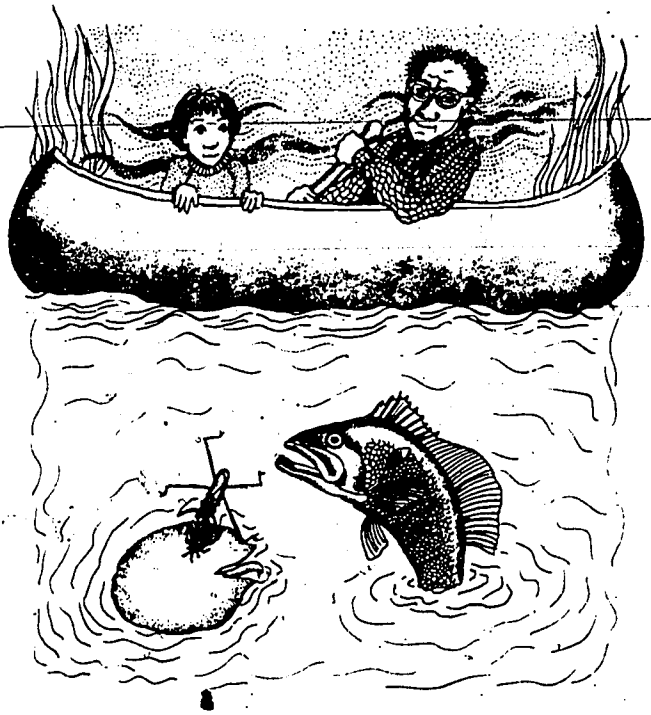
My uncle looked at the questions and said, "Come on, Jason, let's climb into the canoe. You just keep your eyes and ears open, and I bet you'll be able to answer those questions when you get home tonight."

Well, Journal, we took off in the canoe, me in front and Uncle Duck in the back. We were making pretty good headway, but our paddles kept hitting the green plants in the water. I saw one plant that had round, floating leaves. "Hey, Uncle Duck," I said, "I bet that is a lily pad — the kind that frogs sit on."

"That's pretty good, Jason. Let's take a closer look." Uncle Duck paddled over to the plant I saw and we leaned over to study it. Uncle Duck cupped a leaf in his hand. "This is the leaf of a plant called American lotus. It belongs to the water lily family and is very common in marshes, shallow lakes, and ponds. Then Uncle Duck touched a yellow flower floating next to the leaf. "This," he said, "is the beautiful flower of the lotus." Then Uncle Duck reached into the water and showed me the green stem of the lotus. "Well, what do you know," said Uncle Duck; "here is a little pond snail on the stem. Did you know, Jason, that this tiny little snail has a special tongue that is grooved just like a file that you would use to sharpen a saw? The snail moves his tongue back and forth over the stem of a plant and shreds off tiny bits of food for itself. The snail has to work awfully hard, but it seldom goes hungry."

"Look Uncle Duck, there's an insect." I yelled as I pointed to the water "It's got long legs and it's actually walking on the water. And look, it's chasing a black beetle. Wow! It just tackled the beetle. That beetle is just about as big as it is."

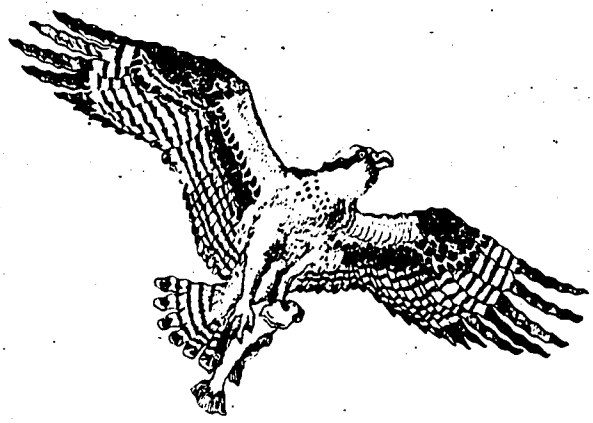
"That was a crawling water beetle, Jason. And the long-legged critter that captured the beetle was a water strider."



Then, Journal, I looked down to take my last look at the water strider and beetle, and you'll never guess what happened. All of a sudden, a big mouth came out of the water and swallowed them both. Then there was the flip of a tail and nothing was left but the waves on the water. "Did you see that, Duck?" I gasped.

"I sure did. That was the tidy work of one of my favorite fishes, the largemouth bass. I've watched that critter catch a bunch of animals. I've even seen it snatch a northern cricket frog in mid-air as it was leaping from one lily pad to another. But you know what, Jason, the bass isn't always the captor. It gets caught by other animals. Hey, look up there, and you might be able to see what I mean."

Then, Journal, I looked up at the sky and saw a most amazing thing. A big, white bird streaked with black was flying high, looking down at the water. The bird passed for a moment and then dove feet first. Its talons struck the water with a big splash and then it rose back into the air. And guess what, Journal, it had a largemouth bass in its talons. I wondered if it was a largemouth bass with a water strider and crawling water beetle in its belly!



"That magnificent bird was an osprey," said my Uncle Duck.

"But, Uncle Duck, do you feel bad that it just killed one of your favorite fishes?" I asked.

"No, Jason. I don't. You see, the osprey will take the fish back to its perch and eat it for breakfast. All of the animals in the marsh need food to survive. Just think about what we've seen this morning. We saw a little pond snail feeding on the stem of an American lotus; then we saw a water strider feed on a crawling water beetle. The water strider and beetle were snatched by a bass, and then we saw a bass scooped out of the water by an osprey.

It works like this, Jason. Plants use the sunshine and water to grow. Then the animals that eat plant food, like the little pond snail, feed on those plants. Other animals, like the water strider and largemouth bass, eat meat. They feed on each other. So you see, that's how food flows through the wetland. Think of the whole process in your mind as being a giant web. Plants are in the middle of the web, and animals are arranged all around them. When an animal feeds on a plant, a line is spun from that animal to the plant. And when an animal feeds on another animal, another line is spun between those two animals. As many different animals feed on each other, many lines are spun back and forth until a big web is formed. Food flows through the wetland through the lines of the food web.

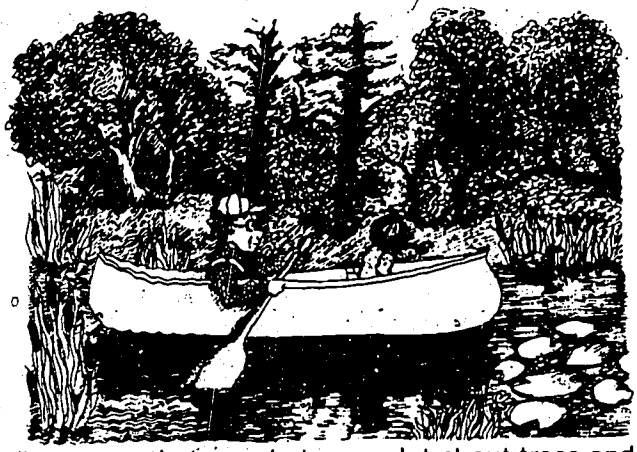
So you see, that's why I don't feel sorry that the osprey caught the bass. For the food web to work, some animals have to die so other animals can live. That's just the nature of things and there's no cruelty about it. Besides, there are plenty more bass in this big ole marsh."

"You know, Duck, that sounds pretty neat," I said. "I know now that plants and animals need food and how they get it. But they must also need a home, just like the home I live in."

"You're absolutely right, Jason, plants and animals do need a home. The marsh is their home. Only we don't call it that; we call it their wetland habitat. Let's paddle over to that bank and explore another area of the wetland habitat."

Once we arrived at the bank, my uncle said, "Can you see any differences between the plants you see standing along the bank and the plants you saw in the water?"

"I certainly can, Uncle Duck. Those plants along the bank are trees and shrubs. Look, there is a cottonwood, and over there is a silver maple. And that shrub on the bank is called a button bush. I can tell the button bush by its ball-like fruit. It looks just like a round button. I know all about trees and shrubs, Uncle Duck. We studied them in school when we worked on the Conservation Kit II. That Kit was all about the forests of Illinois."



"I can see that you do know a lot about trees and shrubs, Jason. I'm impressed. And since you know so much, you must also know that trees and shrubs have woody tissue in their trunks and limbs. That is why they are called woody plants. On the other hand, the water plants, like the American lotus, do not have woody tissue. Their stems are soft and flexible. These nonwoody water plants are called herbaceous plants. You can call them herbs for short. So you see, there are two major kinds of plants in wetlands, the herbs and the woody plants.

"Now Jason, I think it's time for us to turn back. Have you learned everything you need to know?"

"Yes, all except for one thing. I still don't know what the term 'wetland ecosystem' means."

"Well Jason, that is simple. Think about every plant and animal you have seen today. Not one of those plants or animals lives completely on its own. You see, all of the plants and animals live here in the marsh together. They all share the space and food of the marsh. In fact, they depend upon each other for survival. We saw an example of that when we saw the osprey catch the largemouth bass for food. And remember when we drew up the food web in our minds? That web was like a system of how the plants and animals depend upon each other for food. That's how you can define a 'wetland ecosystem', Jason. It's a system of plants and animals living together and depending upon each other in a wetland habitat. What do you say we pull the canoe over here and go get us our lunch?"

Dear Journal: April 21, 1984

I've got some heavy thinking to do. I'm really worried about our wetlands and I need to decide what I can do to help conserve them. Journal, this is why I'm worried.

I met Uncle Duck down at the marsh again this morning and showed him Part 3 of my assignment. These are the questions:

1. What are some of the problems that threaten the well-being of our wetlands?
2. Are wetlands valuable?
3. What effects do these problems have on our wetlands?
4. What can we do to help solve these problems?
5. What is going to happen to our wetlands in the future?

Uncle Duck took a look at the questions and said "Jason, we've got some serious talking to do. Let's talk while we walk."

So then, Journal, we started walking down the levee road through the marsh. I had a feeling we were going to end up at the river. I noticed that on both sides of us the cattails were growing in thick stands. So I said to Duck, "I bet those cattails are good hiding places for animals."

"Let's just check that bet out, Jason," he said. "See that stand of cattails right up there on your right? Let's sneak up on it and take a peak."

We did sneak up on the stand on our tip toes. Then just before we got to it, Duck said softly, "What do you see, Jason?"

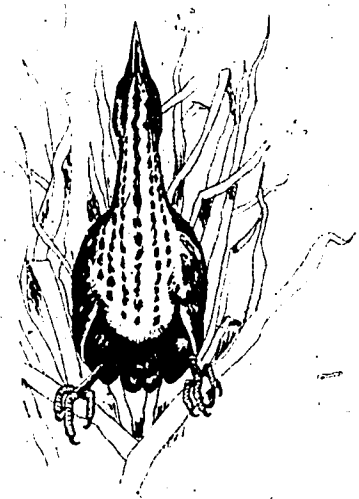
I took a look, shook my head, and said "Nothing, except for the cattails."

"Is that so," whispered Uncle Duck. "Look again, and this time, look through your binoculars."

Oh, and Journal, I did look through my binoculars, and I saw an animal hiding in the cattails. It was a bird and it wasn't moving a muscle. Its slender neck and bill were pointed straight up at the sky. It had rusty-colored streaks running up and down its chest. Sitting there like that, it looked just like a bunch of cattail stems. That's why I hadn't seen it at first. It was camouflaged.

"What bird is that?" I asked Duck. "I've never seen it before."

"That bird is an American bittern, Jason. When summer rolls around, the bittern will build its nest in the cattails. Then it will use its special camouflage to protect itself and its eggs and young.



"Unfortunately, the bittern is an **endangered** species in Illinois. That means it is in big trouble. If things get worse for the bittern, it could become extinct in Illinois. And look over there, Jason, do you see that black bird swimming on the water surface? Can you see its scarlet bill? That's a common moorhen. That pretty bird is doing a little better than the bittern, but it is also in trouble. The moorhen is **threatened** in Illinois. That means that if its troubles continue, it may become **endangered**!"

"But Uncle Duck," I said, "what kind of trouble are these animals in?"

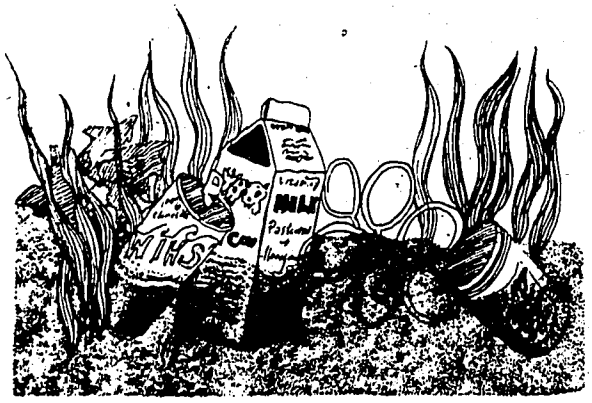
"Well, Jason, it's like this. Wetlands like this marsh provide an habitat for animals that need to live in them. That's one of the reasons why wetlands are so valuable. Wetlands give plants and animals a habitat where they can find food and shelter. Without a wetland habitat, the plants and animals cannot survive. So, if the habitat is in trouble, the plants and animals are in trouble."

"Oh I get it," I said, "if a wetland is threatened by problems, the plants and animals become threatened by the same problems. I guess I better find out about the problems that threaten wetlands. Can you help me do that, Uncle Duck?"

"Yes, I think I can, Jason. For starters, look over there at the side of the marsh that is on the left of this road. You see, I don't own that side of the marsh. Another person, named Mr. Jones, owns that side. And do you hear that pumping sound? That sound is coming from a pump hidden behind those trees. Mr. Jones wants to turn his marsh into cropland, so he is pumping the water out of his side of the marsh and into the river. Also, Mr. Jones wants to build a big levee along the river. That levee would keep the water in the river from flowing into the marsh. Pretty soon, Jason, the marsh would dry up and all of the plants and animals that live here would either die or try to move to a new home. Most would probably die.

"What I'm trying to explain, Jason, is that when we drain or clear wetlands, we destroy the habitat for plants and animals. In fact, habitat destruction is one of the biggest problems threatening our wetlands.

"And here's the evidence of another problem, Jason. See this pile of garbage in the water over here? Someone has sneaked down here at night and dumped a truck load of junk into the water. See these plastic holders in the garbage? Those are the kind of holders that they put on a six pack of soda to hold the cans together. Sometimes, fish swim through the rings of the holders and get stuck in them. Then they die. It's against the law to dump garbage in wetlands, Jason, but there are a few people who just don't care about how their actions damage wetlands.



"It's also against the law to poach animals. You see, our hunting laws are set up to protect animals. It's only legal to take certain species called game animals. And it's only lawful to take the legal limit during legal seasons. When folks come down here and take more than the limit or kill animals that aren't game species, they are really hurting the population of those animals. For instance, American bitterns are having a hard time surviving and when some of them are shot, their chances of survival are all the more slim. Our state has wetland protection laws, but when those laws are violated, there are grave consequences."

"That is so sad, Uncle Duck," I said. "I'm going to tell every one I know to follow the law so our wetlands will be clean and safe."

"Good for you, Jason. If everyone followed the law, our wetlands would have one less problem. Now let's walk on down to the river."

Journal, when we got to the shore of the river, my Uncle Duck said, "Look all around you, Jason. The Illinois River is one of our most valuable assets. Can you think of some reasons why?"

"You bet I can, Uncle Duck. I know that we use the river to carry products up and down the state. When our ancestors came to settle here in 1828, they traveled in a boat up this river from southern Illinois. And here's another thing, Duck. Last week I came down here with my family and we went boating, fishing and swimming. Then we had a picnic over by those trees. Plus, the river is valuable to me right now because I am studying it to learn more about wetlands. It's like a living museum."

"That is very good, my friend," said Uncle Duck. "Let's see if we can discover some more reasons about why wetlands, like this great river, are so valuable.

"Jason, did you drink some water this morning?"

"Yes," I said.

"And what about last week," said Uncle Duck, "did you eat some of the fish you and your family caught?"

"I sure did," I said, "they were delicious."

"Well, Jason, you just supplied us with two more reasons why wetlands are valuable. We get most of our drinking water in this area out of the river. And we also get food. Wetlands provide people

with some of the food and water we need to survive.

"It's not all rosy here on the river though, Jason. The river faces some tough problems. Just look at the water; see how muddy it is? When it rains, the rainwater carries soil off the farmland and into the river. That's why the water is so muddy. The soil in the river is called silt. This silt is the **number one pollutant** of our waterways in Illinois. Plus, when the silt builds up on the bottom, there is less room for the water. So when it rains, the river floods. Fortunately, some of the flood water is taken in by the marsh. That's another value of marshes and swamps. They act like sponges to absorb flood water.

"And there's another problem with the silt in the river. When the silt washes into the river, it is carrying pesticides and fertilizers from the farmland. These chemicals pollute the water and sicken or kill plants and animals. And don't forget, those chemicals also endanger the water and food supply of humans."

"By gosh, Duck. Those are big problems. What can we do to help solve them?" I asked.

"There are two things, Jason. First, we need to practice good soil conservation practices on all our lands. If we use those practices, we can hold the soil in place and keep it from washing into our wetlands. The second thing we can do is be very careful about the amount and kinds of pesticides and fertilizers we use. If we use more than we really need, the problem is only made worse."

"Look, look, Uncle Duck, there goes a river otter swimming across the water. I know what it is because there's a picture of a river otter on the **"Step Into the Wild"** button I'm going to earn if I complete the Conservation Education Kit."

"Is that so? Well, Jason, I suggest you get to work."

"Yes, I'm going to do just that, Duck. But there's one more thing I need to know. What's going to happen to our wetlands in the future?"

"Jason, I'm not sure I can answer that. It will all depend upon how carefully we use our land in Illinois. Over my lifetime, the way we've treated our land has really changed our wetlands. Why, when I was a boy, this marsh was packed full of animals. You could come down here and see hundreds of great blue herons nesting over in those trees. Now a person is lucky to see one heron."

"So when you ask about the future, I guess all I can hope is that our wetlands don't change as much during your lifetime as they did during mine. I really hope that when you are older, you can share wetlands with your niece or nephew, just as I've shared them with you. I want that for you, Jason, because our wetlands, just like our forests and prairies, are part of our natural heritage in Illinois. I believe that all future generations of Illinoisans should be able to enjoy that wonderful heritage.

"Well, Jason, I guess I've just about talked enough. What do you think about the future, Jason?"

"I'm thinking a whole bunch of things, Duck. I've learned so much these past few days. I learned about the great blue heron and the American bittern. I've learned that wetlands give us water and food. But I think the most important thing I've learned is that the future well-being of our wetlands is every Illinoisan's responsibility, and that includes me. I'm going straight home and try to decide what I can do to help conserve wetlands. Thank you so much, Uncle Duck, for teaching me about wetlands. You know what? When I get my **"Step into the Wild"** button, I'm going to give it to you."

"I'll feel very proud to wear that button, Jason."

Building An Ecosystem

Shown above is the Giant Coloring Page included in this Kit. The entire scene is a wetland ecosystem. But what do we mean by the term wetland ecosystem? To understand that term, we can start with the word wetland.

In the Coloring Page, there is land and water. A wetland is any place where there is both land and water. Above a wetland is air. The combination of air, land and water form the physical foundation of a wetland. The physical foundation provides a home for the plants and animals that live in the wetland. This home, just like the one you live in, provides a place for plants and animals to find food and shelter. A plant or animal's home is called its habitat. That leads us to our first fact about wetland ecosystems.

1. **The physical foundation of a wetland ecosystem provides a habitat for the plants and animals that live there.**

Now we can turn our attention to the word ecosystem. As you can see in the Coloring Page, an ecosystem is a system of animals living together. No one animal in the ecosystem can survive by itself. For instance, in the Coloring Page ecosystem, a bluegill is catching a large whirl-i-gig beetle. In turn, that bluegill is about to be snatched up in the jaws of a common snapping turtle. Without the large whirl-i-gig beetle as food, the bluegill could not survive, and without the bluegill, the turtle would go hungry. And even though it may sound surprising, the whirl-i-gig beetles in the wetland could not survive without the bluegill. If the bluegill and other animals did not prey on the beetles, the beetle population would explode. Such an explosion would cause a shortage of food and space, and many beetles would die as a result.

Plants are also part of the system in a wetland. Like the animals, no one plant can live completely on its own. In the Coloring Page ecosystem, a red-tailed bumble bee is feeding on the pollen of a white water lily. Of course, the bee is dependent upon the lily for food but the lily is also dependent upon the bee. When the bee leaves the lily, it will be carrying some of the lily's pollen on its body hairs. As the bee feeds on another lily, some of the pollen from the first lily would rub off onto that lily. The pollen will then fertilize the eggs in the second lily, and the eggs will mature into seeds that may someday grow into new plants. The relationship between the bee and lily leads us to a second fact about wetland ecosystems.

2. **Plants and animals live together in the wetland ecosystem in a state of mutual dependence.**

Even though people do not live in wetland ecosystems, we have an important role to play in

them. Our role is that of caretaker. Each of us can help take care of wetlands by making responsible decisions about how they are used and treated. In Illinois, we have the power to decide if our wetlands are to be kept clean or polluted. And we decide if wetlands are to be cleared or preserved. This leads us to one last fact about wetland ecosystems.

3. **People are responsible for the well-being of wetland ecosystems because we make decisions about how they are to be treated and used.**

Fact Package (FP)
About Wetland Ecosystems

Fact 1. _____

_____

Fact 2. _____

_____

Fact 3. _____

_____

Work Step #1. Complete the FACT PACKAGE above by filling in the blank lines of FACTS 1-3. To do so, match the number before each blank line with the same number in the information on pages 15 and 16. Then copy the fact that follows each number in the information onto the blank lines in the FACT PACKAGE.

Work Step #2. Now that you have completed this first FACT PACKAGE, you have a basic idea about what a wetland ecosystem is, but there is much more to learn about a wetland ecosystem. It is your assignment to learn more so you can answer the questions below. Over the next eleven chapters, you will have a chance to do that. After you have completed all of the chapters, return to this page and answer the questions. To help you answer the questions, you can use the circular clues drawn in front of each question. As you work on each question, look for that clue in one of the chapters. When you find that clue, you will know that chapter holds the information you need for the answer.

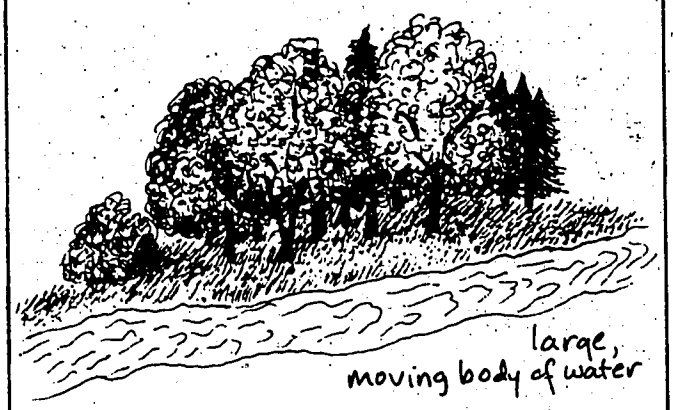
Work Step #3. In Chapters 5-11, there are FIELD GUIDES of plants and animals. After you have completed all of the FIELD GUIDES, cut out each of the plants and animals and arrange them on a large piece of paper into a wetland ecosystem. You can use the Coloring Page to give you ideas about placement. As you arrange your plants and animals, be sure to draw in the physical foundation of the ecosystem such as the air, water and land. For your final step, cut out one of the children drawn in Chapter 12 on page 15. Since that child will represent you, write your name on the blank line below the child. Then, place your child in your ecosystem along with the plant and animals. You can then color the ecosystem. Once you are done, you will have built your very own wetland ecosystem.

Clues	Questions About Wetland Ecosystems
	1. What are the most common types of wetlands in Illinois?
	2. What plants and animals live in Illinois wetlands?
	3. How are dead plants and animals recycled in a wetland?
	4. How is food first produced in a wetland?
	5. How is water and oxygen recycled in a wetland?
	6. How does food flow through the food web of a wetland?
	7. Why do certain animals live in different types of wetlands?
	8. Where do animals find shelter in a wetland?
	9. What is the importance of predators in a wetland?
	10. How can the different species of animals live in harmony in a wetland?
	11. What is the relationship between people and wetlands?

Chapter 2

The Most Common Types of Wetlands in Illinois

clue _____



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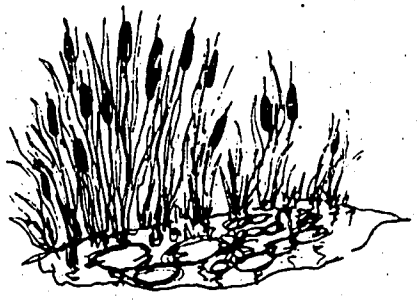

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FACT PACKAGE (FP)
About Wetland Types

The six most common types of wetlands in Illinois are rivers, streams, lakes, ponds, marshes and swamps. **Rivers,** like the Mississippi and Illinois, are large, moving bodies of water. Rivers connect with other rivers and streams to form a stream system that eventually drains into an ocean. When a river floods or cuts a new channel, it creates other wetlands such as backwater lakes, marshes and swamps. **Streams** are smaller than rivers, but they also have moving water. **Lakes** are large bodies of standing water. The water in some lakes is very deep yet shallow in others. **Ponds** are like lakes only they are usually smaller and shallower. **Marshes** are places where the land is low and covered with standing water. Marshes are open areas where there are few trees, but there are many small, green plants like common cattail and American lotus. **Swamps** are bottomland forests covered by standing water. Unlike marshes, swamps are stocked full of trees.

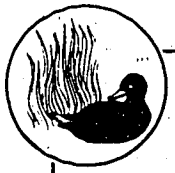
Working With Wetland Types

Work Step #1. Begin work on the word picture above by filling in the blank line at the top of the picture. you can do so by matching the clue in front of the blank line with the same clue in the FACT PACKAGE. Copy the first sentence after the clue in the FP onto the blank line in the picture.

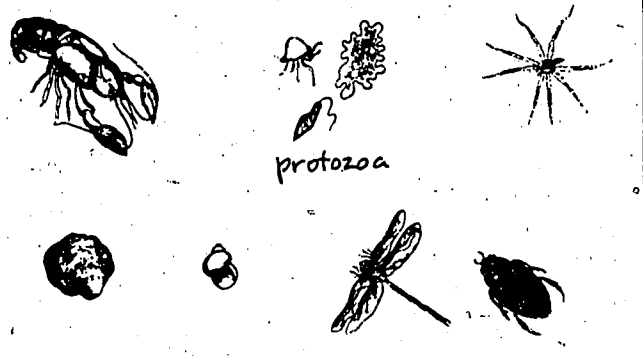
Work Step #2. Complete the word picture by labeling the six types of wetlands drawn in the picture. To help you do that, compare the descriptions beside each drawing with the information in the FP.

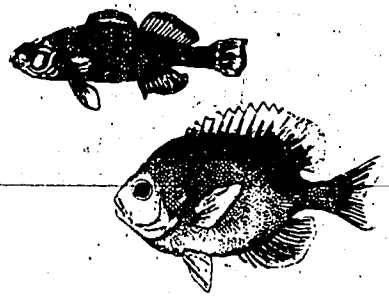
The Kinds of Plants and Animals in Illinois Wetlands

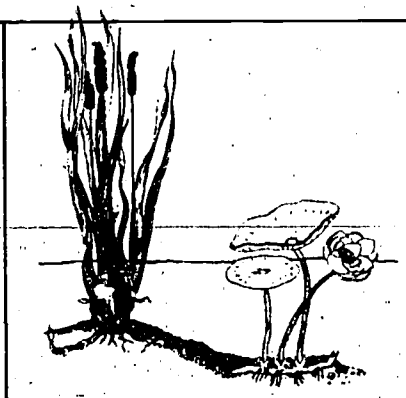
ACHIEVEMENT COUPON
STEP INTO THE WILD

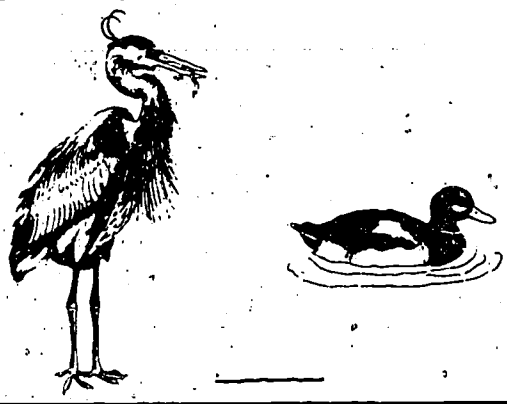


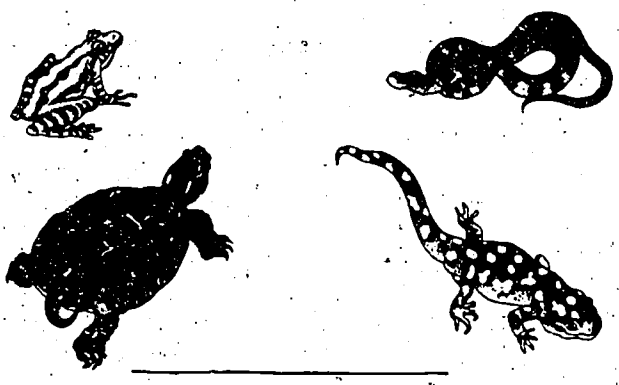
clue











Importance Statement: A wetland habitat is important to plants and animals because _____

FACT PACKAGE (FP) for Plants and Animals

Wetlands provide a habitat for woody and herbaceous plants, invertebrates, fish, amphibians, reptiles, birds and mammals. A wetland habitat is important to the plants and animals that live there. The habitat provides them with a home where they can reproduce, and find food and shelter. Within a wetland habitat they can thrive; without a wetland habitat, they cannot survive.

The habitat in wetlands is very different from the habitat in forest and prairies. Probably the biggest difference is that wetlands always have water. For that reason, the plants and animals that inhabit wetlands must be suited for or adapted to life in or near water.

Woody plants are trees and shrubs like pin oak and swamp privot. These plants are adapted to living in or near water because they can take root and grow in wet or moist soil. **Herbaceous plants**, more simply called **herbs**, are smaller green plants that lack the woody tissue found in trees and shrubs. Wetland herbs, such as American lotus and common cattail, have special features to help them adapt to living in water. For example, a herb has air spaces in its stems and leaves. Because of these air spaces, the herb can stand up straight in the water and float its leaves.

Among the animals in the wetland, the **invertebrates**, or animals without backbones, are the most numerous. There are actually thousands of different kinds of invertebrates, including microscopic one-celled protozoa, insects (beetles, bugs, and dragonflies), mollusks (clams and snails), worms, crayfish and spiders. Because of their special body equipment, wetland invertebrates are adapted to life in or near water. For example, the water strider has special legs that enable it to walk on the water surface. The maple leaf mussel has a thick, muscular foot that it uses to creep along the wetland bottom. The water boatman uses its long, flattened legs to paddle through the water. The giant scavenger beetle has two antennae that it can stick up through the water surface to catch oxygen that is then stored under its wings. It's easy to see how **fish** are adapted to life in water. With their tails and fins, they can swim; with their gills, they can take oxygen out of the water.

Both **amphibians**, such as frogs, toads, and salamanders, and **reptiles**, such as snakes and turtles, are adapted to life in and out of the water. While on land, they crawl or hop. When they take to the water, they swim or paddle their way along.

Wetland **birds** and **mammals** are also adapted for life in and out of the water. Many birds and mammals, like the mallard and river otter, spend a great deal of their time in the water. These animals are equipped with heavy-duty, water resistent feathers or fur to protect them against the water and webbed feet to help them swim. Some birds, like the great blue heron, are not equipped to swim, but they have long, slender legs that they can use to wade in the water. There are other birds and mammals, like the osprey and bobcat, that are not adapted to living in the water. However, these land animals visit wetlands regularly to catch prey, the osprey from the air and the bobcat from along the shore.

Working With Wetland Plants and Animals

Work Step #1. Begin work on the word picture at the top of page 18 by matching the clue in the top left hand corner of the picture with the same clue in the FACT PACKAGE. Then copy the first sentence that follows the clue in the FP onto the blank line in the picture.

Work Step #2. Continue work on the word picture, by labeling the kinds of plants and animals drawn in the seven boxes of the picture. To do so, write the kind of plants or animals drawn in the box onto the blank line at the bottom of each box. Your choices are the seven kinds of plants and animals listed at the top of the word picture. To help you work, be sure to use the information in the FP.

Work Step #3. Complete the word picture by filling in the **Importance Statement** at the bottom of the picture. To do that, write in your own words about why a wetland habitat is important to plants and animals. You can use the information In the FP to help you develop your statement.

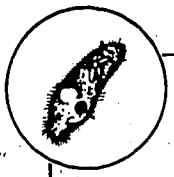
Work Step #4. On a separate sheet of paper, answer these questions:

1. How are woody plants adapted to living near water?
2. What is a special feature of herbs that enables them to grow in water?
3. Explain how the following invertebrates use their special equipment to live in the water (water strider, maple leaf mussel, water boatman, and giant water scavenger beetle).
4. How are fish adapted to living in water?
5. How do amphibians and reptiles travel when on land, when in water?
6. How are some birds, like the mallard and great blue heron, equipped to spend time in the water?

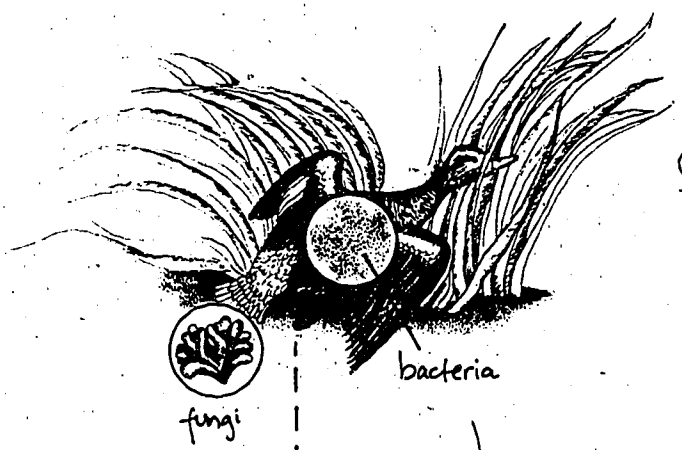
Chapter 4

The Wetland Bottom

In Chapters 2 and 3, you learned to identify the most common types of wetlands in Illinois, and you learned about the kinds of plants and animals adapted for life in or near wetlands. Beginning with this chapter, your assignment is to take a closer look at wetland ecosystems. You can start at the wetland bottom.



clue



① _____

② _____

Importance Statement: The process of nutrient element cycling is important because _____

FACT PACKAGE (FP) for the Wetland Bottom

The wetland bottom is an important part of the ecosystem. It serves as a natural basin to hold the water and provides a stable place for plants to take root. Different types of wetlands have different kinds of bottoms. Rivers and streams usually have hard bottoms made of rock, gravel, sand, or fine soil. However, when run-off water carrying soil from nearby land flows into a river or stream, the bottom becomes covered with soil or **silt.** Still water wetlands, such as lakes, ponds, marshes, and swamps, usually have a softer bottom made of soil or mud.

The wetland bottom is a rich storehouse for the nutrient elements, such as phosphorus and nitrogen, that all plants and animals need to grow. ① When plants and animals die, bacteria and fungi break them down into nutrient elements. ② The nutrient elements are then stored in the bottom until they are taken in through the roots of a living plant.

Once the nutrient elements have entered the plant through its roots, the plant can use the nutrients to help it grow. If the plant is eaten by an animal, such as a muskrat, the nutrients are passed along to it. This is how dead materials in the wetland ecosystem are recycled into valuable nutrient elements for living plants and animals. This process is called **nutrient element cycling.**

There is another reason why nutrient cycling is an important process in the wetland. The dead bodies of animals, along with the decaying stems, leaves, and roots of plants take up a lot of room in the ecosystem. When the dead materials are broken down into microscopic nutrient elements, new living space is created for living plants and animals.

Working With the Wetland Bottom

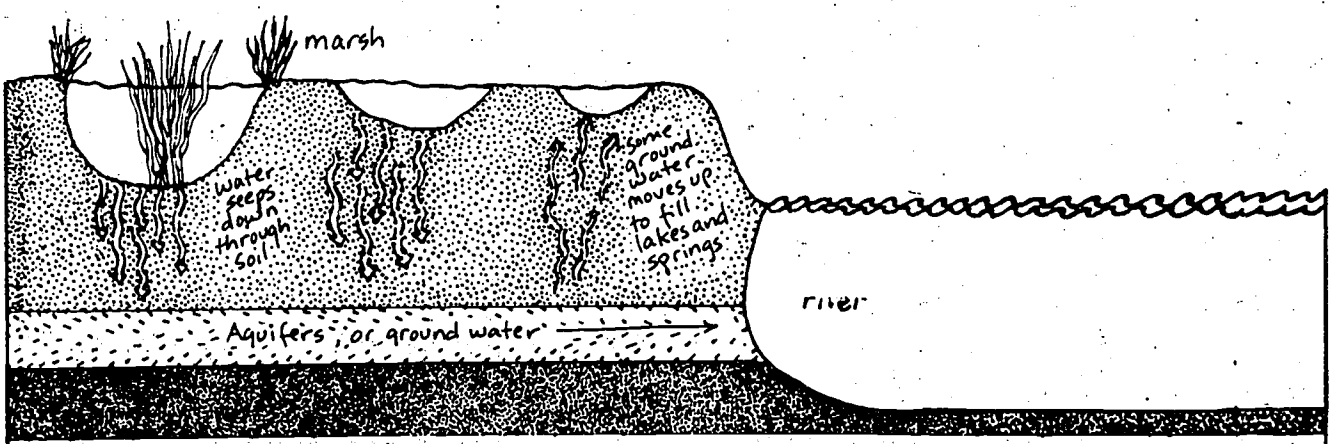
Work Step #1. Begin work on the word picture at the top of page 20 by matching the clue in the top left corner of the picture with the same clue in the FACT PACKAGE. Then copy the first sentence that follows the clue in the FP onto the blank line in the picture.

Work Step #2. Continue work on the word picture by filling in the blank lines 1 and 2. To do that, copy the sentence that follows each of those numbers in the FP onto the blank lines in the picture.

Work Step #3. Through the process of nutrient element cycling, dead materials are recycled into nutrients that plants and animals can use to grow. Explain another reason why nutrient element cycling is a vital process in the wetland.

Work Step #4. Complete the word picture by filling in the blank lines of the IMPORTANCE STATEMENT at the bottom of the picture. To do so, use your own words to explain why the process of nutrient element cyling is important to the wetland ecosystem.

Work Step #5. Study the word picture below. What is deep below the bottom of some wetlands? How does water move from the bottom of wetlands to aquifers? Does some of the water in aquifers help recharge the water supply in lakes, springs and oceans? Why are aquifers valuable to us? Is it important for the water supply in aquifers to be recharged? Why?

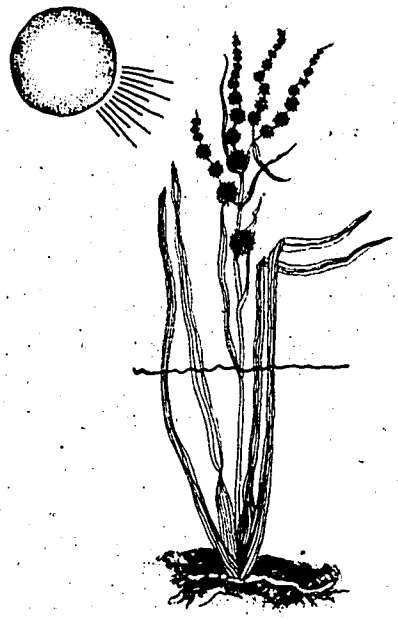


Below the Wetland Bottom

Deep below the bottom of some wetlands, like marshes and swamps, are reserves of ground water called aquifers. These aquifers hold a great deal of the world's water supply. There is 60 times more water in aquifers than in all of our lakes and rivers combined. Since we pump drinking water out of these aquifers everyday, it is important they be recharged by the water that seeps down through the bottom of wetlands.

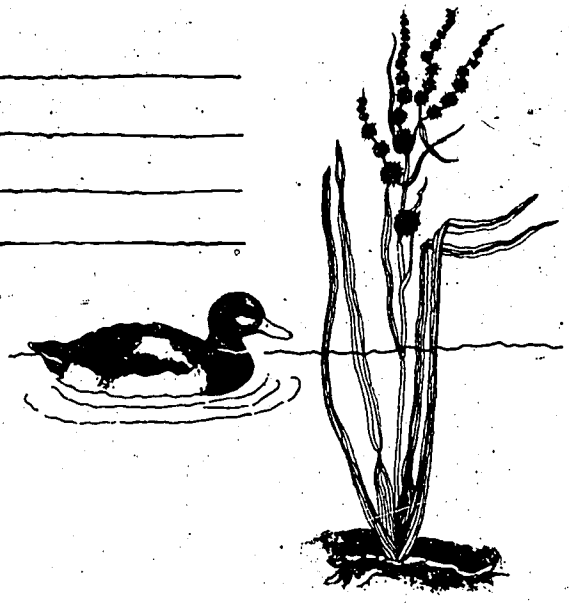
ACHIEVEMENT COUPON
STEP INTO THE WILD

clue



① _____

② _____



③ _____

Importance Statement: The production of food by plants is important because _____

FACT PACKAGE (FP) for Wetland Herbs

Herbs team up with woody plants to produce the first food in the wetland. ① First, herbs, like giant bur-reed, capture sunlight in their leaves. Then, using the sunlight as energy, they combine water and carbon dioxide in the presence of chlorophyll to make glucose or food molecules. This process of making food is called **photosynthesis.** ② When animals, like the mallard, eat parts of the herbs, the food molecules are passed onto them. ③ Since animals cannot make their own food, they depend on herbs and woody plants as the first producers of food in the wetland ecosystem.

Working With Wetland Herbs

Work Step #1. Begin work on the word picture at the top of page 22 by matching the clue in the top left hand corner of the picture with the same clue in the FACT PACKAGE. Then copy the first sentence that follows the clue in the FP onto the blank line in the picture. Continue work on the word picture by filling in the blank lines 1-3. To do so, copy the sentence or sentences that follow those same numbers in the FP onto the blank lines in the picture.

Work Step #2. Complete the word picture by filling in the blank lines of the IMPORTANCE STATEMENT at the bottom of the picture. To do so, use your own words to explain why the production of food by plants is important in the wetland.

Work Step #3. Described below are the eight herbs drawn on the **Field Guide** on page 24. Read each description carefully and write the types of wetland habitats each herb grows in. Then study the clues written beside each herb drawing in the **Field Guide** and complete your **Field Guide** by labeling each herb on the blank line provided.

HERB Descriptions

1. **white water lily:** This herb grows in ponds and marshes. It is rooted, and its circular leaves float on the water surface. Its white flower has a yellow center. Habitat: _____, _____.

2. **Illinois pondweed:** This herb grows in ponds and marshes. It takes root in the bottom, and most of its leaves are submerged in the water although some float on the water surface. Its flower is a narrow spike. Habitat: _____, _____.

3. **coontail:** This herb grows in ponds and marshes. It is rooted, and its leaves are submerged in the water. At the tip of each stem, the leaves are very thick. This gives the stem the look of a raccoon's tail. Its tiny flowers are hidden in the leaves. Habitat: _____, _____.

4. **American lotus:** This herb grows in the shallow water of rivers, lakes, ponds and marshes. It takes root in the bottom, and most of its round, green leaves float on the water surface. Its floating flower has many pale yellow petals. Habitat: _____, _____, _____, _____.

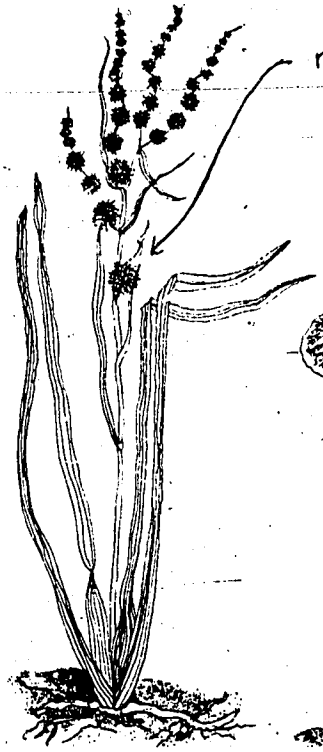
5. **American bulrush:** This herb grows in the shallow water of rivers, lakes, ponds and marshes. It takes root in the bottom, and its dark, green stem stands several feet above the water surface. Its green leaves branch off from the stem, and its tiny flowers are crowded into spike-like clusters. Habitat: _____, _____, _____, _____.

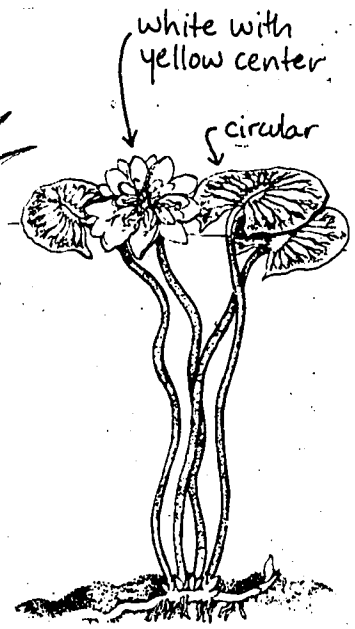
6. **common cattail:** This herb grows in ponds and marshes. It takes root in the bottom, and its stiff, green stem stands four to eight feet high. Its flat leaves branch off from the stem. Its tiny flowers are packed into long green spikes. As the herb matures in late summer, the spikes turn brown like the tail of the cat. Habitat: _____, _____.

7. **giant duckweed:** This herb grows in the shallow water of rivers, streams, lakes, ponds and marshes. Five to ten roots dangle freely from the oval body of this herb which is green above and purple below. Habitat: _____, _____, _____, _____, _____.

8. **giant bur-reed:** This herb grows in ponds and marshes. It takes root, and its green, branching stem stands from three to five feet high. Some of its leaves are above the water while others float on the surface. Its tiny flowers are packed into round flower balls. Habitat: _____, _____.


oval, green above, purple below
roots dangle freely


round flower balls

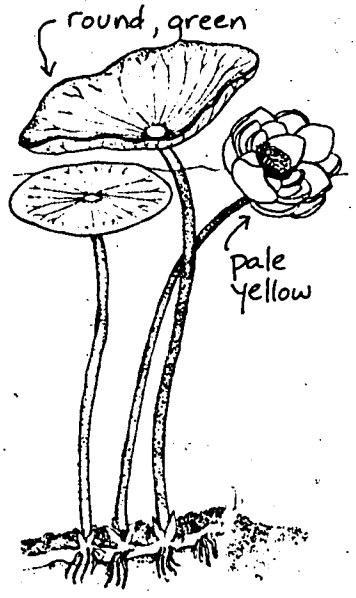

white with yellow center
circular


thick at end of stem


long green spikes turn brown

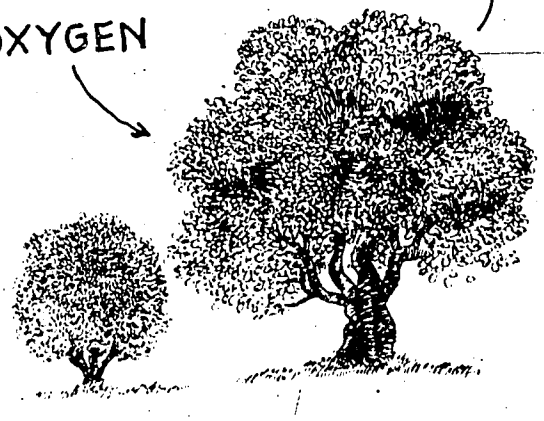

narrow spike


green and branching
spike-like clusters


round, green
pale yellow

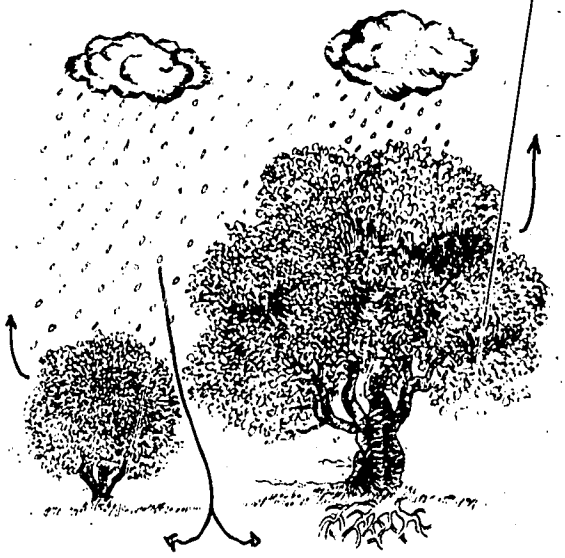
clue

OXYGEN



① _____

2 _____



Importance Statement: The recycling of water and oxygen by plants is important because _____

FACT PACKAGE (FP) for Woody Plants

Together with the herbs, woody plants help recycle water and oxygen in the wetland. ① Trees and shrubs take in oxygen from the atmosphere. When they conduct photosynthesis to make food, oxygen is produced as a waste-product and returned to the atmosphere. ② Trees and shrubs take in water through their roots. Some of the water is returned to the atmosphere when it evaporates from their leaves. This process is called **transpiration.** Water is also given off and returned to the atmosphere when the trees and shrubs break down food molecules to create energy to help them grow. This process is called **respiration.**

The recycling of water and oxygen by plants is an important process in the wetland. The earth's supply of water and oxygen is limited. If plants only used water and oxygen and did not recycle them back to the atmosphere, the supply of these precious resources would run out.

Working with Wetland Woody Plants

Work Step #1. Begin work on the word picture on page 25 by matching the clue in the top left corner of the picture with the same clue in the FACT PACKAGE. Then copy the first sentence that follows the clue in the FP onto the blank line in the picture. Continue work on the word picture by filling in blank lines 1 and 2. To do so, copy the sentence or sentences that follow those same numbers in the FP onto the blank lines in the picture.

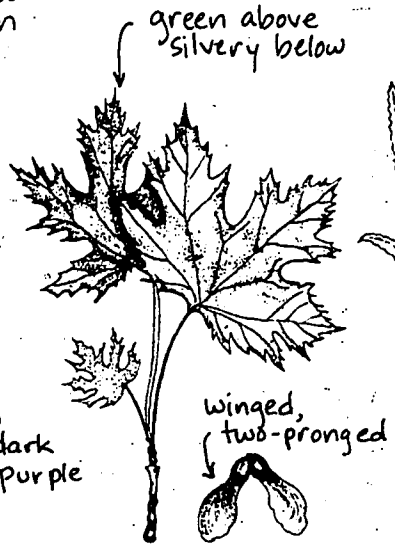
Work Step #2. Complete the word picture by filling in the blank lines of the IMPORTANCE STATEMENT at the bottom of the picture. To do so, explain in your own words why the recycling of water and oxygen is an important process.

Work Step #3. Described below are the eight woody plants drawn in the FIELD GUIDE on page 27. Read each description carefully and study the clues beside each drawing in the FIELD GUIDE. Complete your FIELD GUIDE by labeling each plant on the blank line provided.

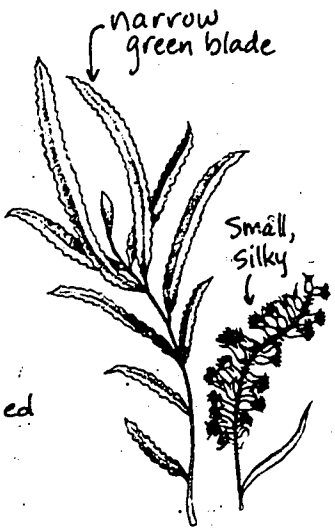
Woody Plant Descriptions

1. **pin oak** - This medium tree grows up to 75' tall. Its pin-pointed leaves are green, and its bark is brown. Its fruit is an acorn.
2. **bald cypress** - This large tree grows to be over 100' tall in swamps. Its bark is reddish-brown scales, and its leaves are yellow-green needles. Its fruit is a green to brown cone.
3. **red-osier dogwood** - This 3-10' shrub grows in thickets. Its twigs are dark red and its pale, green leaves are smooth on the upper surface but hairy below. The fruit is a whitish-blue berry.
4. **silver maple** - This medium to large tree grows up to be 100' tall. Its bark is silvery or gray, and its leaves are green on the upper surface but silvery on the underside.
5. **cottonwood** - This large tree grows to be 100' tall. Its bark is gray, and its triangular leaves are green. The white, cottony hairs attached to its fruits catch the wind to travel.
6. **sandbar willow** - This plant is called a shrub when it is small, but if it grows up to 25' tall, it is called a small tree. Its bark is gray, and its leaves are very narrow, green blades. The small, silky fruits travel with the breeze.
7. **swamp privot** - Known as a shrub if it is small, this plant can grow to be a small tree at 30' tall. It grows in swamps and along rivers. Its bark is brown, and its leaves are yellow-green. Its small fruit is dark purple.
8. **common buttonbush** - Usually a shrub about 3 to 8' tall, bottonbush can grow to be a small tree at 20' tall. Its dark, gray bark is sometimes nearly black, while its leaves are dark green above and paler green below. Its green fruits, tinged with red, are round balls.

bark: brown
size: up to 30'



bark: silvery or gray
size: 100'

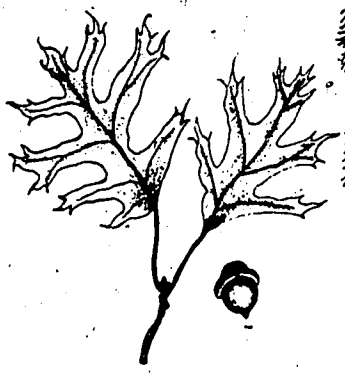


bark: gray
size: 25'

bark: gray
size: 100'

bark: dark gray
size: up to 20'

bark: dark red
size: 3-10'

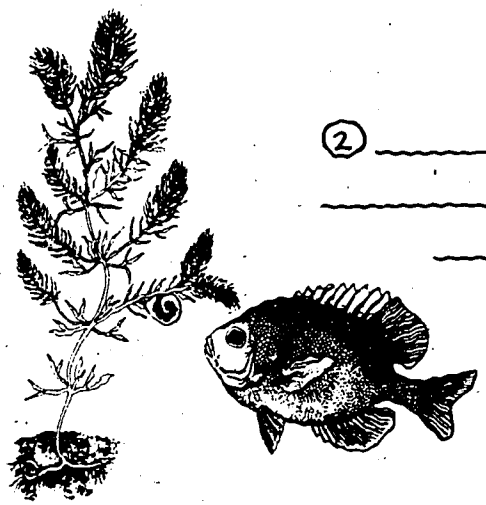


bark: brown
size: 75'

bark: reddish brown scales
size: over 100'

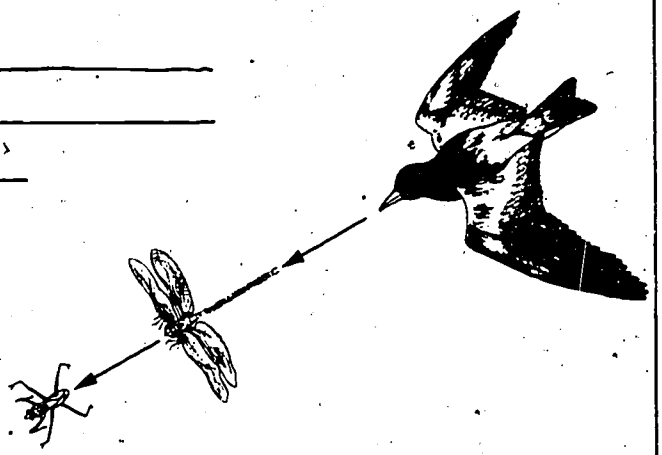
clue

1. _____



2. _____

3. _____



Importance Statement: Invertebrates are important in the wetland because _____

FACT PACKAGE (FP) for Invertebrates.

You learned in Chapter 6 that herbs and woody plants produce the first food in the wetland ecosystem. That plant food feeds all of the plant-eating animals in the ecosystem. So we know that food flows from wetland plants to the animals that eat them. But how does food in the wetland flow to the animals that do not eat plants? We can study invertebrates to find the answer.

By serving as prey for other animals, invertebrates help food flow through the food web in the wetland. ① When an invertebrate, like the little pond snail, feeds on a plant like coontail, food molecules in the coontail are transferred to the snail. ② When the snail is eaten by another animal, like the bluegill, food molecules from the coontail are transferred along to the bluegill. This is how invertebrates turn plant food into food that animals can eat. ③ Some invertebrates, like the green darner, eat other animals, such as the water strider. In turn, the green darner may be eaten by a black tern.

Sooner or later, all invertebrates are eaten by animals who in turn are eaten by other animals. That is how invertebrates help keep food flowing through the food web in the wetland. The illustration below is a mini-version of the food web. As you can see, the food web is made of many overlapping food chains. Because they are small, invertebrates are often at the bottom of the food chains.

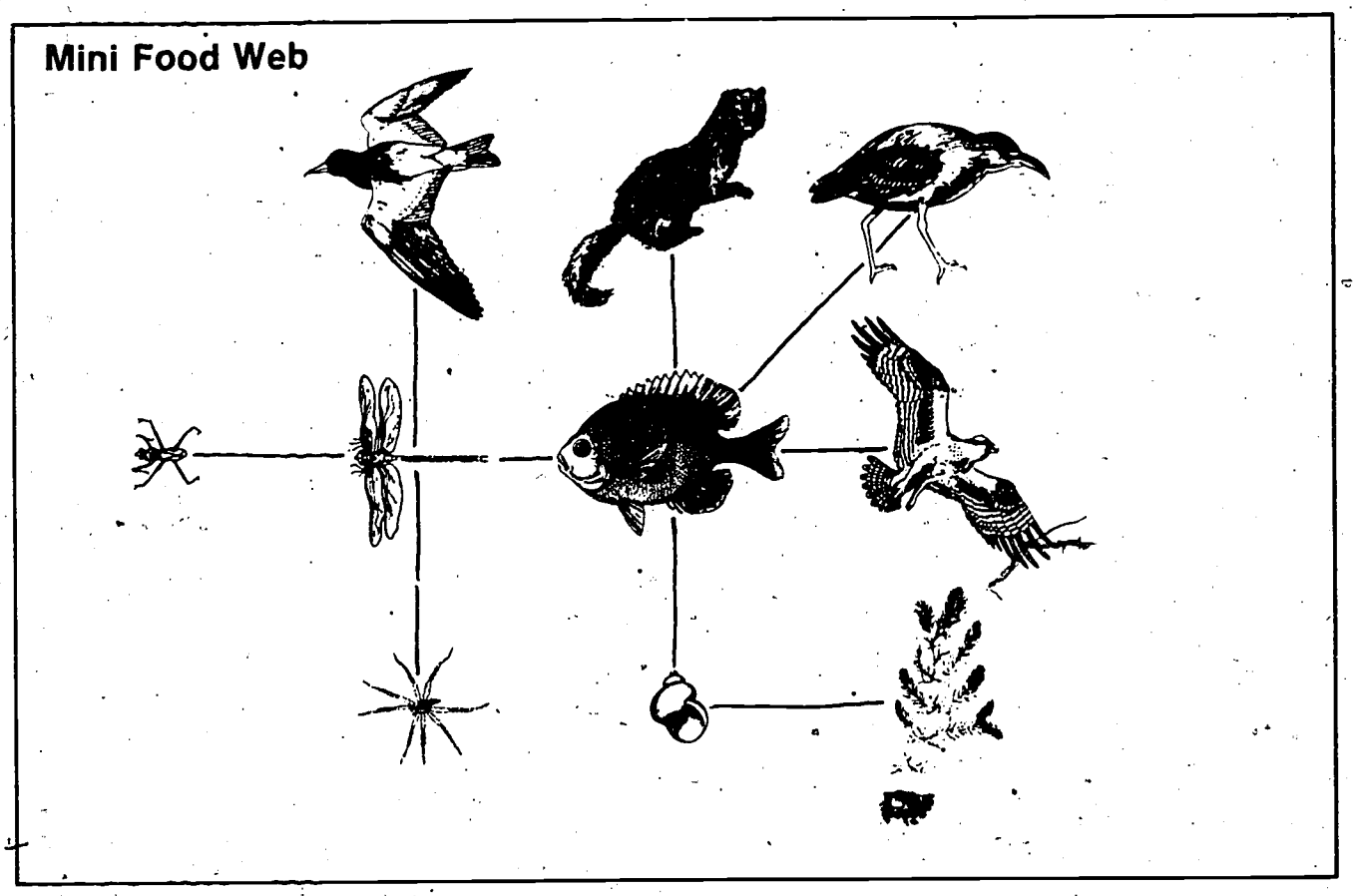
Working with Wetland Invertebrates

Work Step #1. Begin work on the word picture on page 28 by matching the clue in the top left corner of the picture with the same clue in the FACT PACKAGE. Then copy the first sentence that follows the clue in the FP onto the blank line in the picture. Continue work on the word picture by filling in the blank lines 1-4. To do so, copy the sentence or sentences that follow those same numbers in the FP onto the blank lines in the picture.

Work Step #2. Complete work on the word picture by filling in the blank lines of the IMPORTANCE STATEMENT. To do that, explain in your own words why it is important that invertebrates help keep food flowing through the wetland food web.

Work Step #3. Described below are the ten invertebrates drawn in the FIELD GUIDE on page 31. Read the descriptions carefully and then study the clues beside each drawing in the FIELD GUIDE. Complete your FIELD GUIDE by labeling each invertebrate on the blank line provided.

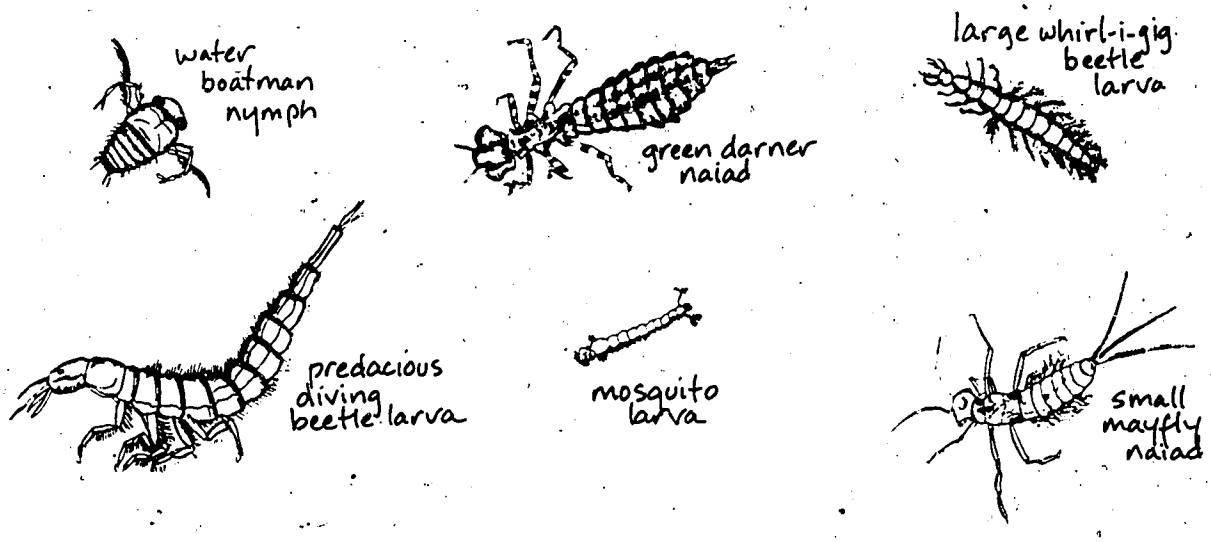
Mini Food Web



INVERTEBRATE Descriptions

1. **small mayfly:** The female mayfly is brown to red, but the male is much paler. Adult mayflies live for only a few days and do not eat. To mate, males swarm together and perform a kind of dance. The males grab the females that enter the swarm and mate in flight.
2. **green darner:** This green insect can flap its four wings independently to fly forward as well as backward to chase down insects.
3. **large whirl-i-gig beetle:** Using its long, slender forelegs and short, paddle-shaped hind legs, this black, oval insect skates across the surface film. Groups of beetles congregate and swim in sweeping circles. The eyes of the beetle are divided into two parts so it can see below water and above at the same time.
4. **water boatman:** This long, oval insect is mottled brown-gray with yellow crossbands. The adult uses its long, flattened legs to paddle through the water. To breathe, it takes in air at the surface and stores it in a silvery envelope around its body.
5. **giant water scavenger beetle:** This insect is brown, gray, or shiny black with reddish black legs. When the adult swims to the surface, it sticks up two antennae to catch oxygen that is then stored under its wings.
6. **pond crayfish:** This brown crustacean often hides under rocks or burrows into the mud. The crayfish uses mud balls from its digging to build a little chimney at the entrance of its burrow.
7. **six-spotted fishing spider:** This spider is greenfish brown with a silvery, white stripe down each side. On the abdomen, there are 12 white spots above, and 6 black spots below.
8. **little pond snail:** This brown snail shreds off plant food with its rasping tongue. It has a thick muscular foot that it uses to move up and down herb stems.
9. **maple-leaf:** This brownish to black mussel creeps across the bottom with its thick, muscular foot. By using a special valve, it sucks in water, eats the tiny bits of food in the water, and shoots the water back out through another valve.
10. **red-tailed bumble bee:** This yellow and black bee has a reddish rear abdomen. When it feeds on the pollen of a flower, some of the pollen rubs off onto a smooth area encircled by hairs on its hind leg. This area is called a pollen basket. The bee carries the pollen in the basket to the next flower. Then, some of the pollen in the basket rubs off onto that flower. The pollen fertilizes the eggs in the flower and they begin to mature into seeds that may someday grow into new plants.

Immature Insect Chart



Insects live in the wetland first as immature forms and later develop into adults. There are three types of immature forms — nymphs, naiads and larvae. Naiads and larvae live and look very differently from their parents and go through a resting stage before they emerge as adults.

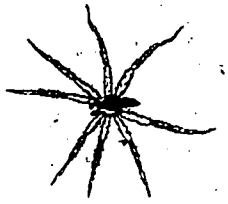
brown, grey or shiny black

black and yellow, with pollen baskets on hind legs

brownish to black, sucks in water, keeps food and shoots water back out

brown, has rasping tongue and a thick, muscular foot

greenish brown 12 white spots above 6 spots below

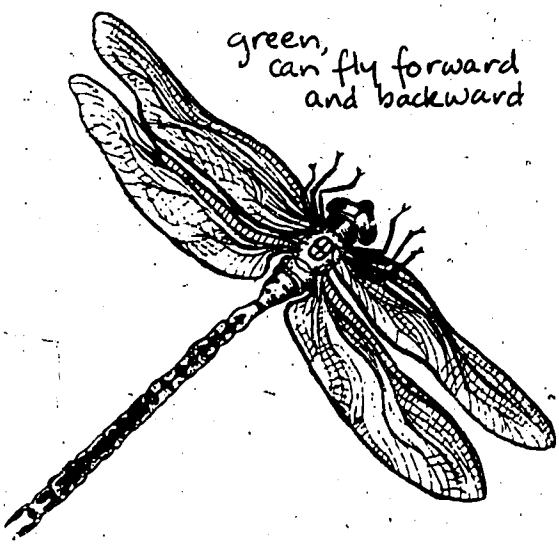


female is brown-red male is paler

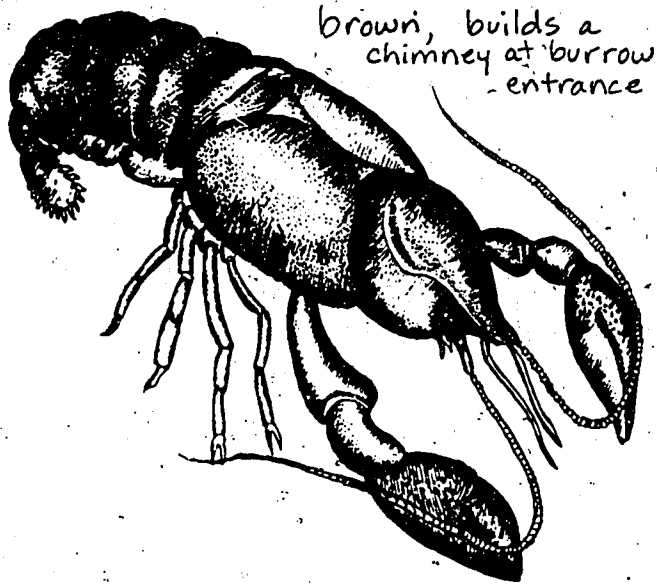
long, oval mottled gray-brown yellow crossbands

black, oval two-part eyes see above and below water

green, can fly forward and backward

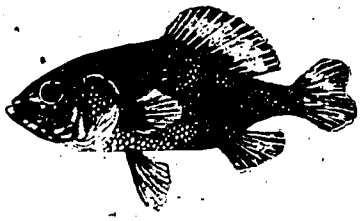
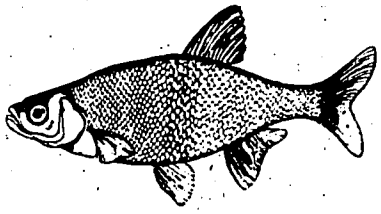


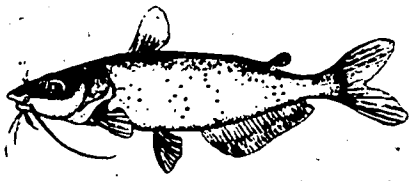
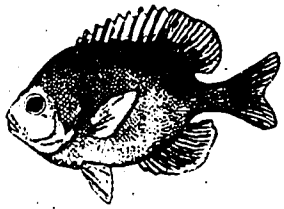
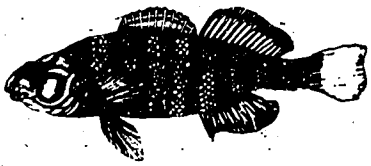
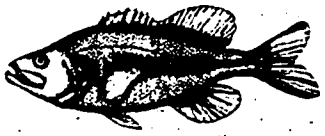
brown, builds a chimney at burrow entrance



Wetland Fishes

clue

rivers	streams	lakes	ponds	marshes	swamps
					

Importance Statement: It is important to learn why certain plant and animal species live in some types of wetlands and not in others because

FACT PACKAGE (FP) for Fishes

You learned in Chapter 2 that there are six major types of wetlands in Illinois—rivers, streams, lakes, ponds, marshes and swamps. These wetlands, along with the less common types, such as bogs, creeks and springs, provide habitat for 186 fish species. But that doesn't mean that all 186 species are found in every type of wetland.

Within a particular type of wetland, only the fish species suited for the natural conditions of the wetland are found. When we speak of the natural conditions of importance to fishes, we mean the quality and movement of the water, the vegetation present and the make-up of the bottom. For example, ponds often have muddy and still water, a great deal of vegetation and a muddy bottom.

The central mud minnow is well suited for the conditions found in ponds. This fish is tolerant of muddy water and is adapted to swim in quiet water. It hunts and spawns amongst herbs and algae. To hide, it burrows into mud. So, because of its lifestyle, the central mud minnow is quite at home in ponds. But placed in a quickly moving, gravel-bottom stream, the little fish would be mismatched with the habitat and could not survive.

In some types of wetlands, the natural conditions in one area may be different from those in another area. For example, in one stretch of a stream, the water may be quickly moving and the bottom made of gravel. Yet, in the pools of that same stream, the water may be quiet and the bottom covered with mud. The fish species suited for the conditions in the quickly moving area live there, and those suited for quiet water live in the pools.

It is important to understand why fish species live in some types of wetlands and not in others, because this is how we can learn what natural conditions each fish needs to survive. Once we know what natural conditions are critical for the survivial of a fish species, we can try to manage our wetlands in such a way to safeguard those conditions. If we can safeguard those conditions, we can preserve our fishes. For instance, the rainbow darter needs a wetland habitat that has clear, quickly moving water. With that in mind, we can help preserve the rainbow darter by working to keep soil and other pollutants out of the wetlands where it lives. And we know that if we dam a river where the darter is living, it may not be able to survive in the slower moving water.

Fishes are not the only species that live only in the wetland habitats they are suited for. All wetland plant and animal species live in the type of habitat where the natural conditions are best for their survival. By studying and managing those natural conditions, we can work to preserve our wetland plants and animals.

WORKING WITH FISHES

Work Step #1. Begin work on the word picture on page 32 by filling in the blank line at the top of the picture. To do that, match the clue in the top left corner of the picture with the same clue in the **FACT PACKAGE.** Then copy the first sentence that follows the clue in the FP onto the blank line in the word picture.

Work Step #2. Described below are eight fishes. Read each description carefully and notice what types of wetland habitats each fish lives in. Also, try to discover why each fish is suited for the conditions found in the wetland habitat types it lives in. Then, on a seperate sheet of paper, explain how each fish is suited for the habitats it lives in.

Work Step #3. Label the drawings in the Field Guide on Page 35.

Work Step #4. Continue work on the picture by labeling each fish. Then draw a line from each fish to all of the wetland habitats it lives in. Finish the picture by completing the IMPORTANCE STATEMENT in your own words.

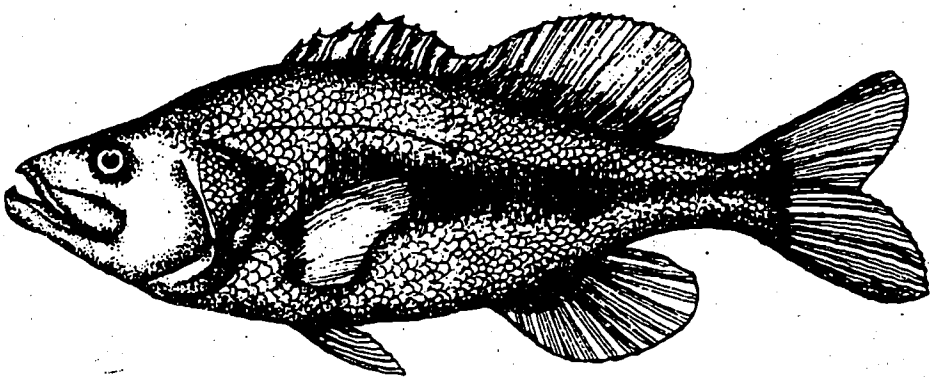
FISH Descriptions

1. **rainbow darter:** This 1.2 to 2", stout-bodied darter is brownish-olive with three dark cross-bars on its back. During the breeding season, the male darter is colored like a rainbow with blue, green, red and orange. The rainbow darter lives in quickly moving creeks, small rivers, and streams. Within these wetlands, the darter is best suited for areas where the bottom is made of gravel and the water is clear. This is because the darter hunts along the bottom for insect larvae, snails and crayfish. If the water is muddy, it is more difficult for the darter to see its prey. If the bottom is muddy, its prey can escape by burrowing into the mud. The rainbow darter also prefers to spawn over a gravel bottom. During early spring, the female buries the lower half of her body into the gravel. She then drives her head into the gravel and rubs her body briskly against the hard bottom until her eggs are forced out. The male takes a position above her and fertilizes the eggs as they are buried into the gravel.
2. **central mud minnow:** This 5" fish is mottled brown with an olive background. It lives in

bogs, slow-moving streams, lakes, ponds and marshes. In these wetlands, the water is usually shallow, still or slowly-moving. The bottom is muddy and a great deal of vegetation is present. These conditions suit the mud minnow because it plucks off worms, snails and insects from the stem and leaves of herbs. It also feeds on herbs and algae. During the spring spawning season, the female deposits her eggs onto plants. The mud minnow prefers swimming in quiet water and often burrows into the mud to hide and rest. Life in a bog is not a problem for this fish because it can tolerate the acid found in the water.

3. **golden shiner:** This 3-5" shiner has a greenish-olive back and golden or silvery sides. It lives in small schools in ponds, lakes, swamps and the quiet pools of small streams. In these habitats, the water is still or slowly-moving. Usually the bottom is muddy or covered with silt, and there is usually a good number of herbs present. These conditions suit the golden shiner because it hunts in the quiet water amongst plants for snails and insects. It also eats algae. In late spring, spawning begins, and the sticky eggs cling to plants until they hatch. The shiner is more tolerant of muddy water than many fish, and can live in habitats that have a large amount of silt in the water.
4. **bluegill:** This small-mouthed fish grows to be 12" long, but is usually smaller. Its back and sides are dark olive-green and its chin and lower gills are blue. It lives in lakes, swamps, ponds, and in the pools of rivers and streams. Within these wetlands, the bluegill prefers to live in well-vegetated areas that have a gravel bottom and clear water. Amongst the plants, the bluegill feeds on algae and hunts for insects, crayfish, snails and small fish. Since the bluegill locates its prey by sight, it does best if the water is not clouded by mud. During the late spring and summer spawning season, the female lays eggs in a nest in shallow water. The male clears space for the shallow nest by flapping its lower fins and tail against the bottom. Any type of bottom will do for the bluegill, but it prefers a bottom made of gravel.
5. **northern pike:** This large fish grows to be 31" long. It is green or brown and marked by many yellow spots. It lives in the pools of creeks and rivers and in lakes and marshes. In these habitats, the water is either still or slowly-flowing. The bottom is muddy and vegetation is present. The pike is suited for these habitats because it can tolerate muddy water and prefers to swim in quiet to medium currents. From the cover of herbs, it ambushes insects, crayfish, frogs, reptiles, and small birds and mammals. During the spring spawning season, the female pike lays many thousand eggs that stick to plants or to sticks, rocks, and rotting leaves on the bottom.
6. **pirate perch:** This 2.5 to 4.5" fish is blackish on the sides with a dark bar across its tail. The pirate perch lives in swamps, ponds, ditches, and slow-moving creeks and streams. In these habitats, the bottom is muddy, the water current slow, and the water depth shallow. Since these conditions are good for plant growth, thick stands of herbs are usually present. The perch is adapted for life in these types of habitats because it prefers to swim in slowly-moving water, and hide amongst the plants. It also finds many of the insects it eats on the stems and leaves of plants. Spawning occurs in May and the female lays her eggs in a nest on the muddy bottom.
7. **largemouth bass:** This 10-20" long fish has a big mouth and is pale olive, black or brown. Since the largemouth bass can adapt to many different kinds of natural conditions, it lives in nearly every type of wetland including rivers, streams, lakes, ponds, and swamps. By day, it swims slowly in the deeper water or drifts about piles of driftwood or vegetation. As darkness falls, it moves to shallow water to feed on fish, crayfish, insects, frogs, and even small mammals. During the spring spawning season, the bass living in streams and rivers travel to quiet bays and inlets so the eggs can be laid over gravel or vegetation in still or slowly-moving water.
8. **channel catfish:** This fork-tailed catfish is pale blue or greenish above and whitish or silvery below. It usually has small black spots on its sides. Even though the channel catfish has been stocked in many Illinois ponds and lakes, it prefers to live in clear fast-flowing streams and rivers. Since the catfish feeds along the bottom on fish, insects, crayfish and plants, it does best if the bottom is made of gravel. Because it locates its prey either by taste, smell or sight, it is the most successful if the water is clear. During late spring and summer, the male cleans out a nest site beneath a pile of driftwood or in a muskrat or beaver burrow. The male then guards the young fish, until they leave the nest.

big mouth
olive, black or brown

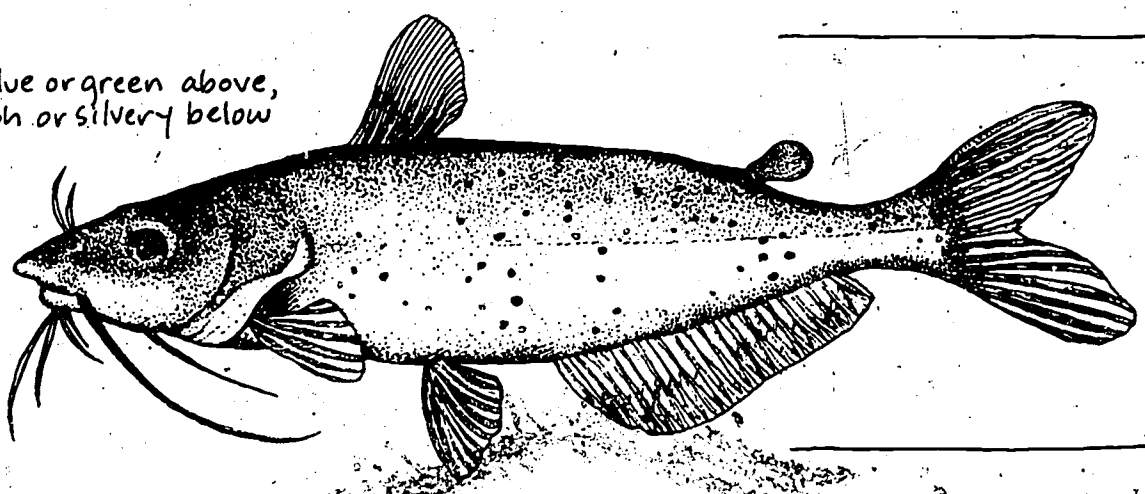


mottled brown,
olive background

_____

_____

pale blue or green above,
whitish or silvery below

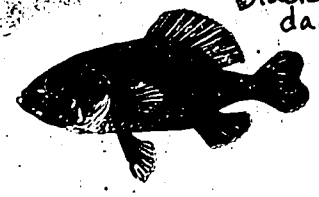


_____

brownish olive,
3 cross-bars on back

_____

blackish,
dark bar on
tail



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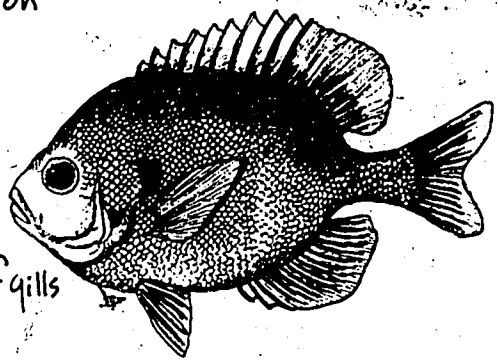
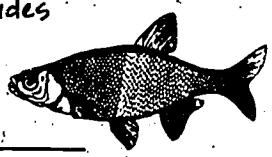


blue chin
and lower gills

_____

greenish olive back;
golden silvery sides



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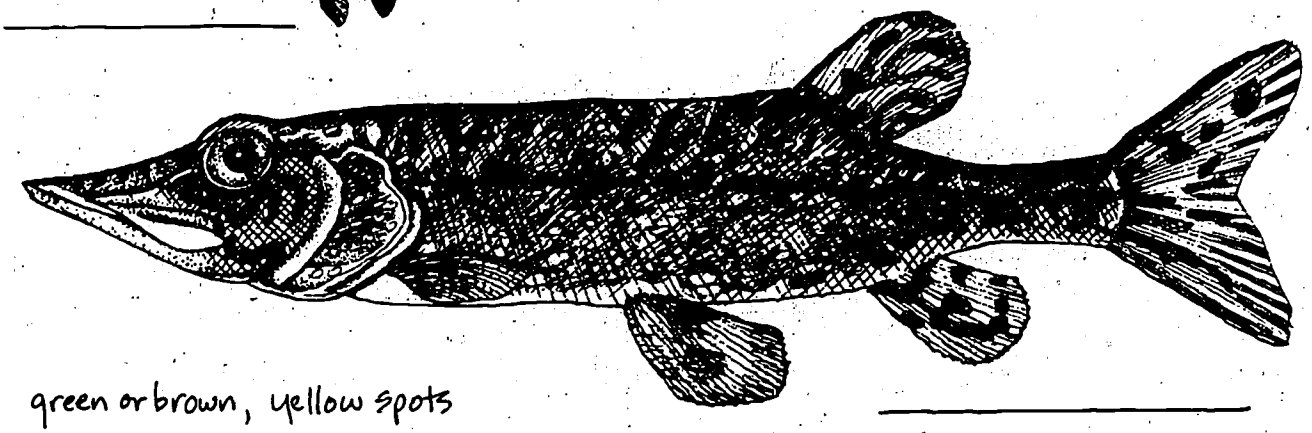
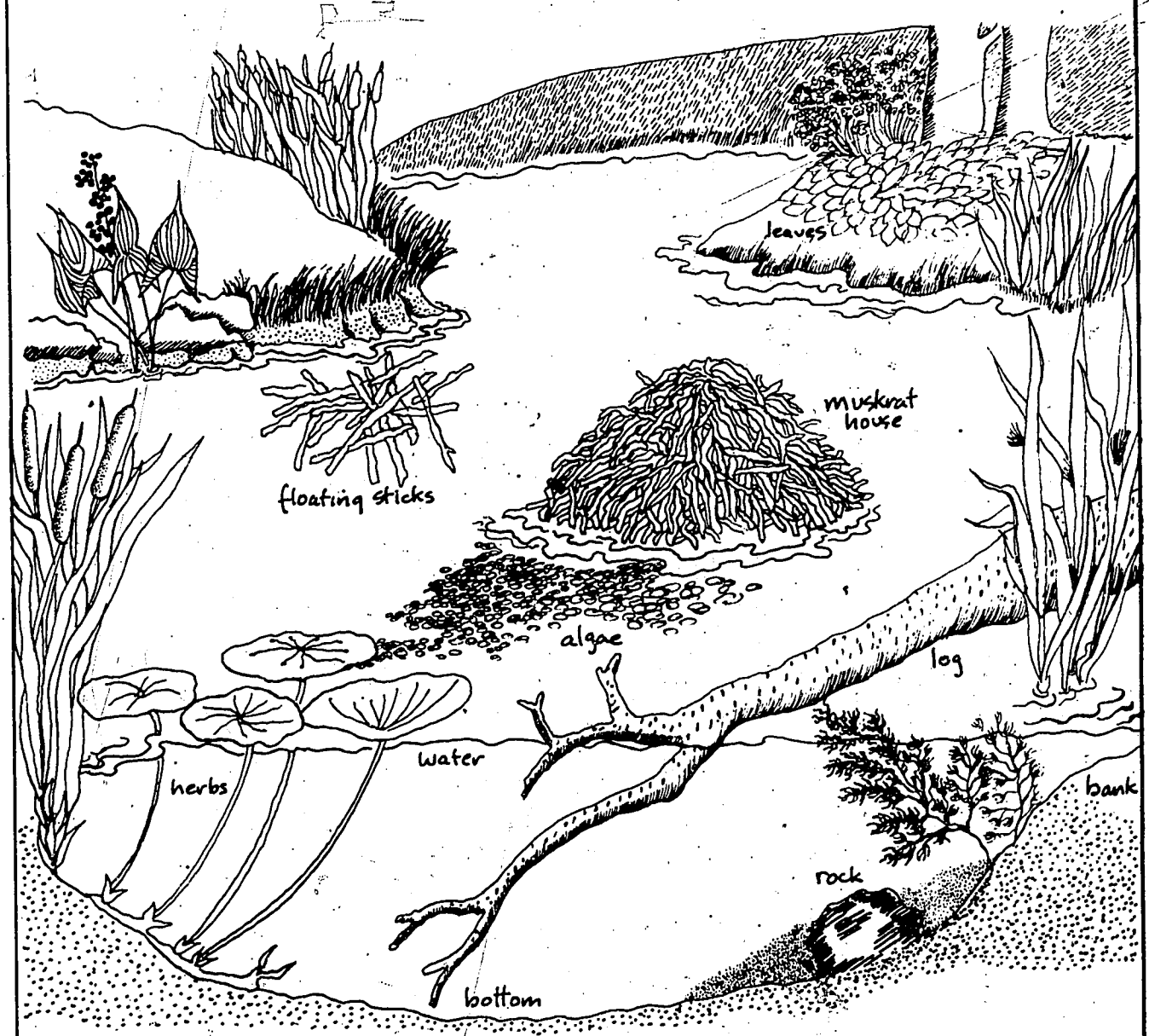


green or brown, yellow spots

_____

ACHIEVEMENT COUPON
STEP INTO THE WILD

clue



Importance Statement: Shelter is important to animals because

FACT PACKAGE (FP) for Wetland Amphibians and Reptiles

Life in the wetland can be tough for amphibians and reptiles. They have to withstand harsh weather and dodge tough predators like the mink and great blue heron.

In order to survive, amphibians and reptiles need to find shelter in many parts of the wetland. When chased by a predator, they need shelter in which to hide. When they hunt, they need shelter from which to ambush prey. When they rest or bask in the sun, they need shelter to support their bodies. During winter, some reptiles and amphibians need shelter in which to hibernate. When spring arrives, they need parts of the wetland that can shelter and protect their nests and/or eggs.

Reptiles and amphibians find shelter in almost every part of the wetland. They burrow into mud, dive to deep water and hide amongst logs, rocks, and vegetation. It's important to keep in mind that other wetland animals, including invertebrates, fish, birds, and mammals, find shelter in some of these same places in the wetland ecosystem.

Working with Amphibians and Reptiles

Work Step #1. Begin working on the word picture on page 36 by matching the clue in the top left corner of the picture with the same clue in the FACT PACKAGE. Then copy the first sentence that follows the clue in the FP onto the blank line that follows the clue in the picture.

Work Step #2. Described below are the nine amphibians and reptiles drawn in the FIELD GUIDE on page 39. As you read each description, pay special attention to where each animal finds shelter in the wetland. Then on the blank lines that follow each description, write the place or places where that animal finds shelter for itself and its eggs. If there is more than one line, that means the animals finds shelter in more than one place in the wetland. To help you get started, the northern cricket frog description has already been completed.

Work Step #3. Once you have listed the places where amphibians and reptiles find shelter, you can continue work on the word picture. Study carefully the wetland scene shown in the picture. Notice that the places that provide shelter for animals are labeled. Next, look at the descriptions of the nine amphibians and reptiles below. Using what you wrote about where each animal finds shelter, write the name of each animal next to all of the places in the word picture that provide shelter for it. For example, if the bullfrog hides in the mud, write bullfrog in the mud shown in the word picture.

Work Step #4. Complete the word picture by filling in the blank lines of the IMPORTANCE STATEMENT. To do so, use your own words to explain why shelter is important to amphibians, reptiles and other animals.

Work Step #5. Your last assignment in this chapter is to label the drawings in the FIELD GUIDE on page 39.

AMPHIBIANS and REPTILES Descriptions

1. **northern cricket frog:** The colors of this small, warty frog range from brown to yellow to red to black. The thick stands of herbs along the shoreline provide a safe place for the frog to hide and ambush small insects and spiders. In spring, the male sits on masses of algae and blows out the air in his vocal pouch to sing its courtship song of "gick, gick, gick." In spring, the female lays about 200 eggs on the surface film where they are protected by floating algae. 1. Adult herbs, algae 2. Eggs algae

2. **bull frog:** This olive-green to brown frog is marked by dark blotches and is the largest frog in North America. During the day, it hides under rocks, logs or in stands of herbs. By night, it stalks the water's edge to catch small birds, snakes and minnows. If approached by a predator, it jumps for the safety of deep water. In spring, the male cuts loose with a deep mating call that sounds like "jug-o-rum." The female lays several hundred eggs on the water surface where they are cradled by algae and floating sticks. 1. Adult _____, _____, _____, _____ 2. Eggs _____, _____.

3. **common snapping turtle:** This large, olive-gray or brownish black turtle has an enormous head, thick legs, powerful jaws, and a long tail. The snapper spends most of its time lurking along the bottom of a lake or stream. Oftentimes, it shelters itself by burrowing into the mud until only its eyes are showing. From this position, the snapper can ambush just about any fish or insect that happens along. During the winter, the shapper hybernates in a mud bank, a thick stand of herbs, or inside a muskrat house. When it moves overland from one wetland to another, it hides beneath leaves. In spring, the female lays 20-30 eggs in a nest she digs in the bank

several yards away from the water. 1. Adult _____, _____, _____, _____ 2. Eggs _____.

4. **midland painted turtle:** Black to slate gray, this turtle is decorated with red lines bordered by yellow. During winter, it hybernates in the mud. During the warmer months, it basks in the sun on a log or stalks the water's edge where it snatches snails, crayfish and small fish. If danger nears, it quickly swims to the cover provided by a stand of herbs. In spring, the female scoops out a little hole in the soil on the bank, lays her eggs, and covers the hole back up with soil. 1. Adult _____, _____, _____ 2. Eggs _____.

5. **Graham's water snake:** This medium-sized, stout-bodied snake is brown or dark olive with a yellow-green stripe along each side of its body. To hunt, it swims slowly through shallow water and snatches crayfish, amphibians and fish. When threatened by a predator, it moves into a crayfish chimney or hides in a stand of herbs or under stones. Oftentimes, it climbs up the trunk of a tree where it finds shelter camouflaging itself on a limb overhanging the water. The female gives live birth to 6-39 young in spring. 1. Adult _____, _____, _____, _____.

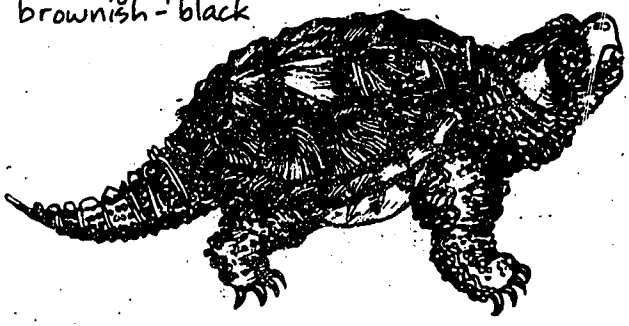
6. **mudpuppy:** This large, brown to gray salamander breathes through reddish, bushy gills. By day, it seeks the shelter of the deepest water in a lake or river. When night falls, it swims closer to the surface where it hunts for small fishes, crayfish, snails and worms. If approached by a predator, it swims to the shelter provided by floating algae or sticks. In late spring, the female lays about 100 eggs beneath an underwater log or rock. 1. Adult _____, _____, _____ 2. Eggs _____, _____.

7. **tiger salamander:** This brown to black amphibian is marked by light spots and is the largest land dwelling salamander in the world. It spends the daylight hours buried beneath a log or rock in a forest or wet meadow. Through the night, it hunts for worms, insects, mice, and amphibians. When the rains of spring begin, it moves to a pond or stream to mate. The female lays 25 to 100 eggs in a mass that is sheltered by floating sticks and vegetation. During its stay in a wetland, the adult often hides in a crayfish chimney. 1. Adult _____, _____, _____ 2. Eggs _____, _____.

8. **northern water snake:** This large, stout snake is tan to gray marked by reddish-brown blotches. From behind the cover of herbs, this snake darts out and surprises frogs, fish, and salamanders. When at rest, it hides under rocks. During spring, the female gives live birth to 15-30 young. The baby snakes are only 6-12" long but their habits are similar to those of the adult. 1. Adult _____, _____ 2. Young _____, _____.

9. **western ribbon snake:** This slender, black snake has three light stripes running down its body and two fused spots on its head. It lives on land as well as in water. When on land, it hides under leaves and rocks in the forest. In water, it is a very fast swimmer and can chase down frogs, tadpoles, and small fish. If threatened by a larger predator, it speeds to the cover provided by herbs. During the winter, it hybernates in a rock crevice. When the weather warms up, the female gives live birth to 4-27 young snakes. 1. Adult _____, _____, _____.

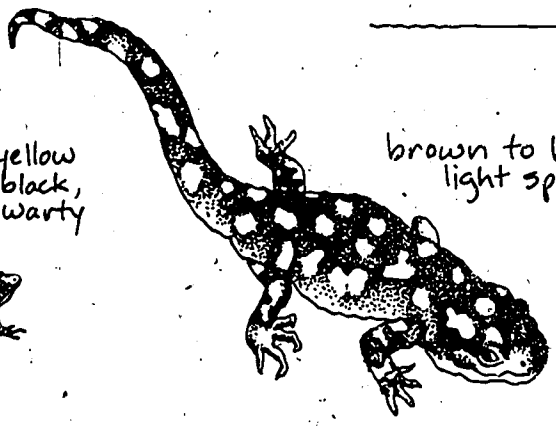
olive-gray, or brownish-black



olive-green to brown, dark blotches

brown to yellow to red to black, small and warty

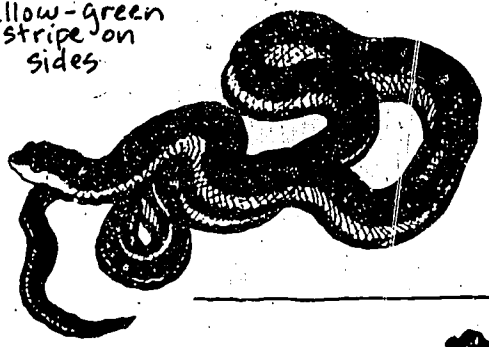
brown to black light spots

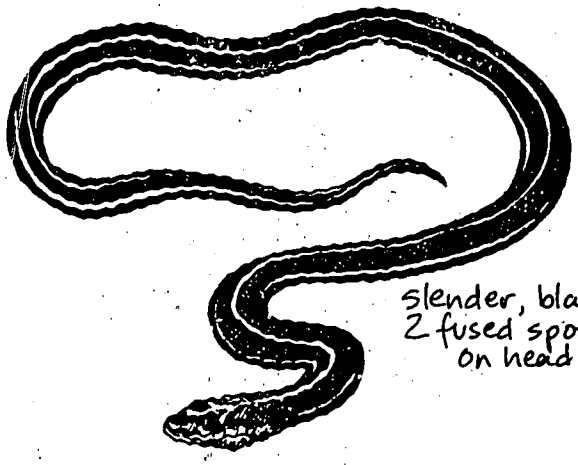


brown to gray, red bushy gills

tan to gray marked by red-brown blotches

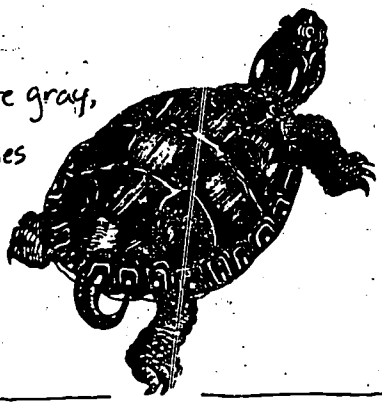
brown or dark olive, yellow-green stripe on sides





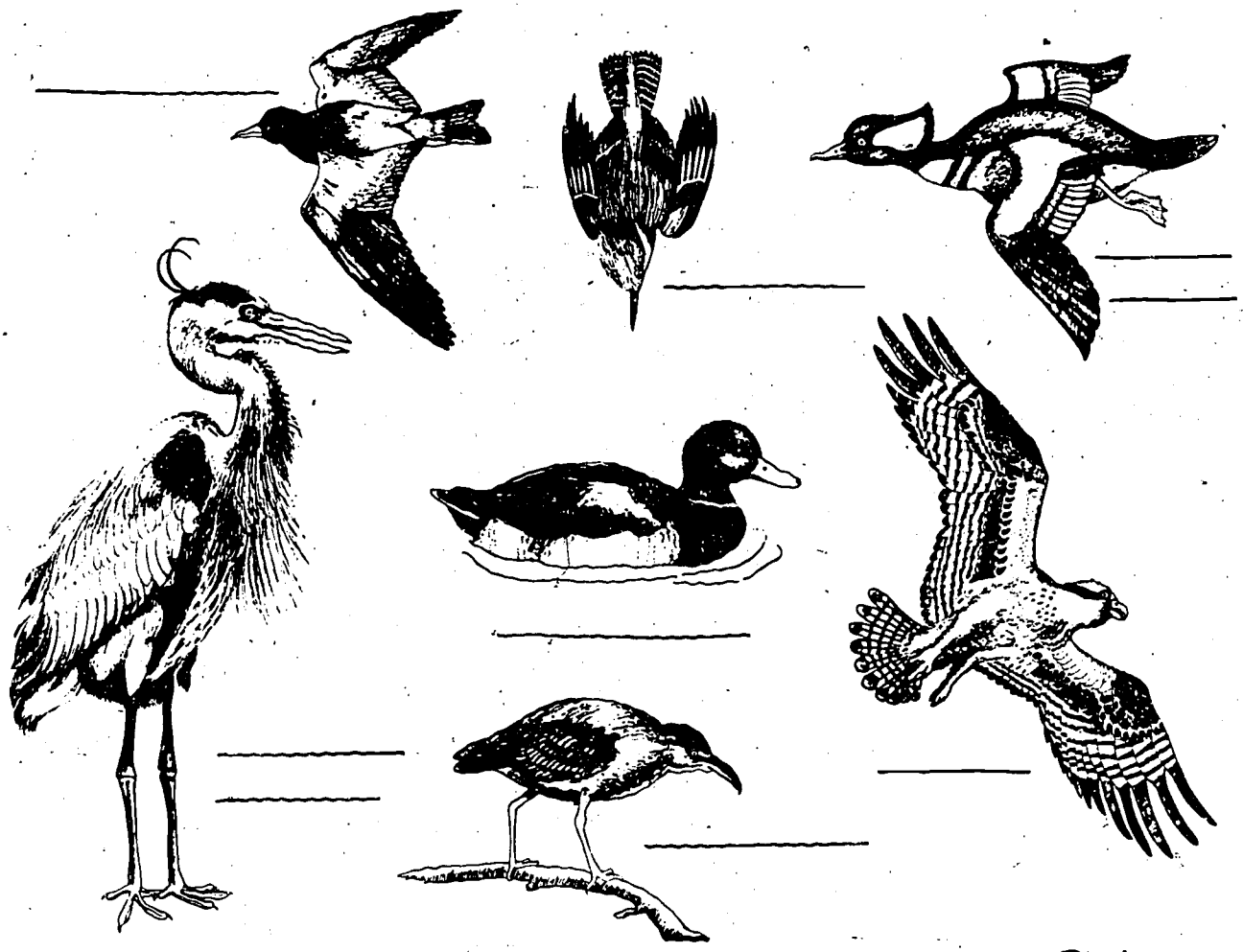
slender, black, 2 fused spots on head

black to slate gray, decorated with red lines



ACHIEVEMENT COUPON
STEP INTO THE WILD

clue



Invertebrates Mammals Amphibians/Reptiles Fish Birds

Importance Statement: Birds and other predators are important because

FACT PACKAGE for Birds

There are many beautiful birds in the wetland. Although some birds eat only plants, others are meat-eating predators.

As predators, birds help maintain the balance of life in the wetland by controlling the populations of other animals. But how does this process work? We can look at a mighty predator like the osprey to find the answer.

Often called the fish hawk, the osprey preys on fish. By eating fish, the osprey helps keep the fish population from exploding. Such an explosion would have a disastrous effect upon the wetland ecosystem. First of all, there is only so much space in the water for all the animals that need to live there. An over-sized population of fish would take up too much of that space and some other animals, like frogs, salamanders, turtles and snakes, would be crowded out of the water. Secondly, the food supply in a wetland is also limited. To survive, each animal must get its share of that food. If an over-sized population of fish is taking more than its share from the food supply, many animals, including some of the fish, may not get enough food to grow properly. Some might even die from starvation.

In addition to fish, bird predators help control the populations of invertebrates, amphibians, reptiles, other birds and mammals. For example, the barred-owl helps keep the number of rats and mice under control and the black tern helps prevent a population explosion of insects. With their work, bird predators and all other predators including invertebrates, fish, reptiles, amphibians, and mammals make sure that no one animal takes more than its share of space and food. This keeps the balance of life in the wetland **stable** and guarantees a chance of survival for all animals, big and small.

Working With Birds

Work Step #1. Begin work on the word picture on page 40 by matching the clue in the top left corner of the picture with the same clue in the FACT PACKAGE. Then copy the first sentence that follows the clue in the FP onto the blank line that follows the clue in the picture.

Work Step #2. Described below are the nine birds drawn in the FIELD GUIDE on pages 42 and 43. As you read the descriptions, pay special attention to the *hunting strategy* of each bird. (The *hunting strategy* is the way birds go about catching prey. For example, some birds chase prey in the air while others swim through the water to snatch prey.) Next complete Sections 1 and 2 that follow each description. In Section 1, circle the set of three words that best describes the hunting strategy of each bird. In Section 2, list the kinds of prey that each bird takes.

Work Step #3. Begin work on the FIELD GUIDE on pages 42 and 43 by labeling each bird. As you can see, each bird is drawn in a hunting position. To complete the FIELD GUIDE, write the three-word hunting strategy of each bird on the blank lines.

Work Step #4. Continue work on the word picture. To do so, label each bird drawn in the picture. Then draw a line from each bird to the kinds of animals it preys upon. When you are finished, you will have a chart of all the animal populations those birds help control. You will notice that many of the lines overlap to find a web. This will give you a look at part of the food web in the wetland.

Work Step #5. Finish the word picture by completing the IMPORTANCE STATEMENT in your own words.

WETLAND BIRD Descriptions

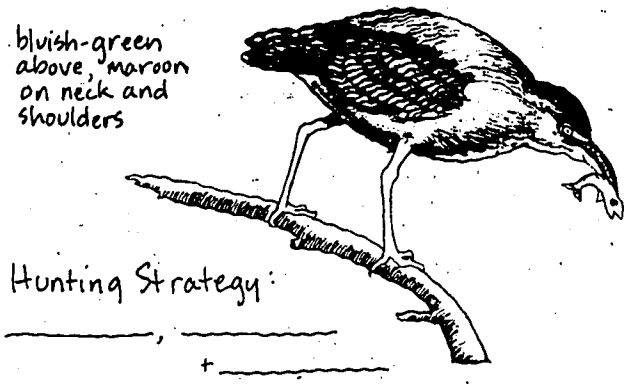
1. **black tern:** This bird is gray above with a black head, neck and belly. A fast and expert flyer, the tern zig-zags over the water with its bill pointed down. If it spots an insect, it flies in hot pursuit, dipping and spinning until it snatches the prey in its bill. The tern is so quick, it can catch one of the fastest of insects, the green darner. 1. **Hunting strategy:** Cruise, Chase and Snatch - or - Perch, Chase and Pounce. 2. **Prey** _____.
2. **belted kingfisher:** This bird is blue-gray above with a blue band or belt across its chest. It has a large crest on its head and a long pointed bill. Sometimes the kingfisher perches on a limb or electric wire and surveys the water below for the movement of fish. Oftentimes, it flies about 30-40 feet above the water, scanning it for prey. When it sees a fish, it may hover for a moment and then pull its wings back and dive head long into the water. It disappears below the water for a second and then rises into the air with the captured prey in its bill. 1. **Hunting strategy:** Scan, Hover and Dive - or - Scan, Chase and Pounce. 2. **Prey** _____.
3. **spotted sandpiper:** This bird is dark brown above with white underparts dotted with black. On its long, skinny legs, the graceful sandpiper takes cat-like steps along the shore of a pond or lake. As it walks, it bobs its tail

and holds its body forward until it is almost parallel with the ground. In this position, its bill is within easy striking distance of any insect that happens to be on the shore or amongst the vegetation. If it does spot prey, it strikes quickly, swallows the food and continues on its way. 1. **Hunting strategy:** Watch, Listen and Dive - or - Stalk, Watch and Strike. 2. **Prey** _____.

4. **great blue heron:** This tall, slender bird has a dark grayish back and wings and a long, black plume falling from the back of its white head. The heron hunts most commonly by standing almost perfectly still in shallow water. Even though its head does not move, its eyes are always rolling back and forth, watching the fish swimming in the water below. When one comes within reaching distance, the heron darts its long neck forward and snatches the prey with its beak. 1. **Hunting strategy:** Perch, Cruise and Pounce - or - Stand, Look and Grab. 2. **Prey** _____.

5. **osprey:** This bird has a dark back and wings and a white head and underparts. A good clue to its identity is the black stripe running from its beak, through the eye to its back. Sometimes called the fish hawk, the osprey flies and sails 30-100 feet above the water, looking for fish. When it spots prey, it may hover for a moment and then close its wings half-way and dive. As its feet splash into the water, it pulls its wing back and rises into the air. If the hit was on target, a fish is tightly pinned in its talons. 1. **Hunting strategy:** Cruise, Dive and Strike - or - Perch, Chase and Pounce. 2. **Prey** _____.

6. **green heron:** This small heron is bluish green above with maroon running from the back of its neck to its shoulders. To hunt, it stands very still on a log or rock and waits patiently until it spies a frog, fish or grasshopper. The heron can bend its neck as if it was made of rubber and once it spots prey, it darts its neck down in any direction and seizes the animal in its beak. 1. **Hunting strategy:** Cruise, Dive and Snatch - or - Stand, Watch and Snatch. 2. **Prey** _____, _____, _____.



Hunting Strategy:
_____, _____ + _____

7. **mallard:** The colorful male mallard has a green head, a white neck band and a rusty breast. The female is mottled brown so that she can sit camouflaged on her nest in a stand of dried cattails. This duck eats mostly plants but when it hunts for animals, it swims slowly and plucks off insects, snails, and frogs resting on plants or floating in the water. 1. **Hunting strategy:** Swim, Look and Pluck - or - Cruise, Dive and Snatch. 2. **Prey** _____, _____, _____.

8. **hooded merganser:** The handsome male merganser has a rounded, white cap or hood bordered by black. The male is sharply colored with white, brown and black while the female is a duller brown. To hunt, the merganser swims along the surface and then suddenly, turns tail up and dives. Once it is underwater, it swims by stroking its wings and kicking its feet. If it spots prey, it gives chase. Usually it is quick enough to catch the fastest little fish or insect. When it does snatch an animal, its specialized bill holds it in a tight grip. Its bill, called a serrated bill, has sharp jagged edges that can squeeze and pin slippery minnows and tadpoles. 1. **Hunting strategy:** Swim, Dive and Pursue - or - Perch, Fly and Chase. 2. **Prey** _____, _____, _____.

Hunting Strategy:
_____, _____ + _____

Birds Field Guide

blue-gray above, blue belt across chest

Hunting Strategy:

_____, _____

+ _____

_____

Hunting Strategy:

_____,

_____

+ _____

_____

dark brown above, white underparts with black dots

Hunting Strategy:

_____, _____ + _____

_____

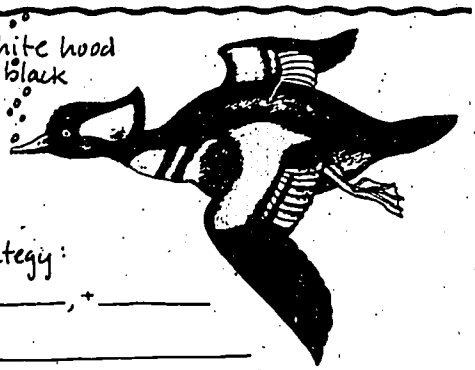
grey above, black head, neck and belly

Hunting Strategy:

_____, _____ + _____

_____

male has white hood bordered by black

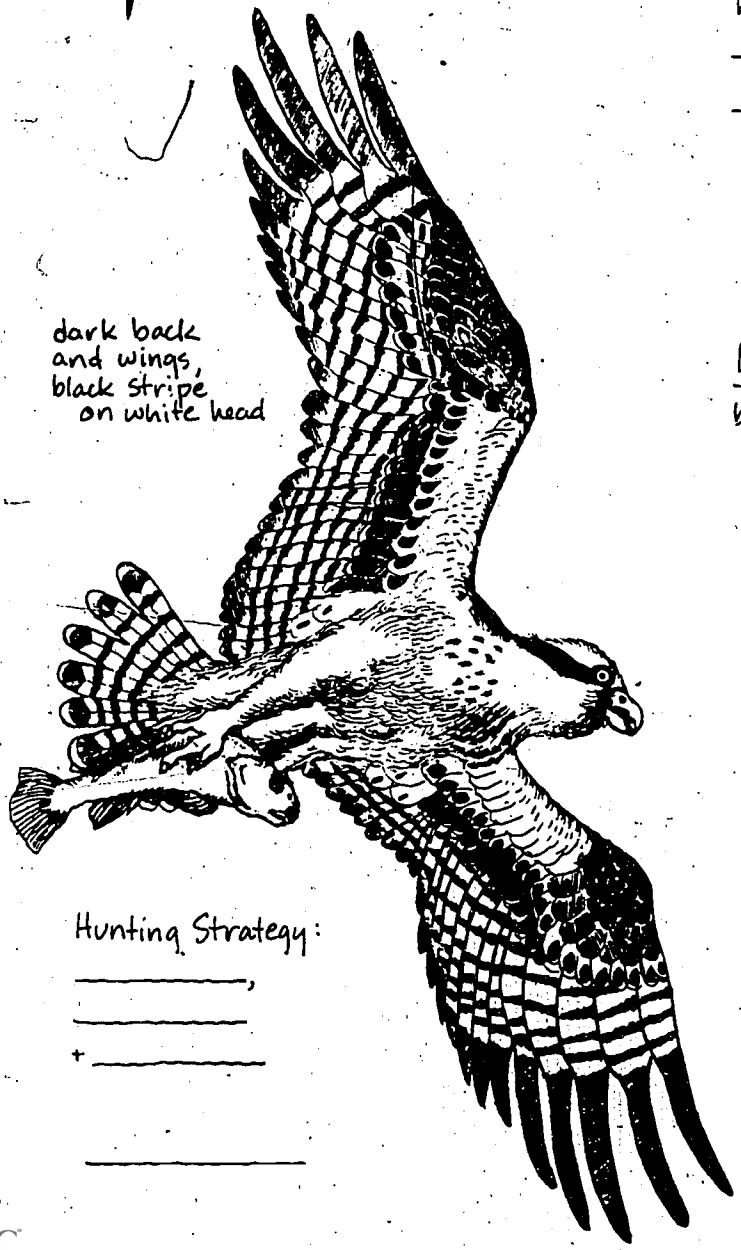


Hunting Strategy:

_____, _____, + _____

_____

dark back and wings, black stripe on white head



Hunting Strategy:

_____,

_____

+ _____

_____

long plume, tall, slender, black back and wings

Hunting Strategy:

_____,

_____

+ _____

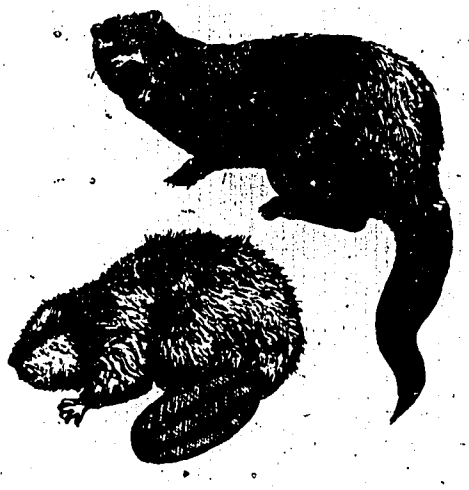
_____

ACHIEVEMENT COUPON
STEP INTO THE WILD

clue

1. _____

2. _____



3. _____

Importance Statement: It is important for each animal to have its own niche because _____

FACT PACKAGE (FP) for Wetland Mammals

Life is not easy in the wetland. There is only so much food and space, and all species, big and small, must compete for their share. Fortunately, nature has designed a way to reduce this competition so that all animal species can live in harmony in the wetland. We can study mammals and the five letter word in quotation marks in the next clue sentence to understand how.

Mammals can live together in harmony because each species lives in a certain "niche" in the wetland. ① A species' niche is its special place or role to play in the ecosystem. ② So that each species can have its special place to feed and raise young, the mammals spread out over the wetland. For example, the muskrat moves about mostly in the water and builds its nest in a house of stalks. The raccoon, on the other hand, hunts along the shore and raises its young in a tree hollow. ③ So that each mammal can have its own role to play, the mammals have different feeding habits. The beaver feeds on trees at night while the river otter hunts for animals by day.

Although the niches of some mammals may be similar, they are never quite the same. This guarantees each species its share of space and food in the ecosystem. And even though the mammals prey on each other, the survivors can live to carry on the species.

Like the mammals, all other animal species have a niche in the wetland. Because each species lives within its niche, all of the animals can live together, and the ecosystem will function smoothly. If one species loses a part of its niche, it suffers and may eventually die out. For example, the niche of the bobcat includes river bottom forest. Since a great deal of the forest in Illinois has been cleared to make room for cities and cropland, the bobcat has suffered and dwindled in numbers. In fact, the bobcat is listed as a "threatened mammal" in Illinois. If conditions continue to worsen for the bobcat, it may become "endangered" which means that it could become extinct in Illinois.

Working with Mammals

Work Step #1. Begin work on the word picture on page 44 by matching the clue in the top left corner of the picture with the same clue in the FACT PACKAGE. Then copy the first sentence that follows the clue in the FP onto the blank line that follows the clue in the picture. Continue work on the word picture by filling in the blank lines 1-3. To do so, copy the sentence or sentences that follow each of those numbers in the FP onto the blank lines in the picture.

Work Step #2. Finish the word picture by completing the IMPORTANCE STATEMENT in your own words.

Work Step #3. Described below are the *nine* mammal species drawn in the FIELD GUIDE on pages 46 and 47. As you read each description, pay special attention to the niche of each species. To do that, notice the parts of the wetland the species feeds in, what it eats, when it is active and where it finds shelter for itself and young. Using what you learn from the descriptions, complete the NICHE CHART on page 48 by completing Steps 1-4. At Step 1, there are seven boxes. Each box represents a part of the wetland, including the parts just outside of the wetland like the forest and meadow. In each box, list the mammals that feed in that part of the wetland. Remember that mammals feed in more than one part of the wetland. Be sure to list each mammal in all of the parts where it feeds. At Step 2, there are six boxes. Each box represents a kind of food. In each box, list the mammals that feed on that kind of food. At Step 3, there are three boxes. In the day box, list the mammals active by day; in the night box, list those active at night; in the afternoons and morning box, list the mammals active during those times. At Step 4, there are four boxes. Each box represents a part of the wetland where the mammals find shelter for themselves and nests. In each box, list the mammals that find shelter in that part of the wetland.

Work Step #4. Now that your NICHE CHART is complete, you are invited to a challenge. Try as hard as you can to find two animals that have exactly the same niche. If you can't, don't worry. That is the way it is supposed to be. Since no two species have exactly the same niche, each is guaranteed its own place and role in the ecosystem. This is how each animal survives while living in harmony with the other animals in the wetland.

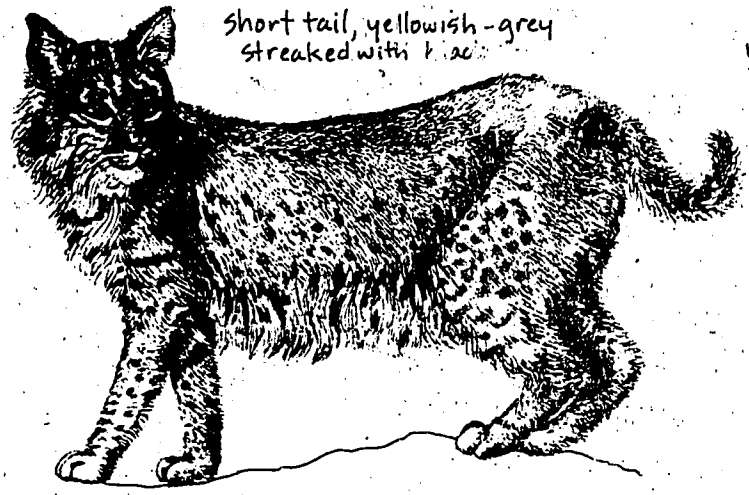
Work Step #5. Your last assignment in this chapter is to complete the FIELD GUIDE on pages 46 and 47. Study the clues beside each drawing in the guide and label the mammals.

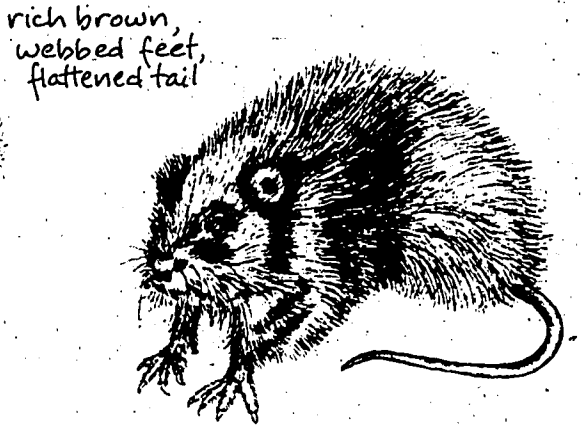
MAMMAL Descriptions

1. **muskrat:** This rich brown animal uses its webbed feet and somewhat flattened tail to help it swim. By day, the muskrat moves amongst the herbs where it feeds on roots, stems and leaves. Out in the water, the

muskrat builds several dome-shaped houses of cattail and bulrush stems. In these houses, the muskrat finds shelter for itself and young. If a pair of muskrats are living along a quickly moving stream, they do not build a house. Instead, they dig into a mud bank and build a nest in one chamber of the burrow.

2. **mink:** This long, slender animal is dark brown and has slightly webbed hind feet and a long, bushy tail. Mostly at night, the mink stalks the shore of wetlands where it preys on insects, crayfish, frogs, snails and water birds. Sometimes, it travels to a nearby meadow where it catches mice and rabbits. To shelter itself and young, the mink crawls into a burrow in the bank. Oftentimes it takes over the house of a muskrat out in the water.
3. **short-tailed shrew:** This mouse-sized shrew has nearly black, velvety fur and a sharp-pointed head. It lives in the forest surrounding a swamp. By day or night, it travels through the leaves on the forest floor to catch earthworms, snails, and insects. It finds shelter for itself and nests in tiny tunnels that it digs just beneath the forest floor.
4. **bobcat:** This bob-tailed cat has yellowish gray fur streaked with black. Mostly at night, the bobcat travels through the forest along rivers and swamps. This is where the cat tracks down and kills birds, rabbits, and squirrels. For shelter, the bobcat makes a den in a fallen rotten log or at the base of a standing hollow tree in the forest.
5. **river otter:** This animal has thick, short, brown fur, a flattened head and large webbed feet. By day, the otter swims through the water to catch earthworms, crayfish, frogs, turtles and fish. It makes a den in a hole in the bank.
6. **little brown bat:** This olive-brown or yellowish mammal flies on nearly hairless wings made of thin skin. During the warm months, it often flies above lakes and ponds. From dusk to dawn, it chases down insects in the air. During the day, it stays in a nearby forest where it shelters itself and young in the hollow of a tree.
7. **beaver:** This large, brown animal has a flat, paddle-shaped tail and webbed hind feet. At night, the beaver feeds on the inner bark of the trees it cuts down along the shore. To shelter itself and young, the beaver builds a wooden lodge in the water behind its dam. Occasionally, it makes a den in a burrow in the bank.
8. **meadow vole:** This short-tailed animal is brownish gray above and yellow or rust below. It lives in meadows at the edge of marshes. Mostly in the morning and then again in the afternoon, the vole cuts out travel runways in the grass. Sometimes, however, the vole is active at night. Since the vole eats grass, it can eat as it works. In its runways, which are about the size of a garden hose, the vole shelters itself and its nest.
9. **raccoon:** This gray-brown animal can be identified by its black mask and its tail ringed with black and white. By day, the raccoon sleeps in the hollow of a tree in the forest. This hollow is also where the raccoon raises its young. Throughout the night, the raccoon prowls along the shore where it feeds on nuts, berries, insects, crayfish, snails, earthworms, small birds and fish.





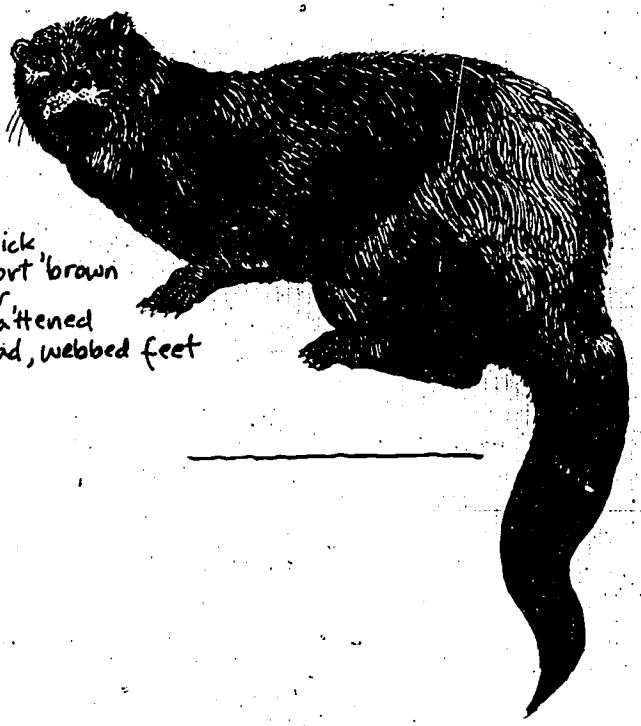
Mammal Field Guide

gray-brown, black mask, ringed tail

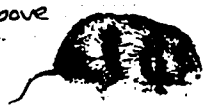
olive brown or yellowish, with nearly hairless wings

nearly black, velvety fur, sharp pointed head.

thick, short brown fur, flattened head, webbed feet



short-tail, brown-gray above yellow or rust below



long, slender dark brown slightly webbed feet long, bushy tail

large, brown, flat, paddle-shaped tail, webbed hind feet

Niche Chart

Step 1: Part(s) of Wetland Each Species Feeds In

Water	Air	Shore	In Herbs	Forest	Meadow
1.	1.	1.	1.	1.	1.
2.		2.		2.	2.
3.		3.		3.	

Step 2: Food Each Species Eats

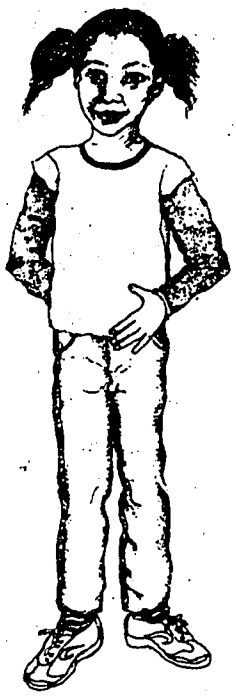
Plants	Invertebrates	Amphibians/ Reptiles	Fish	Birds	Mammals
1.	1.	1.	1.	1.	1.
2.	2.	2.	2.	2.	2.
3.	3.	3.	3.		
4.	4.				
	5.				
	6.				

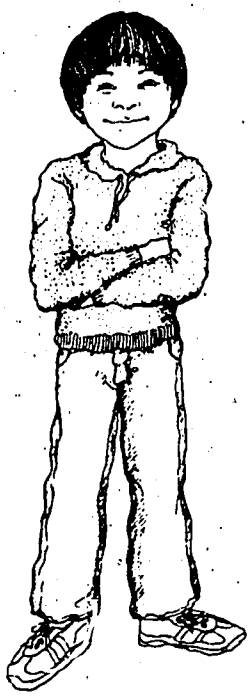
Step 3: Time When Each Species is Active

Day	Night	Morning and Afternoon
1.	1.	1.
2.	2.	
3.	3.	
4.	4.	
5.	5.	

Step 4: Location of Shelter for Each Species and Its Nest/Young

Bank	Water	Meadow	Forest
1.	1.	1.	1.
2.	2.		2.
3.	3.		3.
4.			4.





① _____

Importance Statement: The land-use decisions people make about wetlands are important because _____

FACT PACKAGE (FP) for People and Wetlands

In Chapters 1-11, you learned about the plants and animals that live in wetlands. In this chapter, your mission is to study the relationship between people and wetlands.

Unlike plants and animals, people do not live in wetlands. However, we all live near wetlands. Somewhere not very far from your home or school, is a river, stream, lake, pond, marsh, or swamp. You have probably visited one or some of these wetlands to swim, boat, fish, or simply look at the plants and animals there.

We all enjoy wetlands but we also have a responsibility for their well-being. We are charged with that responsibility because we are the guardians of the land in Illinois. It is up to us to care for all of our land, including our wetlands. One way we try to care for our land is by making decisions about how our land is used and treated. These decisions are called land-use decisions.

Since people have the power to make land-use decisions, we are the caretakers of Illinois' wetlands. ① Some of our decisions affect wetlands in a positive way while others can prove to be harmful to wetlands.

When something new like a road, building, or shopping center needs to be built, people make a decision about what land to build it on. Oftentimes, they decide to drain and clear away a wetland so they can build there.

Illinois is a state that has a great deal of cropland. Ever since the state was settled, people have been deciding to clear wetlands to make room for more cropland. Farming, itself, also affects wetlands. As fields are plowed, the soil is loosened and stripped of vegetative cover. When it rains, some of that soil washes off the fields into nearby wetlands. This soil or "silt" pollutes the water and builds up on the bottom of wetlands.

Soil is not the only pollutant in our wetlands. Other pollutants are sewage, pesticides, and toxic chemicals. Because of the decisions people make, these pollutants are often dumped into wetlands. This pollutes the water and is harmful to the plants and animals in wetlands.

Individuals also make careless decisions that harm wetlands. Every time someone throws garbage in a wetland or illegally shoots a wetland animal, the ecosystem is damaged.

People also make decisions that are good for the well-being of wetlands. Oftentimes landowners and public and private groups decide to preserve wetlands so the plants and animals can flourish and people can enjoy the wetlands.

People also work hard to control and treat the pollutants that flow into wetlands. Many farmers use good soil conservation practices to slow down the rate of soil running into wetlands. And each time one of us visits a wetland and leaves it just as we found it, we have made a land-use decision that benefits wetlands.

Work Step #1. Begin work on the word picture at the top of page 49 by filling in the blank line at the top of the picture. To do so, match the clue in the top left of the picture with the same clue in the FACT PACKAGE. Then copy the first sentence that follows that clue in the FP onto the blank line. Next fill in the blank line 1. Do that by copying the sentence that follows the number 1 in the FP onto the blank line in the word picture. To continue work on the picture, write your name on the blank line below one of the children in the picture. This means that you are a wetland caretaker. As you grow up, and after you are an adult, you will make many land-use decisions that affect wetlands.

Work Step #2. Finish the word picture by completing the IMPORTANCE STATEMENT in your own words.

Work Step #3. You learned in the FACT PACKAGE that people make land-use decisions that affect the well-being of wetlands. Listed below are ten land-use decisions. Read each decision carefully and then on a separate sheet of paper, answer the questions about how that decision affects the wetland. To help you work, look at the clue in front of each decision and then find the same clue in one of the Chapers 2-11. When you have found that clue, you will know that Chapter holds information you need for your answer.

Land-Use Decisions

Decision 1. A school group had decided to start a fund drive to buy and preserve a wetland. What are the six major types of wetlands they could buy?

Decision 2. A farming couple have decided to drain and clear several types of wetlands on their property to make room for more cropland. When the wetlands are cleared away, what are the seven kinds of plants and animals that will lose their habitat?

Decision 3. Many years ago, the people at a sewage plant decided to dump sewage into a stream. Ever since then, phosphates in the sewage have been acting like fertilizers and making many of the stream plants grow more abundantly than normal. There are so many plants, the bacteria and fungi in the water cannot keep up with the job of breaking them down when they die into nutrient elements. As a result, the nutrient element cycle in the stream has been interrupted. Does this mean there will be less of the nutrients that plants and animals need to grow? Will there be less space for living plants and animals in the stream ecosystem?

Decision 4. Several years ago, the owner of a large farm decided to spray herbicides on his crops. Since the owner did not follow the instructions carefully, he has been spraying too much herbicide on the fields. Rain water has carried a large amount of the herbicide from the fields into a marsh in the middle of his property. The herbicides have killed off many of the herbs in the marsh. Explain how this has slowed down the production of food in the marsh.

Decision 5. The people at a lumber company have decided to cut down all of the trees around a lake. Will this decision affect the recycling of water and oxygen around the lake? Explain your answer.

Decision 6. At a meeting of the town council in Anywhere, Illinois, one group of citizens proposed that the town lake be sprayed with insecticides to reduce the number of insects around the lake during spring and summer. Another group countered their proposal and said that the lake should not be sprayed because the insecticides would harm the lake ecosystem. After carefully considering the arguments of both groups, the town council voted not to spray the lake. The chairperson of the council said the decision was based upon the fact that the spraying would kill off many aquatic insects, and that the loss of those insects would disrupt the flow of food to other animals in the lake. In addition, the chairperson said that people could be harmed if they ate fish from the lake that had absorbed some of the insecticide in their bodies. Can you explain how the loss of insects could disrupt the flow of food in the lake ecosystem?

Decision 7. People have decided to dam a river. This will slow down the current of the water. Will fishes suited for living in quickly moving water, like the rainbow darter, still be able to live in the river?

Decision 8. The people of a city have decided to preserve a pond as a nature study area. Will this decision enable amphibians and reptiles to still find shelter in the pond? In what parts of the pond will they still be able to find shelter?

Decision 9. Many years ago, the people of Illinois decided to pass laws that prohibit the hunting or killing of several hundred animal species in Illinois. Many of the species protected by those laws are predator birds in wetlands. Why has this decision been good for the well-being of wetlands?

Decision 10. In the early 1970's, the people at a Construction Company decided to build a housing sub-division around a large lake. To make the sub-division an attractive and interesting place to live, the Construction Company decided to preserve the lake in its natural condition. Once the homeowners moved into the sub-division, they also decided to preserve the lake. They have kept the water clean by not throwing garbage into the lake. They have also protected the shore of the lake by not driving on it in cars or on motorbikes. And they have been careful not to harm any of the herbs and woody plants growing in or around the lake. They have even preserved a forest that stands on one side of the lake and a meadow that borders another side. How have the land-use decisions made by the Construction Company and the residents of the sub-division protected the niches of mammals that live near or in the lake? Name some mammals that have been able to keep their niches as a result of the land-use decisions.

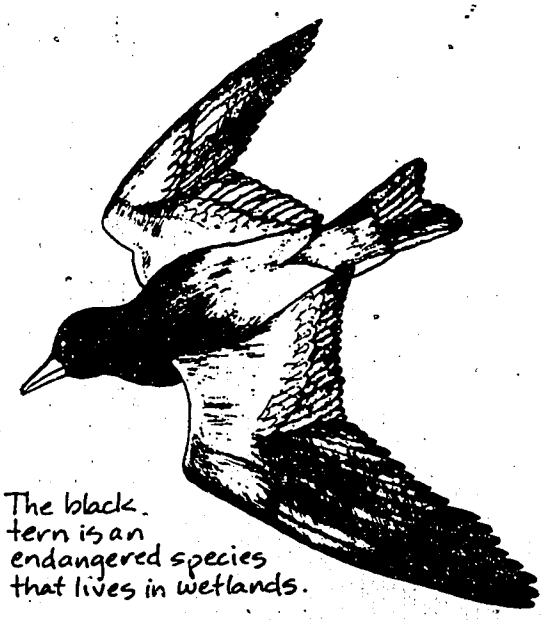
Chapter 13

Wetlands Are Valuable

In Illinois, our wetlands are places of great value. This holds true for the smallest marsh to the mighty river Mississippi. It is your mission, in this exercise, to discover the reasons why the wetlands are a valuable part of the Illinois' natural resources. To carry out your mission, study the six **VALUE REASONS** below and complete the FACT PACKAGE.

VALUE REASON 1
Wetlands Provide Habitat for Plants and Animals

You learned in the Building an Ecosystem Chapters (1-11) that many plants and animals are adapted to life in or near the wetlands. Since wetland plants and animals are equipped to feed, reproduce, and find shelter in or near a wetland habitat, they cannot do the same away from a wetland. For these plants and animals, a wetland habitat is a matter of life and death. With a wetland habitat, they can thrive; without a wetland habitat, they are doomed. A safe habitat is especially critical for plant and animal species that are having a hard time surviving. These "endangered" and "threatened" species are already low in numbers and may be clinging to life in just a few wetland locations. If those wetlands are destroyed, they may be pushed to, or closer to, extinction in Illinois. For example, creeping loosestife is a plant that survives in only three areas of swampy forest in Illinois. Other endangered and threatened plants and animals that depend on wetland habitats in Illinois are dune willow, Kankakee mallow, bluebreast darter, bald eagle, river otter and black-crowned night heron.



The black tern is an endangered species that lives in wetlands.

VALUE REASON 2
Wetlands Filter and Trap Sewage, Silt and Chemical Pollutants

Wetlands work as natural filters. To understand how, let's look at an imaginery marsh. This large marsh is bordered on the west by a housing subdivision, by a farm on the east, and by an interstate highway on the north. Along its southern boundary, it drains into a small stream that eventually runs into a major river. When it rains, a lot of pollutants run off of the areas around the marsh into its water. Sewage from the septic tanks in the housing subdivision pass through the soil into the marsh. Soil washes off of the farmland and runs into the marsh. The run-off soil is carrying pesticides and fertilizers that also enter the marsh. And finally, heavy metals and automobile by-products from the interstate wash off the highway and drain into the marsh. Once the pollutants are in the marsh, they are trapped by the thickly growing herbs. The soil or silt, pesticides, metals and automobile wastes settle to the bottom. The phosphates and nitrates in the fertilizers are broken down and recycled through the nutrient element cycle. By the time the water flows out of the marsh, through the stream and into the river, many of the pollutants have been filtered out of the water and left behind in the marsh. Because of the marsh's work as a filter, the water in the river is kept cleaner. This is not to say that wetlands, like the marsh, can filter any amount of pollutants and not be damaged. Every wetland reaches a cut-off point and once it reaches that point, it cannot absorb any more pollutants without being damaged. That is why we need to work to control the amount of pollutants that flow into our wetlands.

VALUE REASON 3

In Illinois, our rivers flood each year. These floods often cause serious damage. The damage is lessened, however, due to the work of the backwater wetlands, such as lakes, swamps, and marshes along the rivers. When a river floods, much of the water spills over into its backwater wetlands. These wetlands then act like sponges and absorb the flood water. This helps keep the flood water out of our cities and off of our roads. Once the floods have peaked, the backwater wetlands release the flood waters slowly back into the river. As a bonus, some of the pollutants in the flood water have been filtered and trapped in the backwater wetlands and never enter the river.

VALUE REASON 4
Wetlands Recharge Aquifers

Deep below our wetlands are large underground reserves of water called aquifers. Since we take water out of the aquifers, it is important that they be recharged by rainwater. Wetlands play an important role in that process. Wetlands catch the rainwater. The water then sinks down through the wetland bottoms until it reaches and recharges the aquifers.

VALUE REASON 5
Wetlands Provide Food and Water for Humans

Wetlands provide some of the fuel we need to live. We get our drinking water from rivers, lakes and aquifers. We eat fish and other animals taken from wetlands. The water from wetlands is even used to irrigate some of the crops produced by Illinois farmers. These crops help feed people all over the world and are an important part of our economy.

VALUE REASON 6
Wetlands Provide Opportunities for Recreation and Serve as Living Museums of our Natural Heritage

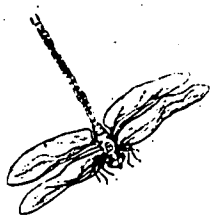
Most people enjoy wetlands at one time or another. Wetlands give us a place to swim, fish, hunt, boat, and observe nature. In these wetlands, we can study the beautiful plants and animals that live there. And we can stand in fascination as we watch how the wetland ecosystems work. Every little tadpole and each blossoming plant is part of our natural heritage in Illinois. When we visit wetlands, we can enjoy that wonderful heritage.

FACT PACKAGE (FP) about the Value of Wetlands

On a separate sheet of paper, create a **FACT PACKAGE** about the value of wetlands. To do that, explain in your own words the six reasons why wetlands are a valuable part of Illinois' natural resources.

Wetlands are valuable to all of these species.

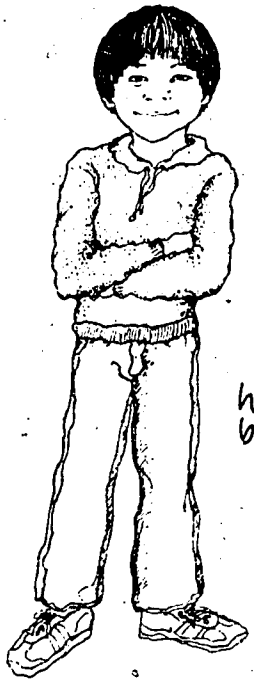
belted kingfisher



green darner

raccoon

northern cricket frog



human being

coontail

Chapter 14

Problems that Threaten Wetlands

Described in the **FACT PACKAGE (FP)** below are four major problems that threaten wetlands in Illinois. These problems are **habitat destruction, siltation, violation of protection laws,** and **chemical pollution.** On pages 56 and 57, there are word pictures that illustrate each of those four problems. It is your job in this exercise to complete those four word pictures. To do that, follow these instructions.

The FACT PACKAGE is divided into 4 Parts. Start at **Part 1 - The Problems.** Take one problem and look at the clue drawn before it. Then match that clue with the same clue in Part 1 of one of the word pictures. Next copy the word or words that follow the clue in the FP onto the blank line in the word picture. Follow the same procedure with the next three problems.

Part 2 - The Causes
There are four causes of wetland problems listed. Take one cause and match its clue with the same clue in Part 2 of one of the word pictures. Next copy the ***bold words in italics only*** that follow the FP clue onto the blank line that follows that clue in the word picture. Follow the same procedure with the other three causes.

Part 3 - The Effect
There are four effects of wetland problems listed. Take one effect and match its clue with the same clue in Part 3 of one of the word pictures. Then copy the ***bold words in italics only*** that follow the FP clue onto the blank lines that follow that clue in the word picture. Follow the same procedure for the other three effects.

Part 4 - The Solutions
There are four solutions given for wetland problems. Take one problem and match its clue with the same clue in Part 4 of one of the word pictures. Then copy the ***bold words in italics only*** that follow the clue in the FP onto the blank lines that follow that clue in the word picture. Follow the same procedure for the other three solutions. Once you are finished, you will have completed your study of the problems threatening Illinois wetlands.

FACT PACKAGE (FP) about Wetland Problems

Part 1. The Problems

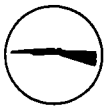
siltation

habitat destruction

violation of protection laws

chemical pollution

Part 2. The Causes



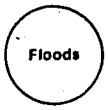
People who break the law by dumping wastes or harm protected animals in wetlands.

The soil from cropland is carried by rainwater into the water of wetlands. This is called ***soil erosion.***

Pesticides and fertilizers are the major causes. Farmers and homeowners spray pesticides, herbicides and insecticides to control pests, fungi and insects on their plants. They also treat their plants with fertilizers to help them grow. These chemicals make their way down into the soil. When rainwater erodes the soil, the chemicals are washed along with the soil into wetlands.

The draining and clearing of wetlands to make room for the development of buildings, roads and farmland.

Part 3. The Effects



The run-off soil called "silt" makes the water in the wetland muddy. The muddy water blocks the flow of sunlight that plants need to conduct photosynthesis. As a result, animals are deprived of plant food. The thick blanket of silt is too unstable for plants to take root in. As plants die, the animals also suffer from a lack of oxygen. As more and more silt builds up on the bottom, there is less room for the water. This makes the wetland flood during heavy rains. The final results of siltation are that ***plants and animals die, and floods are caused.***

Pesticides, herbicides and insecticides pollute the water of wetlands. Plants, and some animals, take in the chemicals from the water. Eventually, the chemicals are passed from one animal to the next in the food web until all animals are laced

with the chemicals. As a result, the plants and animals sicken and often die. The fertilizers also pollute the water. Some plants are tolerant of the fertilizers and grow more abundantly than normal. Eventually, these plants take over the wetland by shading out the less-tolerant plants in the ecosystem. Before long, the less tolerant plants die out and the animals suffer from a lack of food and oxygen. People also are victims of chemical pollution. When we eat fish from a stream that is polluted with chemicals, those chemicals are passed into our bodies. The end results of chemical pollution are that ***fewer plant species survive, animals sicken and/or die, and people may suffer.***

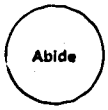
Wetlands provide a natural habitat for plants and animals. In this habitat, they can find food and shelter. Wetlands also provide wonderful places for people to swim, boat and to observe nature. When wetlands are destroyed to make way for new development, ***plants and animals die*** because they have lost their habitat ***and people also lose the wetlands they enjoy.***

In Illinois, there are laws that protect wetlands and the wildlife that live in them. For instance, it is illegal to dump sewage or any other pollutant into wetlands. It is also illegal to harm the nearly 500 species of animals that are protected by law. There are 72 "endangered" and "threatened" wildlife species in Illinois. The endangered species are in danger of becoming extinct. It is against the law to hurt, kill or possess an endangered animal. Many endangered animals, like the least tern, live in or near wetlands. There are some species, like the muskrat, hooded merganser and bluegill, that can be legally hunted, fished or trapped. However, it is illegal to violate fishing and hunting laws when taking these species. Hunters, anglers, and trappers must follow safety rules, take no more than the legal limit of game animals, and also hunt, trap, or fish within the posted seasons.

When people violate wetland protection laws, the consequences are grave. When wastes are dumped into wetlands, plants and animals may die in the polluted water. And remember, people also get their drinking water from these same places. When a hunter violates a hunting law, he or she is taking more than his or her share of the supply. And, of course, the results are obvious when animals are illegally shot. Unfortunately, the leading cause of death for the bald eagle, an endangered bird that lives along Illinois' rivers and lakes in the winter, is illegal shooting. As a result of protection law violations, every part of the ***wetland ecosystem is damaged and people suffer too.***

Part 4. The Solutions

Of course, we would not want to stop the development of all new buildings, roads and farmland. But before we build or develop anything new, we should look at all of the places where it could be built. Sometimes, we can choose a building site that is not a wetland or other natural habitat. The choice about where to build or develop something new is usually not an easy one. But, with careful land-use planning, we can try to ***preserve as many wetlands as possible.***



The solution to this problem is simple: ***we should all abide by the laws that protect wetlands.***

There are two important things we can do to help solve chemical pollution. First, since chemicals are carried into wetlands with the soil that washes off farmland, we can work to ***control soil erosion.*** By using good soil conservation practices like the ones described in the solution to the Problem of siltation, farmers and other landowners can help control soil erosion. If we can slow down soil erosion, we can also reduce the amount of chemicals flowing into our wetlands. The second thing we can do is ***control the amount and kind of chemicals we use.*** People who use chemicals should follow the instructions carefully and apply only the recommended amount. If too great a quantity of chemicals is used, the problem is only worsened. We should also pay close attention to the kinds of chemicals we use. We know that some chemicals are more harmful than others. For example, chemicals like DDT stay active in the environment for many years. Because of this, DDT and some other persistent chemicals have been banned in the United States. Scientists are now trying to develop new chemicals that are less persistent. These chemicals break down more quickly in the environment and do less damage. In the future, we should try to use these less persistent chemicals.

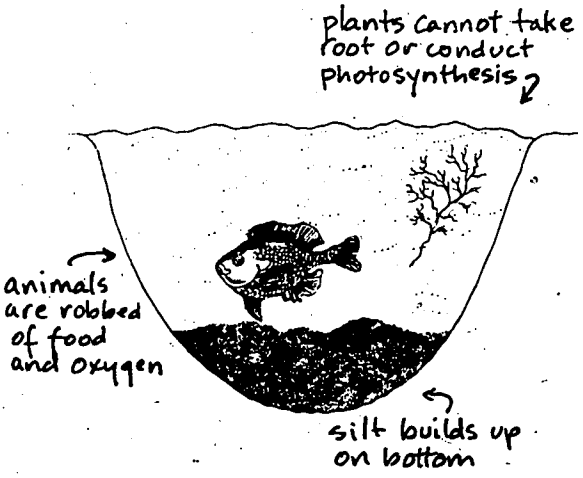
Farmers can use ***good soil conservation practices*** to slow down the rate of soil erosion. One thing they can do is leave more crop stubble on their fields. The stubble holds the soil and keeps it from washing away. They can also build rounded ridges of earth called terraces across sloping fields. These terraces catch and hold rainwater as it runs downhill. Farmers and landowners can also plant trees, shrubs and prairie grasses on their land, especially on hills bordering streams. The roots of these plants hold the soil in place.

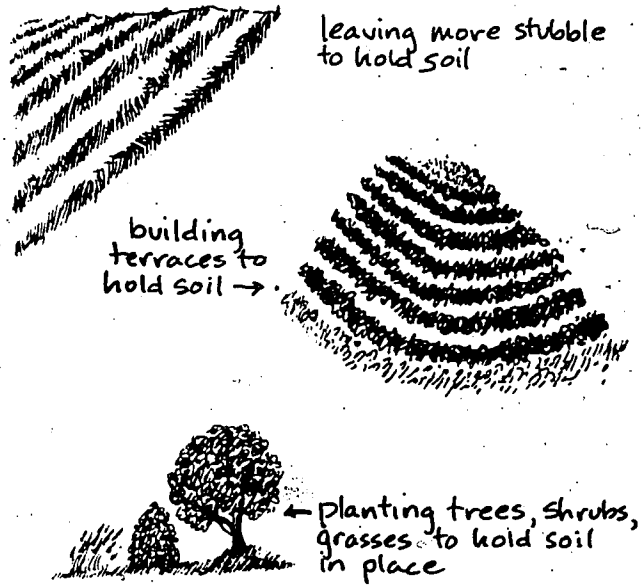
Part 1 - The Problem: _____

Part 2 - The Cause: _____

Part 3 - The Effects: Floods _____

Part 4 - The Solution: Conserve _____



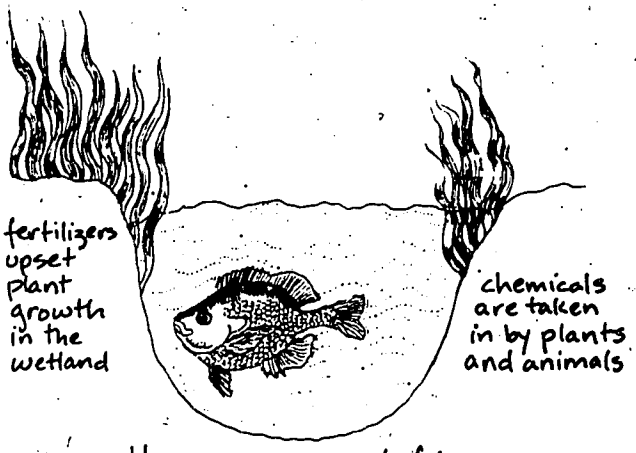


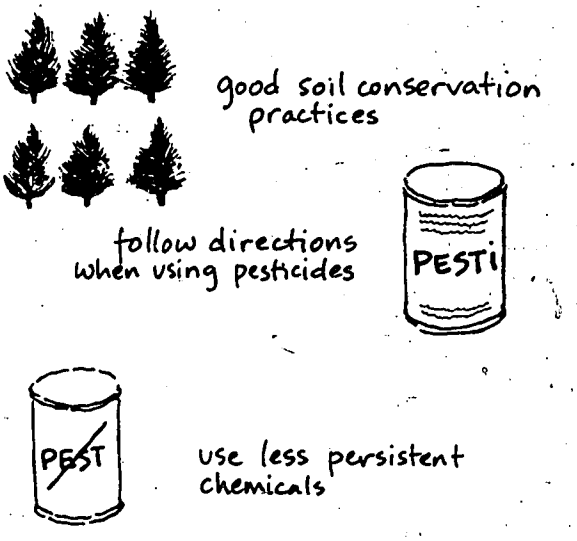
Part 1 - The Problem: CP _____

Part 2 - The Cause: PESTi _____

Part 3 - The Effects: _____

Part 4 - The Solution: Control _____



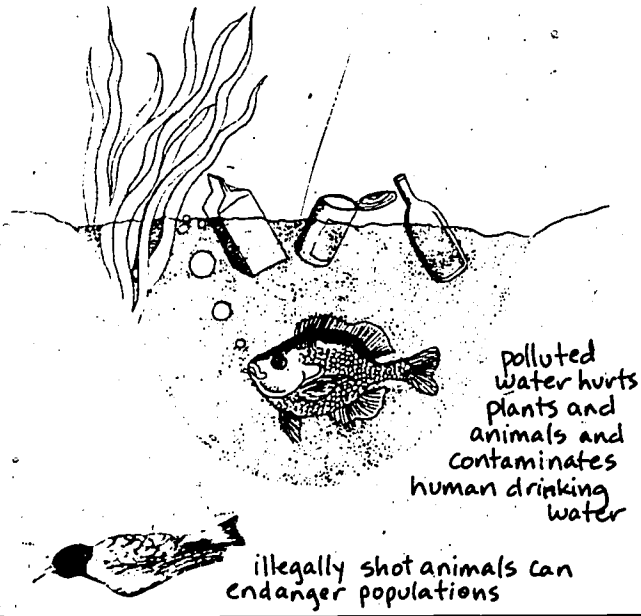


Part 1 - The Problem: _____

Part 2 - The Cause: _____

Part 3 - The Effects: Less _____

Part 4 - The Solution: Abide _____



polluted water hurts plants and animals and contaminates human drinking water

illegally shot animals can endanger populations

treat wetlands with care

Part 1 - The Problem: _____

Part 2 - The Cause: _____

Part 3 - The Effects: No Home _____

Part 4 - The Solution: Preserve _____

Plants and animals are left homeless and people lose the wild places they enjoy.

People can make wise land-use decisions.

Chapter 15

Working as a Wetland Manager

On page 52, you learned about why wetlands are such a valuable part of our natural resources in Illinois. Then on pages 53-57, you studied the problems that threaten wetlands as well as some of the solutions to those problems. Now it is time for you to put what you have learned to **work managing our wetlands.**

You learned in Chapter 12 that we are the caretakers of the wetlands in Illinois. Any work that we do to care for or conserve our wetlands is called **wetland management.** Since each Illinoisan is a caretaker of our wetlands, each of us, including you, is a **Wetland Manager.** After all, it is up to us to solve the problems that threaten our wetlands. If we can solve those problems, our wetlands will be conserved and there will be a lot of winners. Wetland plants and animals will benefit, people will have safe drinking water and our children will be able to enjoy wetlands just as we do.

Getting Some Practice

To complete this exercise you will have to work as a **Wetland Manager.** To do so, place yourself in the position of the four **wetland managers** below. In each of those positions, you will be working to solve a wetland problem. Do your work on a separate piece of paper. To help you work, match the clues drawn at each position with the same clues in Parts I of the word pictures on pages 56 and 57. Also match the clue at each position with the same clues in the **FACT PACKAGE** on pages 53-55. You will need the word pictures and the background information in the **FACT PACKAGE** on pages 53-55 to complete your management work. You will also have to answer questions about the value of wetlands so you should review the information on page 52 before you begin.

Position 1: STUDENT

As a student, you are a **wetland manager.** There are many things you can do to help conserve wetlands. Which of the following could you do to help conserve wetlands? ① Learn about wetlands and the conservation of wetlands in your class at school. ② Go to the library and read more about wetlands. ③ Prepare a report about wetlands and present it to your class. ④ Tell others about the value of wetlands and why they should be conserved. ⑤ Write to your lawmakers and encourage them to pass laws to conserve wetlands. ⑥ Treat wetlands with care when you visit them. Can you think of some other things you could do to conserve wetlands?

Let's practice one thing you can do to help conserve wetlands. Pretend that you have gone to visit a farmer in your area. You want to talk to the farmer about the ***problem of siltation.*** Explain what you would tell the farmer about the causes of siltation. How would you explain the effects of siltation on wetlands? What things would you tell the farmer to do to help solve the problem of siltation? If the farmer asks you why wetlands are valuable, what would you say?

Position 2: ADULT

When you grow up to be an adult, you will be a wetland manager. There are many things that you will be able to do to help conserve wetlands. Which of the following do you think you could do? ① Treat the wetlands you visit with care and tell your children and others to do the same. ② Attend public land-use meetings to express your views about the importance of conserving wetlands. ③ Write to your lawmakers about how you think laws should be passed whenever possible to protect wetlands. Can you think of some other things you could do as an adult to help conserve wetlands?

Pretend you are an adult. You are attending a meeting of the land-use planning committee of your town council. The purpose of the meeting is to plan where to build a new shopping center. You know that one of the sites being considered for the shopping center is a large marsh not very far from your home. You are concerned about the ***habitat destruction*** that would occur if the shopping center is built on the marsh site. What would you tell the committee about the effects of habitat destruction upon wetlands? What would you advise the committee to do as they decide where to build the shopping center? If the committee wants to know why you think wetlands, like the marsh near your home, are valuable, what would you say?

Position 3: FISHERIES BIOLOGIST

When you grow up, you may choose to be a fisheries biologist. In Illinois, fisheries biologists work for the state or federal government. As wetland managers, their chief job is to improve the conditions in our wetlands so that fish and other wildlife can live and reproduce. If you were a fisheries biologist, which of the following could you do to help conserve wetlands? ① Give talks to school and community groups about the importance of conserving wetlands. ② Advise landowners about how to control soil erosion so that the amount of silt and chemicals flowing into our wetlands will be reduced. ③ Advise farmers and homeowners about how to use pesticides and fertilizers properly. ④ Treat wetlands with care and tell others to do the same. Can you think of some other things you could do as a fisheries biologist to help conserve wetlands?

Pretend you are a fisheries biologist. You are addressing a community group that is very concerned about a large fish kill that just occurred in a nearby lake. You know that the fish kill was caused by pesticides that ran off of farmland into the lake. What will you tell the group about the causes of ***chemical pollution***? What will you tell them about the effects of chemical pollution on wetland ecosystems? Will you tell the group that chemical pollution threatens human drinking water? Explain two things you could tell the group about solving the problem of chemical pollution. If the group wants to know why you think wetlands are valuable, what will you say?

Position 4: CONSERVATION POLICE OFFICER

When you grow up, you may choose to work for the Department of Conservation as a Conservation Police Officer, called a CPO for short. A CPO is a **wetland manager** whose job is to enforce the laws that protect our wetlands and other natural resources This is a big job that CPO's cannot do all by themselves. They depend on all Illinoisans to follow the law so our precious natural resources will be safe. If you were a CPO, which of the following could you do to help conserve wetlands? ① Give talks to school and community groups about the laws that protect wetlands. ② Talk to people when they visit wetlands and tell them to follow the law and enjoy the wetlands safely. ③ Give people tickets if they violate the law and explain to them what they have done to harm wetlands. ④ Treat wetlands with care when you visit them and tell others to do the same. Can you think of some other thing you could do as a CPO to help conserve wetlands?

Pretend you are a CPO. You are working today in a State Park where there is a large lake. As you are walking around the shore of the lake, you see someone dumping a truckload of garbage into the lake. Is that legal? If not, what would you tell the person about how her actions are harming the wetland? Next, you encounter someone who has poached a great blue heron and a least tern. Is it legal that the person has shot the heron? If not, how would you explain that to the person? Is it legal that the person has shot the least tern? If not, how would you explain that to the person? What would you tell the person about how his actions have damaged the wetland ecosystem? An hour or so after you leave that person, you meet up with a hunter who has taken the legal limit of hooded mergansers from the lake. Would you tell the hunter that he is helping to conserve the wetland by taking only the legal limit and by not shooting protected animal species? Next you encounter a school group that is conducting **Wetland Sleuthwork** at the lake. The students want to know how protection law violations effect wetlands. What would you tell them? What would you tell them about the solution to protection law violations? If the students ask you why you think wetlands are valuable, what would you say?

Chapter 16

Wetland Sleuthwork

It is your mission in this exercise to spy on a wetland. To succeed, you need some spy equipment: The equipment you need are a pencil, paper, magnifying glass, binoculars, glass jar, a dip net and a pan. You also need a big dose of spy-spirit because you are going to be sneaking about a wetland looking and listening for every sign of life. Once you spot something, you need to describe and draw the evidence just as a spy would. Please remember to be sneaky. Once you enter the wetland, all of the animals will explode into action. You will have to be quiet in order not to scare them away. To help you with your investigation, you should use the FIELD GUIDES in this kit. To begin your work, start at Part I. There are 5 parts. At the beginning of each part, study the ***target and mission clue box*** first. You will then know what part of the wetland you will be spying on. Get going! Good luck!

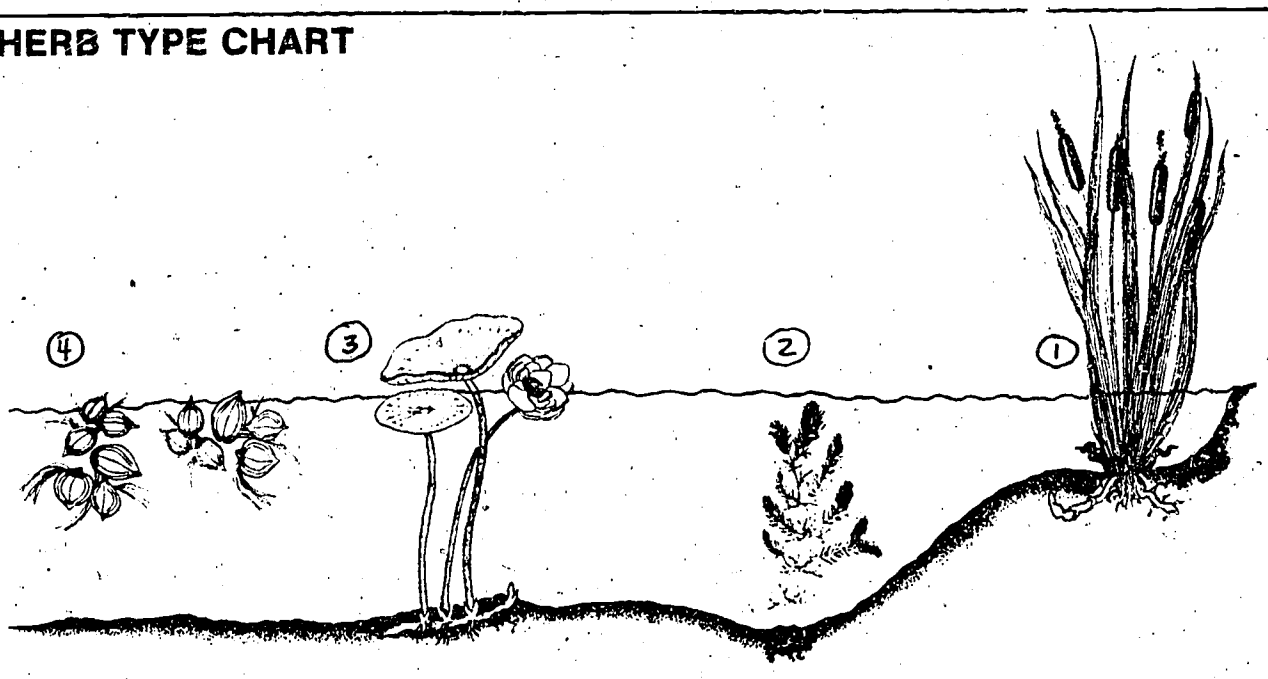
Part I

Strategy A
Study the HERB TYPE CHART below. The chart shows the four types of herbs in the wetland.

Strategy B
Now start your investigation of herbs. How many TYPE 1 herbs can you locate? _____ how many TYPE 2? _____ TYPE 3? _____ TYPE 4? _____. Using your **Herb Field Guide,** identify as many of the herbs as you can. Prepare a **Herb Life Chart** like the sample on page 61 for each herb you see.

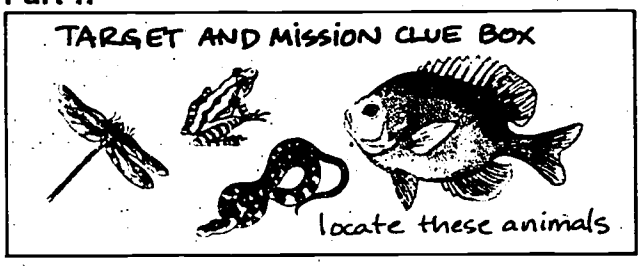
Strategy C
Locate at least 5 different tree and shrub species. Try to collect one leaf and one fruit from each tree or shrub you locate. With your **Woody Plant Field Guide,** can you identify any of the plants? _____. Prepare a **Woody Plant Life Chart** like the one in the sample on page 61 for each shrub and tree and then move to Part II.

HERB TYPE CHART



Type #1. Emergent: Stems and leaves of these herbs stand above water.
Type #2. Submerged: Stems and most leaves of these herbs are submerged or below the surface of the water.
Type #3. Rooted Floating: Leaves of these herbs float on surface. The herbs are rooted in the bottom.
Type #4. Free Floating: Entire herb floats near or at surface of water. It is not rooted in the bottom. Its roots dangle freely in the water.

Part II



Strategy A
Start with the smallest but most numerous animals, the invertebrates. Look across the sky of the wetland. Do you see any insects flying above the water? _____. Move now to the plants. Can you spy any insects, spiders, or snails on the leaves and stems of plants? _____. Examine the water next. Do you see any insects like the water strider moving across the water surface? _____. Bend down and look into the water. Can you see any insects, worms, snails, or clams in the water? _____. Very carefully lift up some rocks or a log. Did you uncover any invertebrates? _____. As you work, pay special attention to trying to find the immature forms of insects. To help you identify immature forms of insects check out the **Immature Insect Chart** on page 30. With your **Invertebrate Field Guide,** try to identify any adult invertebrates you see. Then prepare an **Animal Life Chart** like the sample below for every immature or adult invertebrate you find.

Strategy B
Try to locate as many fish as you can. Do you see any fish swimming near the shore? _____. Do you see any spawning areas on the bottom? _____. Look across the water surface for several minutes. Can you see any fish jumping up to snag insects? _____. Do you see any of the circles that fish make when they come to the surface to feed? _____. Using your **Fish Field Guide,** can you identify any of the fish you have seen? Prepare an **Animal Life Chart** for every fish you have located.

Strategy C
Stand very quietly at the edge of the water and look for reptiles and amphibians. Can you see any tadpoles? _____. Do you see or hear any toads or frogs? _____. Pick up some leaves and a few rocks. Are there any salamanders or crayfish hiding beneath them? _____. Do you see any turtles basking on rocks or logs? _____. Can you spy any snakes basking, swimming or crawling through the grass or leaves? _____. Using your **Amphibians and Reptiles Field Guide,** can you identify any of the animals you have located? Prepare an **Animal Life Chart** for each animal you have spied.

SAMPLE

HERB LIFE CHART

Type: 1 (2) 3 4
Name: Illinois pondweed
Height: 16"
Flower: narrow spike
Leaves: O oval
Color: green

Draw Herb Below:

SAMPLE

WOODY PLANT LIFE CHART

Name: cottonwood
Height: 100'

Draw and Describe plant below

bark: grey

fruit: white, cottony hairs on fruit

leaves: triangular and green

SAMPLE

ANIMAL LIFE CHART

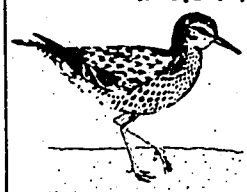
Name: water boatman
Color and Features: oval-shaped, brown-gray, yellow crossbands
How does it travel?: Swims

Draw Animal Below

water boatman

Part III

TARGET AND MISSION CLUE BOX



Detect the presence of:

Strategy A

Stand quietly by the shore **and listen.** Can you hear the call or song of any bird? _____. If so, it may sound like the song of the common yellowthroat illustrated at your right. Try to describe any songs or calls you hear: _____

Strategy B

Scan the area around the wetland with your binoculars. If you don't have any binoculars, depend upon your keen eyesight. Can you see any birds flying? _____; swimming? _____; stalking the shore? _____; diving? _____; or perched on branches? _____. With your **Bird Field Guide,** can you identify any of the birds you see? Prepare an **Animal Life Chart** like the one in Part II for each bird you spot.

Strategy C

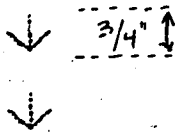
Walk slowly and carefully along the shore. Keep your eyes pinned to the ground to spot bird tracks. Check the **Tracks Sample Box** below for some of the tracks you might find. On a separate sheet of paper, draw all of the tracks you have located.

Strategy D

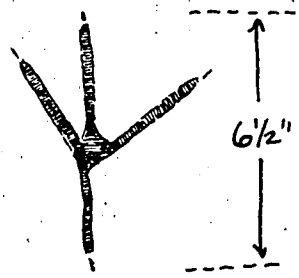
Before you leave this part, look for the nests of birds. Start with the shoreline vegetation. Peak very carefully into several stands of herbs. Do you spy a nest? _____. Move next to the trees and shrubs. Can you see any nests located in their branches? _____. **REMEMBER: A GOOD WETLAND SLEUTH DOES NOT HARM OR TOUCH THE NEST OF ANY ANIMAL. THAT IS ITS HOME.** Prepare a nest box like the one in the sample below for each nest you find.

SAMPLE

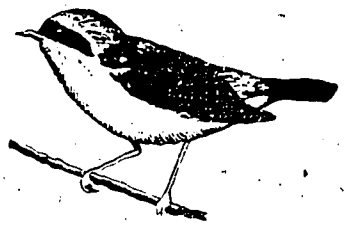
TRACKS BOX



spotted sandpiper



great blue heron



Listen for the clear, rapid chant of the common yellowthroat "witchy-witchy-witchy- witch."

eastern kingbird

SAMPLE

NEST BOX

Bird name: eastern kingbird

Description of nest: twigs and stems

Location: tree branches by pond

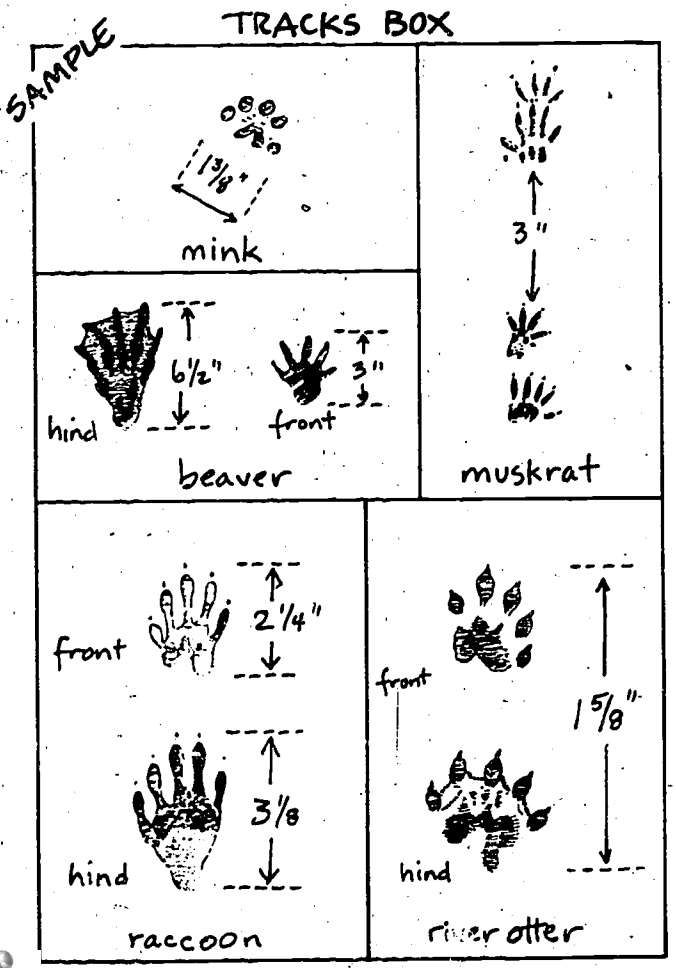
Height above ground: 15 feet

Draw Nest below

Part IV

Strategy A
Stand very quietly at the shore. Do you see any mammals swimming? _____; in the vegetation? _____; or moving along the shore? _____. With your **Mammal Field Guide,** can you identify any of the mammals you see? _____. Prepare an **Animal Life Chart** like the one in Part II for each mammal you spy.

Strategy B
Walk carefully along the shore and look for the tracks of mammals in the mud or sand. The **Tracks Sample Box** below will give you an idea of what some mammals' tracks look like. Draw any tracks you find.



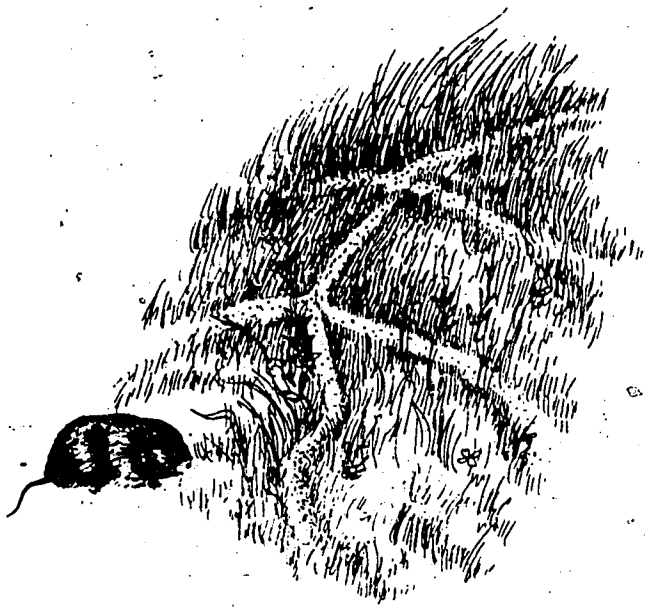
Strategy C
As you scour the shore line for tracks, look also for mammal feces or "scats". The scats of the muskrat are drawn here. Draw any scats you find.

The scats of the muskrat.

Strategy D
Your next assignment is to look for mammal shelters. Review page 48 of this kit for the type of shelters mammals use. Can you find or see a muskrat house? _____; a beaver lodge? _____; or the burrow of a mink or river otter in the bank? _____. Describe and draw any shelter you find.

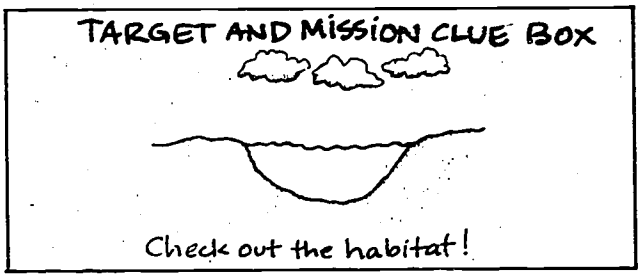
Strategy E
Now walk away from the wetland to the nearest natural habitat. If you walk into a grassland, look for mammals and the signs of mammals. You many be able to find the grass runway of a small animal like the meadow vole. If you walk into a forest, look for mammals and their tracks and scats.

Strategy F
Use your **Field Guide** to identify any mammals you have seen in Part IV. Prepare an **Animal Life Chart** for each mammal and draw any tracks or scats you have found.



The grass runway of the meadow vole.

Part V



Stategy A
Name the type of wetland habitat you are investigating _____.
Review page if you need assistance.

Strategy B
Check out the water. If you have a thermometer, measure and write down the water temperature. _____. Do you see algae in the water? Now dip a glass jar into the water and then hold the jar of water up to the sun. Is the water clear? _____; or muddy? _____. What do you see in the water?

The quality of the water is very important for the well-being of plants and animals. If the water is clear, sunlight can penetrate the water to reach plants so that they can conduct photosynthesis. Clear water is also good for the animals who must see food underwater and for those who use gills to get oxygen. Do you think the water in the wetland you are spying on is of good quality for plants and animals? _____. Is the water in your wetland moving? _____; or still? _____. How deep is the water a few feet out from the shore? _____. Are there waves? _____.

Strategy C
Now move to the wetland bottom. Take your dip net and sweep it along the bottom. Be sure to scoop up some of the bottom. Then dump the contents of the net into a pan. Is the bottom made of mud? _____; sand? _____; or rocks? _____. Are there leaves? _____. Pick around in the pan to observe everything in it. Draw and describe every object or animal you dipped out from the bottom.

Strategy D
Now look to the sky. ***The air is also an important part of the wetland habitat. That is where water, carbon dioxide, and oxygen are stored. Flying animals also use the air for travel space.*** Smell the air in your wetland. Does it smell clean? _____. Do you see any clouds in the air? _____. Do you see any animals traveling through the air? _____.

Strategy E
Now it is time for you to pull together the results of your wetland sleuthwork. In the **Wetland Ecosystem Box** below, the physical structure of the habitat, including the air, soil and water, is already drawn. To complete your mission, draw in as many of the plants and animals you have seen in each of the four parts of your work. You can use your **Field Guides** and the **Giant Coloring Page** to help you make your drawings. If you want to, you can draw your **Wetland Ecosystem** on a larger piece of paper. Once you are finished, you will be a **Certified Wetland Sleuth.** There is a card that will certify you as such a sleuth on page 5 of this kit. Be sure to sign your name on the card. **CONGRATULATIONS!**