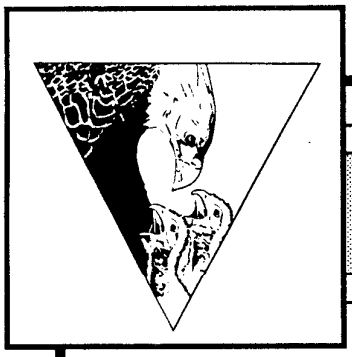
BALD EAGLE AWARNESS WEEK

ACTIVITY GUIDE

BUREAU OF ENDANGERED RESOURCES

WISCONSIN DEPARMENT OF NATURAL RESOURCES



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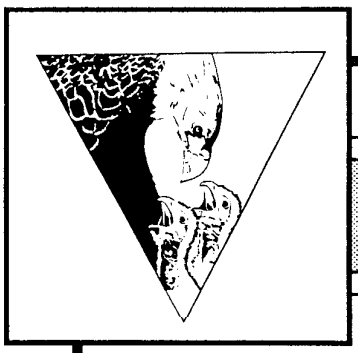

Introduction

Bald Eagle Awareness Week Activity Guide

by Beth A. Fritz and Charlene M. Gieck

Introduction:

The bald eagle is lucky to be our national symbol and to receive so much attention. The eagle is an endangered species and we once feared it would become extinct -- that it would disappear forever.

Once common through out Wisconsin, bald eagle populations crashed in the 1960's due to pesticide (DDT) use and habitat loss.

Today, over 400 nesting pairs occur in the northern third of Wisconsin.

During Bald Eagle Awareness Week, we hope you take time to learn some characteristics of eagles, explore how this species made its comeback, and investigate what problems still exist.

Teachers: The activity Guide is accompanied by a poster and activity sheets. Use these materials in your classrooms or as take home projects. Feel free to duplicate these materials.

This activity guide is not just for science teachers. Eagles can be the topic in art and English classes as weel. Please share the ideas.

Enjoy Bald Eagle Awareness Week!

Objectives

1. to refresh your memory of eagle characteristics

2. To learn new information about eagles

3. To promote awareness of the comeback of the bald eagle

4. To promote awareness of the problems still facing the bald eagle

acknowledgements

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The Natural History of Bald Eagles

Objectives:

1) Be able to describe bald eagle physical characteristics (size, color, weight, and age).

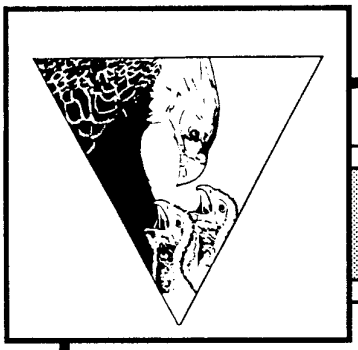
2) Be able to describe the life cycle and habitat requirements of bald eagles.

3) Be able to describe bald eagle reproduction and nest construction. Determine environmental factors necessary for successful reproduction.

4) Be able to evaluate unique adaptations which help eagles to survive (talons, wings, beak, eyes).

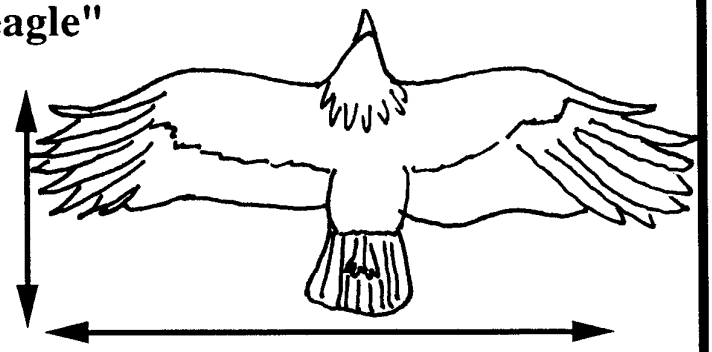
5) Be able to describe the mechanisms of flight.

6) Be able to locate on a map areas where eagles go for the winter and why.



Bald eagle biology

Bald eagle (*Haliaeetus leucocephalus*) means "White-headed sea eagle"



Length:
Female 34-43 inches
Male 30-35 inches

Weight: 8-14 pounds

Flight Speed:
Over 100 miles per hour while diving; 30-40 mph in normal flight

Eye sight:
Resolving power is 6-8 times greater than humans

Coloration:
Adult: rich chocolate brown body with white head and tail; yellow beak, feet and eyes. Adult plumage is seen after 4-6 years

Immatures: rich chocolate brown body, head and tail; underside of wings are spotted with white; yellow feet; brown beak and eyes

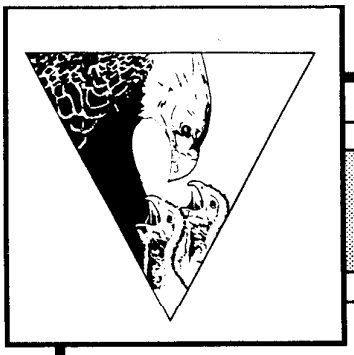
Nesting Habitat:
Prefer tall, living white or red pine trees near water; also use dead and deciduous trees.

Wingspan: 6-7 feet

Life Span:
20-30 years; but many do not survive the first year of life

Food:
Fish!! Sixty to ninety percent of their diet is fish; includes suckers, northern pike, muskellunge and bullheads. Eagles are not fussy. They will eat live or dead fish. Eagles also eat waterfowl, mammals and carrion.

The Nest (Eyrie or Aerie):
Consists of a large mass of branches, usually next to the trunk of the tree. Nests are often reused year after year with more branches added. Nest construction begins in February or March.



Adaptations

Eyes, feet, feathers, wings, beaks, eyes, feet, feathers, wings, beaks, eyes...

What Makes an Eagle Unique?

- Eagles have keen vision
- Eagles have sharp talons
- Eagles have curved beaks
- Eagles have feathers

Background

All creatures evolved special features which help them survive in their habitat or ecological niche. Eagles are no exception. All Eagles, along with vultures, hawks, falcons and owls are considered raptors or birds of prey. Raptors have the ability to kill live prey and as predators are situated at the top of the food chain. Man is the only creature which kills eagles. Eagles, the largest of the hawks, hunt during the day and sleep at night--they are diurnal. Can you think of a raptor which is nocturnal (active at night and sleeps during the day)? Birds of prey, as predators of the sky, have evolved special adaptations of the eyes, feet (talons), beaks, feathers and wings to help them hunt for their specific prey in their specific habitat. Raptors play a special role in nature--to remove the weak, sick or old animals from the community. This allows healthy strong individuals to use the limited resources such as nesting sites, food and wintering habitat. Without predators the earth would be over run with pests such as rodents and insects. Predators are vital components to healthy ecosystems.

Note: locate shadowed words in the reference section under glossary.

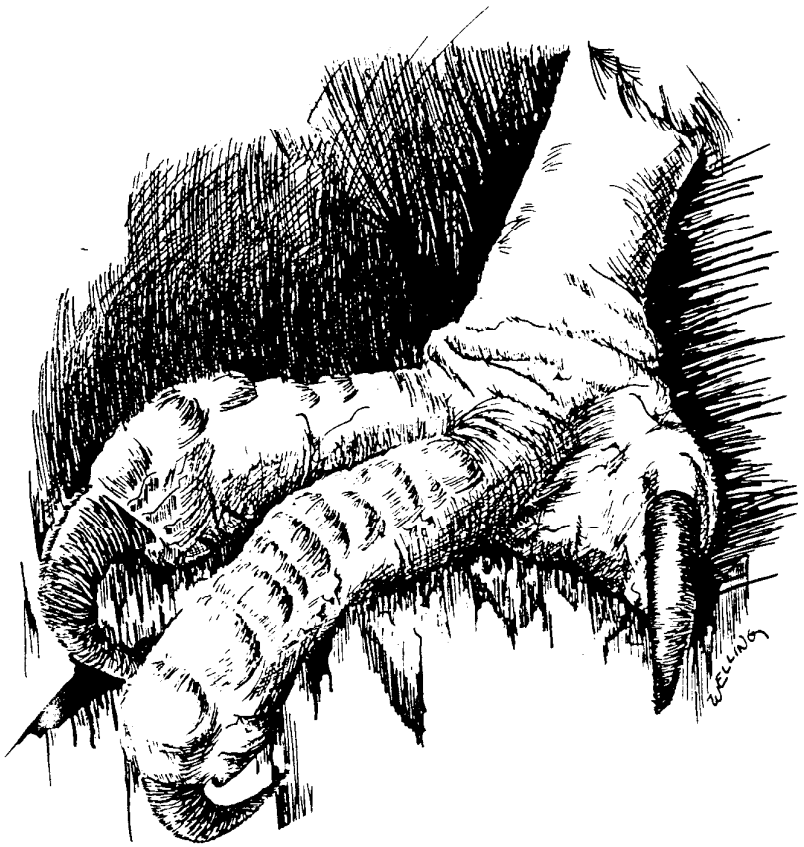
Raptare is Latin for to *seize and carry.*

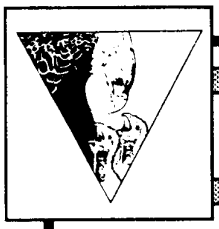
Predator of the sky

The Latin word, raptare, reflects how raptors and especially eagles hunt for prey. Eagles swoop down and grab their prey with their talons. A hunting eagle will search for food by focusing on the movement of its prey. Prey species are camouflaged to avoid being seen by predators. The fur, scales and feathers of prey species are designed to blend in with their surrounding habitat. That is why most species are darkly colored on the top or as seen from above. Only when a prey species moves does it become visible to a predator. (Have you ever seen a rabbit freeze in its tracks if you walk too close? This is a behavior evolved to avoid detection by predators.) Once an eagle notices the movement of its prey, it will swoop down and try to grab the prey with its talons. However, the majority of the time, the eagle misses its prey--strong and healthy prey usually escape. When an eagle does catch a fish, small mammal or small bird, the prey is killed quickly by the impact of the strike or strength of the sharp piercing taloned feet. Once the prey has been caught, it is carried some distance to be consumed in peace. Eagles have developed powerful wings to carry their meal off to be eaten. The sharp, powerful beak of the bald eagle has evolved over time to tear fish and flesh into edible pieces.

Talons

Talons are the special adaptation of the feet. The sharp modified claws are used to grab and help kill the prey. To help hold on to slippery fish, bald eagles have evolved an additional adaptation of its feet . The bottom of a bald eagles rough toes are covered with small bump like projections called **spicules**.



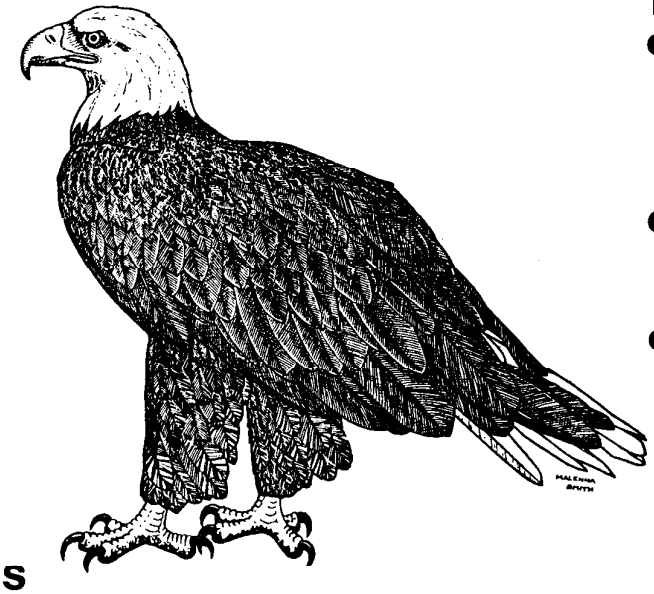


Did you know? Did you know?

Eagle Eyes

Did you know?

- Bald eagles have vision 6-8 times better than humans.
- Eagles have binocular vision. (Being able to use both eyes simultaneously to view an object.)
- Eagles have three eyelids. All raptors have a third eyelid called the nictitating membrane. The nictitating membrane protects the eye form damage when and eagle catches its prey or feeds its eaglets. It also moistens and cleans debris from the eye.
- Eagles close their eyes by moving the lower lid up.
- (Look in the mirror. How do humans close their eyes?). A bald eagle can see a fish underwater from over 1.5 miles away.



Beaks

- The bald eagles powerful curved beak evolved to tear and rip the flesh of fish prior to its consumption.
- Eagles do not catch their prey with their beaks.
- The beaks of raptors reflect the size and type of prey hunted. (Look at a kestrels beak. Can you guess what they eat?)

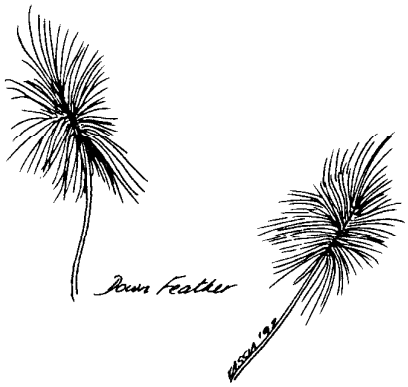
Feathers

Feathers are unique to birds. No other group of animals have feathers. Birds have several types of feathers: down, contour and flight. The soft down type feathers are located close to the body under the contour feathers. They function to keep the bird warm and help regulate body temperature by providing excellent insulation. Down traps air in tiny spaces, thus avoiding loss of heat. Contour feathers are located on the birds body, wings and tail. These overlapping feathers contain more structure making the bird streamlined and aerodynamic--both important for flight. Flight feathers are specialized contour feathers which are attached to the wing. The overlapping of these feathers produce a large broad flat surface necessary for flight.

Feathers are unique to birds

Fun facts about feathers

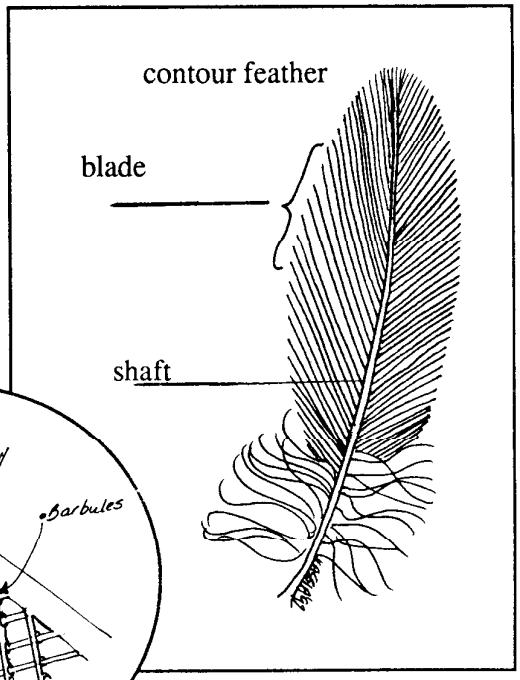
- It is against the law to posses even one eagle feather without a permit from the U.S. Fish and Wildlife Service.
- Birds preen to clean their feathers and rehook any barbs and barbules which may have become detached from its neighbors.
- Birds have special oil glands at the base of their tail which is used tc waterproof the feathers.
- The word bald comes from the Old English word "balde" which means "white" and refers to the white feathers covering the head of mature bald eagles.
- A bald eagle has roughly 7000 feathers which weigh almost two pounds. A bald eagle weighs 8-14 pounds. That's a lot of feathers!

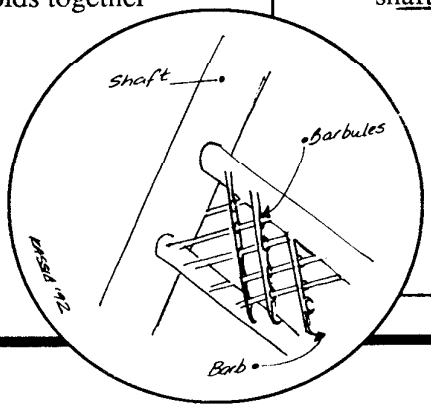


Activity: Obtain some chicken feathers and place them on an overhead projector. Have participants identify contour and down feathers and the parts of a feather (shaft, barbs, vane, and barbules). Have participants rub the feather the wrong way to separate barbs. Now have them pull the feather through their fingers to reconnect the barbs to simulate a bird preening. Note: it is illegal to possess feathers form any migratory bird.

What is a feather?

Feathers are made up of a central hollow tube called the **shaft**. The **vane** or **blade** comprises the rest of the feather (the colored portion of a feather). The blade is composed of thousands of **barbs** which radiate off of the shaft in rows. The barbs contain small hooks and loops which interlock and hold each blade to its neighbors. This interlocking of blades on the shaft of the feather results in a strong flat surface which holds together during flight.





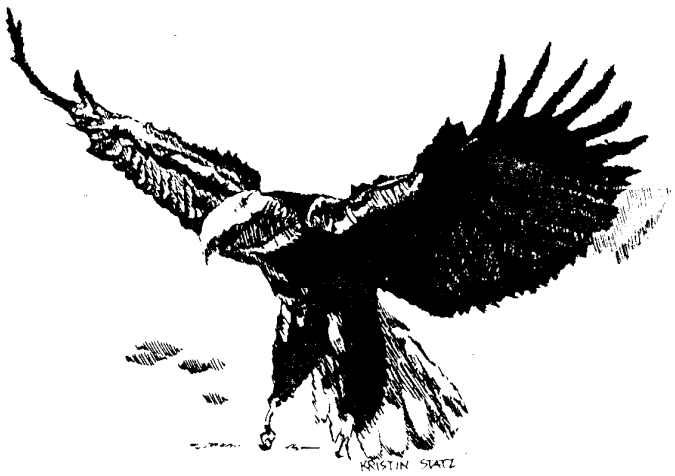
On the wings of Eagles

Flight

The size, shape, and width of a raptors wings hints at how and when a bird hunts and what type of prey is hunted. The shape of the wing can tell you whether the bird flies fast and strikes swiftly like the peregrine falcon or whether the bird soars on broad wings using natural air currents to conserve energy while searching for prey like the bald eagle.

How does it work?

Birds fly when air flows over the top of the wing. The front of the wing is thick and narrowed at the back allowing the wings to cut through the air. This forces air over the top of the wing which lifts the body of the bird. Only when the air pressure under the wing is greater than the mass or weight of the bird will the bird fly. The faster the air moves over the top to the wing, the greater the lift of the wing.



The downstroke of the wing provides most of the power for flying.

Silhouettes in flight.

Osprey vulture Eagle, hawk

Energy conservation is for the birds.

Energy conservation nature's way

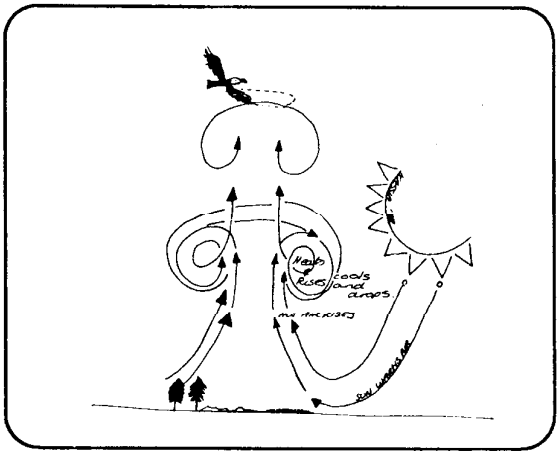
Thermals

Warm air is lighter than cold air. Cold air surrounding the thermal is sucked in as the heated air rises.

The pocket of warm air rises like a balloon, floating on the cool air below.

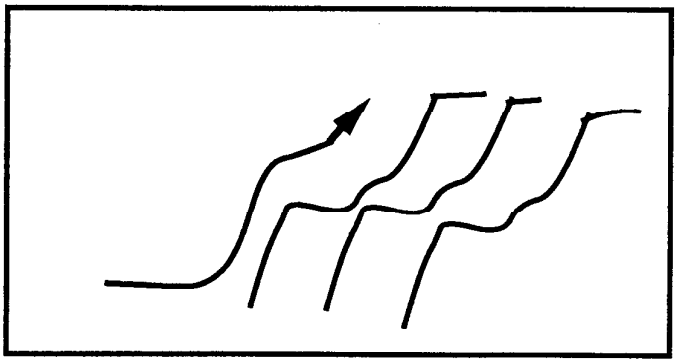
Once in the thermals, the eagles soar, using little energy to maintain flight.

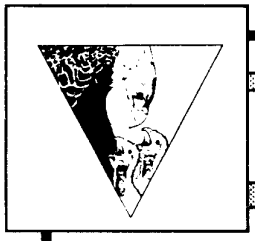
Eagles can climb several miles inside big thermals.



Air Currents

Another way eagles conserve energy is by using natural air currents formed in front of bluffs . Air is forced upward as the wind hits the front of the structure. Eagles ride the wind to gain altitude.





Different strokes for different folks

At low speeds the bald eagles broad wings can hold it up in the air longer than the narrow wings of the peregrine falcon.

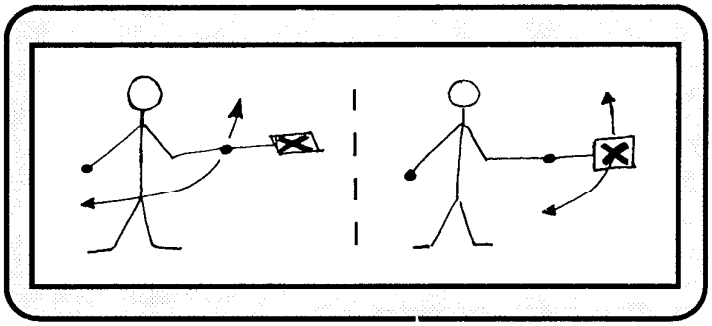
Did you know...

- Birds have hollow bones which make them very light.
- The bald eagle needs broad wings to lift its heavy prey into the air. An eagle can't lift more than its body weight.
- Migrating bald eagles have been tracked flying at more than 60 miles per hour.
- Tail feathers act as a rudder, allowing the bird to steer during flight.
- Bald eagles spend the majority of their flight time soaring rather than flapping their wings.

Wing shape

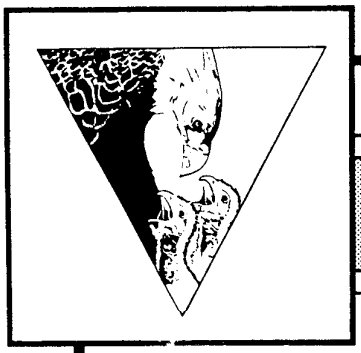
Activity : To investigate the mechanisms of flight show how wide wings help eagles soar. Take two pieces of paper of equal weight and fold one of them in half and then again. Drop the two pieces from the same height at the same time. Discuss why the wider paper drops slower than the narrower (folded) one. Compare the wide wings of the bald eagle with the narrow wings of the falcon. pretend the wide paper reflects the wings of a hawk and the narrow paper that of a falcon. Discuss why narrow wings are an advantage for the falcon and why wide wings are more suitable for the type of prey eagles consume (compare hunting methods, prey species, and their habitats).

Eagles change position of their wings to increase or decrease their speed of flight.



To show students how an eagle can increase or decrease its speed of flight have students take a piece of cardboard and mark it with an X. **A.** Have the students hold the cardboard so the X is toward the ceiling and move it back and forth. With little air resistance, this action simulates an eagle flying fast. Eagles fly fast by turning the front edge of the wing into the wind. **B.** Now take the cardboard and face the X toward the wall. Fan it back and forth. Feel the air resistance. This action simulates how an eagle slows down. When an eagle wants to land, it spreads its wings, causing air resistance and blocking the wind.

Note: These exercises were adapted with permission from *Zoobbooks Eagles* a publication available from Wildlife Education, Ltd., 930 West Washington St., San Diego, CA 92103



Other activities

1. The scientific name for the bald eagle is *Haliaeetus leucocephalus.* Bald eagles are members of the genus Aquila, order Falconiformes. Research and discuss naming systems. Discover the meaning of these names (*leuco* means white, *cephalus* means head).

2. Show video tapes featuring eagles: 1) "Bald Eagles in Wisconsin" produced by the WDNR, and 2) "We care about Eagles" produced by the National Wildlife Federation. See Resources.

3. Word search and cross word puzzles can be used to introduce new vocabulary words pertaining to the natural history of bald eagles.

4. Make life size silhouettes of various raptors (Adult and juvenile bald eagle, red-tailed hawk, peregrine falcon, turkey vulture and osprey) and tape them to the ceiling. Dimensions of silhouettes can be found in field guides to birds. Additionally, make a tracing of one of the students for comparison. Discuss the differences in wing shape and size and how each reflects the different feeding habits, food base and habitat needs.

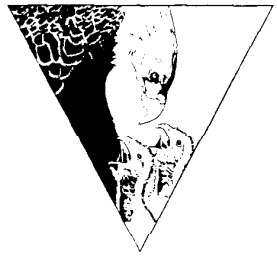
5. Research the habitat requirements of bald eagles for successful nesting and wintering. Based on this information, look at a Wisconsin map and predict where bald eagles would likely nest and winter in Wisconsin. Discuss how food and nest availability, roost requirements and proximity to humans affect where bald eagles can be found through out the year. Compare the students predictions with data showing where eagles are located in Wisconsin. See resources.

6. Conduct an essay contest depicting "A year in the life of a bald eagle" or have students write on the life cycle of Wisconsin bald eagles. Use wildlife calendars or posters as prizes. Submit winners to the DNR's Natural Resources magazine or other magazines for publication.

7. Have students collect branches that have fallen to the ground, and have them use these to build an eagle nest to scale.

8. Discuss differences between extinct and extirpated. Define the following words: species, habitat, community, ecosystem,endangered, threatened, and raptor.

9. Learn the different muscles, bones and feathers of the wing by participating in the Build an Eagle Wing activity found in the book *Eagles--Hunters of the Sky*, a Wonder Series production written by Ann C. Cooper). Additional activities, such as the migration game and build a food chain, are also available in the book. See resource section of this pamphlet. Copied with permission from: The Denver Museum of Natural History and Roberts Rinehart Publishers.



Other activities

10. Join the Fold. The Wisconsin Bureau of Endangered Resources promotes awareness of endangered species and their communities through the art of paper folding or Origami. By following simple instructions, students can learn to fold paper into the shapes of endangered species. For advanced students an eagle pattern can be found in the book *Animal Origami for the Enthusiast* by John Montroll.

11. Adaptations for survival: Read information on feathers, wings, eyes and talons and conduct activities in the *Zoobooks* "Eagles" and "Birds of Prey" magazines. Included is a brief description of several activities. 1) To investigate the resolving power or ability to focus on objects at a distance, place a small object on the floor. Have students move away until they no longer see the object. This is the limit of their or human resolving power. Measure the distance and multiply by eight. This distance represents a Bald Eagles resolving power. Permission was granted to adapt activities using this material.

12. To learn about the effects of chemical accumulation in the environment, play the Deadly Links game located in the resource section (Wisconsin Project Wild Elementary, page 197). Adapt the game using bald eagles as the predator and fish as their prey. To demonstrator carrying capacity and the relationship between predator and prey, play "Quick Frozen Critter" (Wisconsin Project Wild Elementary, page 105. Copied with permission from: Project Wild, Western Regional Environmental Education Council, 1983.

13. Research the differences between fish eagles and booted eagles. Discuss which of the two eagles found in North America (bald eagle and golden eagle) fit in to each category.

14. Determine unique characteristics of eagles. What animals fly? (don't forget mammals) What animals lay eggs? What animals have feathers? (Only birds have feathers and therefore are unique.

Eagles in Society

Objectives:

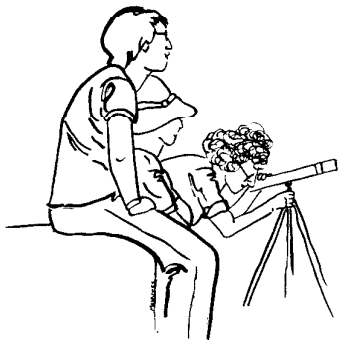
1) Describe how eagles are used as symbols in our society.

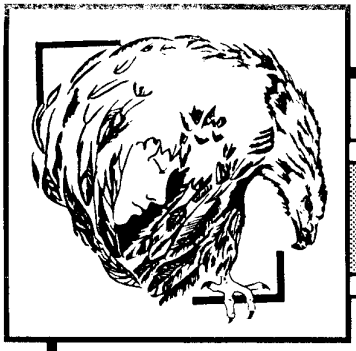
2) Learn how eagles are viewed and valued by Native Americans.

3) List which activities of humans have caused a decline in eagle populations.

4) List activities of humans which help eagle populations.

5) Discuss what YOU can do to help eagles.





Native American View

Graceful, majestic, and powerful--the bald eagle symbolizes nobility and spirituality for Native Americans. The legend of the eagle, like all legends, is an integral part of tribal life. When elders tell a legend, they pass on life wisdom and experience to the young, preserve tribal history, and entertain. Often the vivid stories tell of how things came to be and pay respect to the land, water, air and wildlife.

In Pueblo mythology the eagle is believed to have a close relationship with the Sun because it often soars out of sight. The feathers of the eagle were believed to carry prayers to the heavens.

Often referred to as the Thunderbird, the eagle's image can be found in the designs of ceremonial costumes, blankets, and jewelry. Only y people who have done good deeds may wear eagle feathers in their regalia. Feathers may be given as gifts during special ceremonies.

Native Americans have joined in the fight to protect the bald eagle and no longer harvest eagle feathers. Instead, a law entitles Indian religious leaders first right to feathers of eagles that have died from accidents or natural causes.

Eagle Dancer
Pueblo Indian

1. RED
2. BLACK
3. BLUE
4. GREEN
5. YELLOW
6. PINK
7. BROWN
8. DARK GREEN
9. TAN
10. GREY
11. ORANGE
12. PURPLE
13. DARK BLUE

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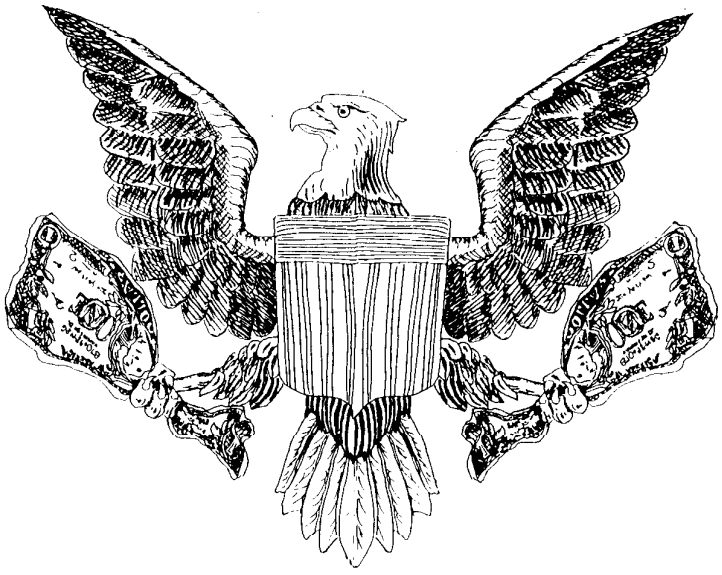
Eagle Symbolism

United States History

When you hear "bald eagle", what words come to mind? Strength, dignity, majesty, freedom, and some power are probably some.

The eagle was selected for the Great Seal in 1782 to symbolize Congress as the symbol of supreme power and authority. Although the Great Seal is not the first item to feature an eagle as a symbol, it was the first to use the American bald eagle species.

Military units have used the bald eagle in many ways to symbolize strength, courage and fierceness. During the Civil War, a Wisconsin regiment had an eagle called "Old Abe"--named after President Lincoln--as a mascot. During World War II, a U.S. Air Force squadron called "The Screaming Eagles" became well known for bravery against the enemy.



The bald eagle has also been used on U.S. money. In 1932, the eagle was put on the back of the George Washington quarter. On paydays, many people used to say "the eagle flies". It is now common to see eagles representing companies and businesses in their signs and logos.

Laws Protecting Eagles

Endangered Species Act (1976)

The bald eagle is endangered in all but 5 of the lower 48 states. In the other 5 states (Wisconsin, Minnesota, Michigan, Oregon, and Washington) it is listed as threatened. Penalties: up to $20,000 and/or 1 year prison. Endangered Species Act also authorizes habitat protection and funding.

Bald Eagle Protection Act (1940)

Now known as the Eagle Protection Act, prohibits the taking, possession, sale, purchase or barter, transport, export or import of any bald eagle (or golden eagle), alive or dead, including any part, nest, or egg, unless allowed by permit. Penalties: fines of $10,000 to $20;000 or 2 years in prison or both. "Taking" is defined as "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb."

Lacey Act (1981)

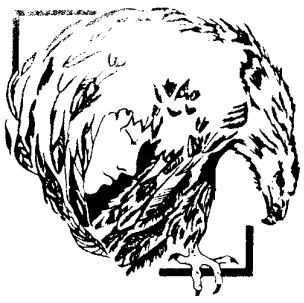
The Lacey Act makes it unlawful to "import, export, transport, sell, receive, acquire, or purchase" any bald eagle. Penalties: fine up to $20,000 and/or 5 years in prison.

Airborne Hunting Act (1971)

This act prohibits 1) use of aircraft to harass wildlife and 2) shooting, capture or killing of wildlife from aircraft. Penalties: fine up to $5,000 and/or 1 year prison.

Migratory Bird Treaty Act

In 1972 the bald eagle was given similar protection as listed above. Penalties: fines up to $500 and/or 6 months in prison; sale or barter penalties; $2,000 and/or 2 years in prison.



Winter Eagle Watching

Bald eagles are sensitive to human disturbance. Never disturb eagles at their nest! Disturbance at that time can cause them to abandon the eggs or young in the nest.

Watching eagles during the winter has a lesser impact on the birds--especially if done correctly.

Wintering populations of eagles vary with the weather. During harsh, cold seasons, fewer eagles are seen in Wisconsin. No matter what the weather is like, eagles are found near open water. This includes the areas below dams on the Mississippi and Wisconsin rivers. The action of the moving water keeps the water from freezing. Eagles will concentrate around these open water areas to hunt for fish.

December through February is the best time of year to visit eagle feeding areas. Mornings are usually more productive when viewing around the dams, but eagles can be found during the day in the surrounding countryside where they search for carrion. Later in the afternoon, eagles begin returning to their favorite roosting area.

Watch for other interesting birds. The open water attracts waterfowl such as common mergansers and common goldeneyes.

When viewing eagles take care not to disturb them. **You should stay in your car.** Your car makes a good "blind" and does not disturb the eagles. Disturbance could mean a missed meal which might mean not enough energy to maintain body temperature through a cold night.

A winter roost site is generally a valley which opens out toward the river with large trees offering protection from the cold winds of winter and isolation from human disturbance. Never enter a roost at night! Many of these sites are now threatened with destruction from housing and marina development.

The three best areas to watch eagles are detailed on the enclosed maps. These areas include Cassville on the Mississippi River and the Petenwell and Prairie du Sac dams on the Wisconsin River. Reads Landing, MN, is also a great watching spot.

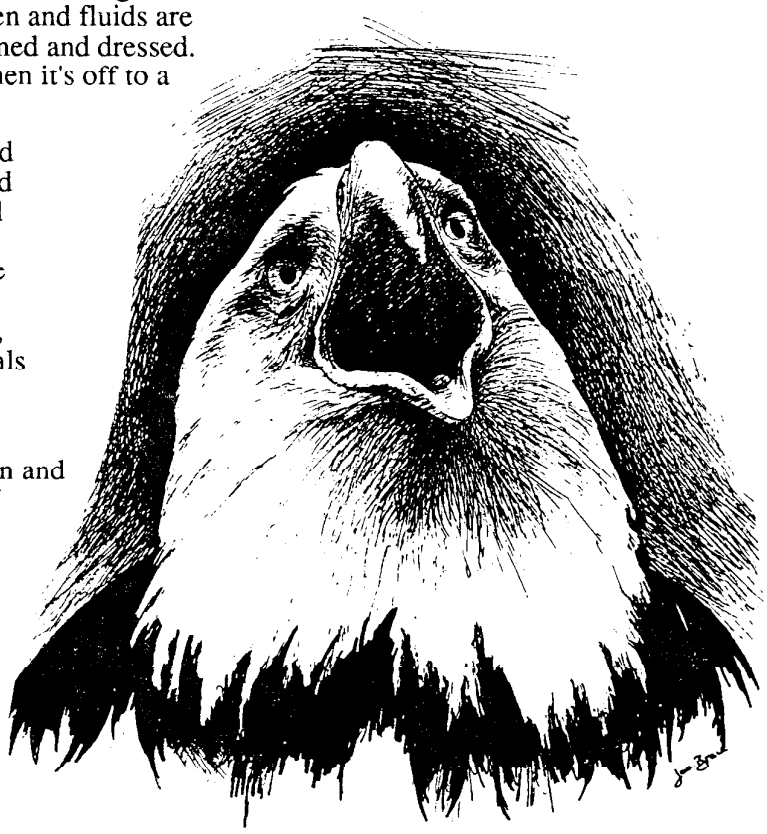
Eagle Rehabilitation

There is help for injured eagles. Every year, hundreds of raptors suffer from injuries and illnesses that make it impossible for them to survive in the wild. Without medical attention, many of these birds would perish.

The Raptor Center (TRC) at the University of Minnesota, St. Paul, started in 1972 and specializes in treatment and rehabilitation of raptors. Since its inception, TRC has treated over 6,000 raptors and received injured raptors from 37 states across the country. Almost half of the treated birds are released to the wild. The Center also provides research and education to help preserve raptor populations and to teach future decision-makers about their value in nature.

Over 600 bald eagles have been admitted to TRC. At least half of these originated from Wisconsin. The estimated cost to treat a bald eagle is $1500-4000. Upon arrival at TRC, a bird is given a thorough exam and X-rays. A blood sample is taken and fluids are given to the bird. Wounds are cleaned and dressed. Surgery is performed if needed. Then it's off to a quiet room to recuperate.

Most "patients" arrive in the fall and winter during annual migrations and hunting seasons. They are collected by concerned citizens and wildlife managers. Causes of injury include shooting, being hit by cars, trap injuries, collisions with powerlines, and ingestion of poisonous chemicals in the environment.



The birds are checked each day to determine changes in their condition and to put clean bandages on wounds if needed.

After treatment and before release, each raptor goes through a conditioning program. Daily flights help strengthen the wing muscles again. TRC staff monitor their progress. Full recovery averages 8-10 weeks. Some cannot be released to the wild again.

For the lucky ones--it's a release back to the wild.

To help injured raptors, you can adopt a bird by contacting the Raptor Center at 1920 Fitch Ave. St. Paul, MN 55108

Wheels of Information

Background

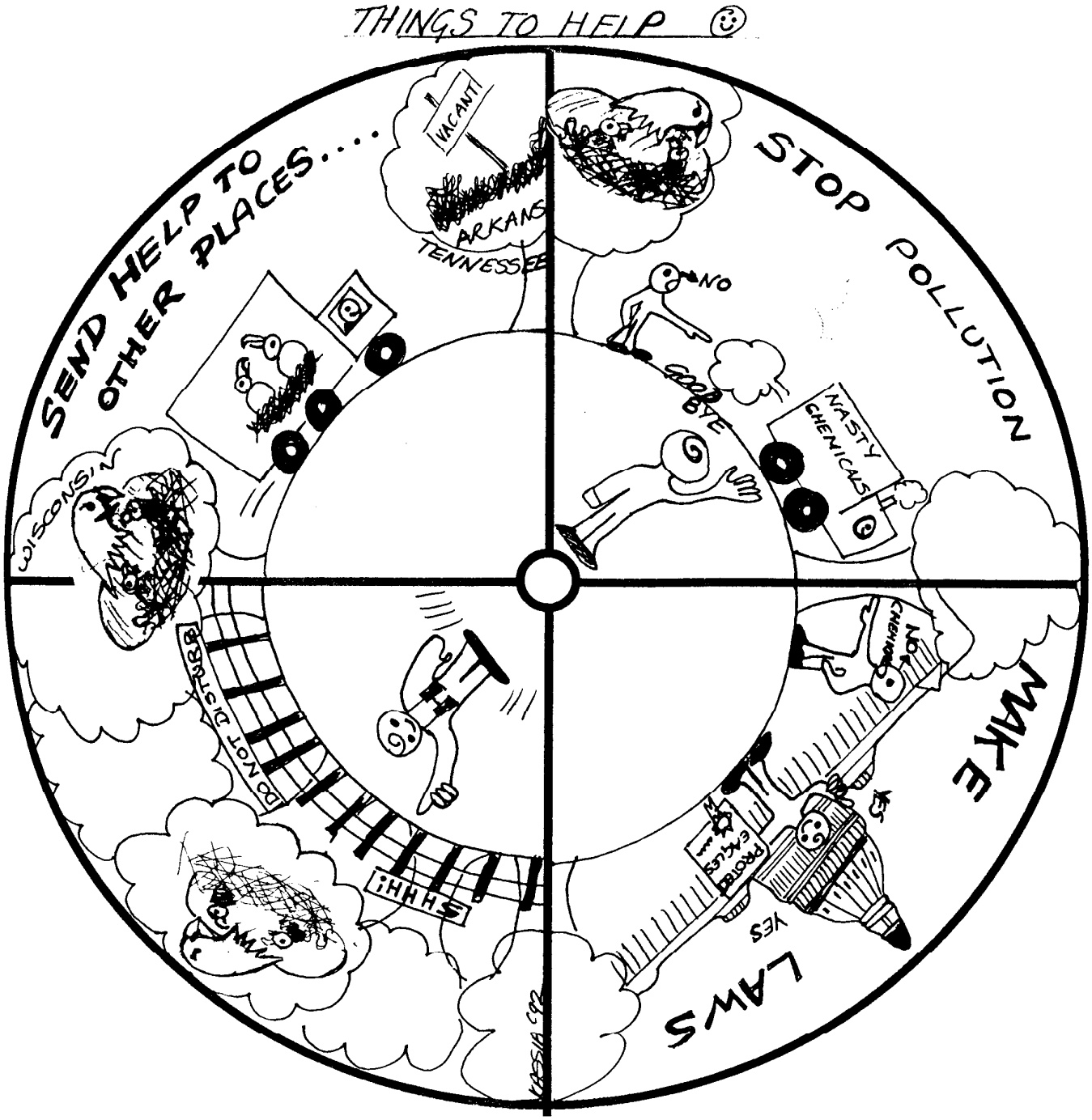
Bald eagles became endangered due to human activities, such as shooting eagles, polluting the environment (lead, DDT) disturbing nests and destroying habitats. These magnificent birds are recovering due to such activities as developing management plans, hacking or relocating eaglets, banning chemicals and pollutants and protecting their environments.

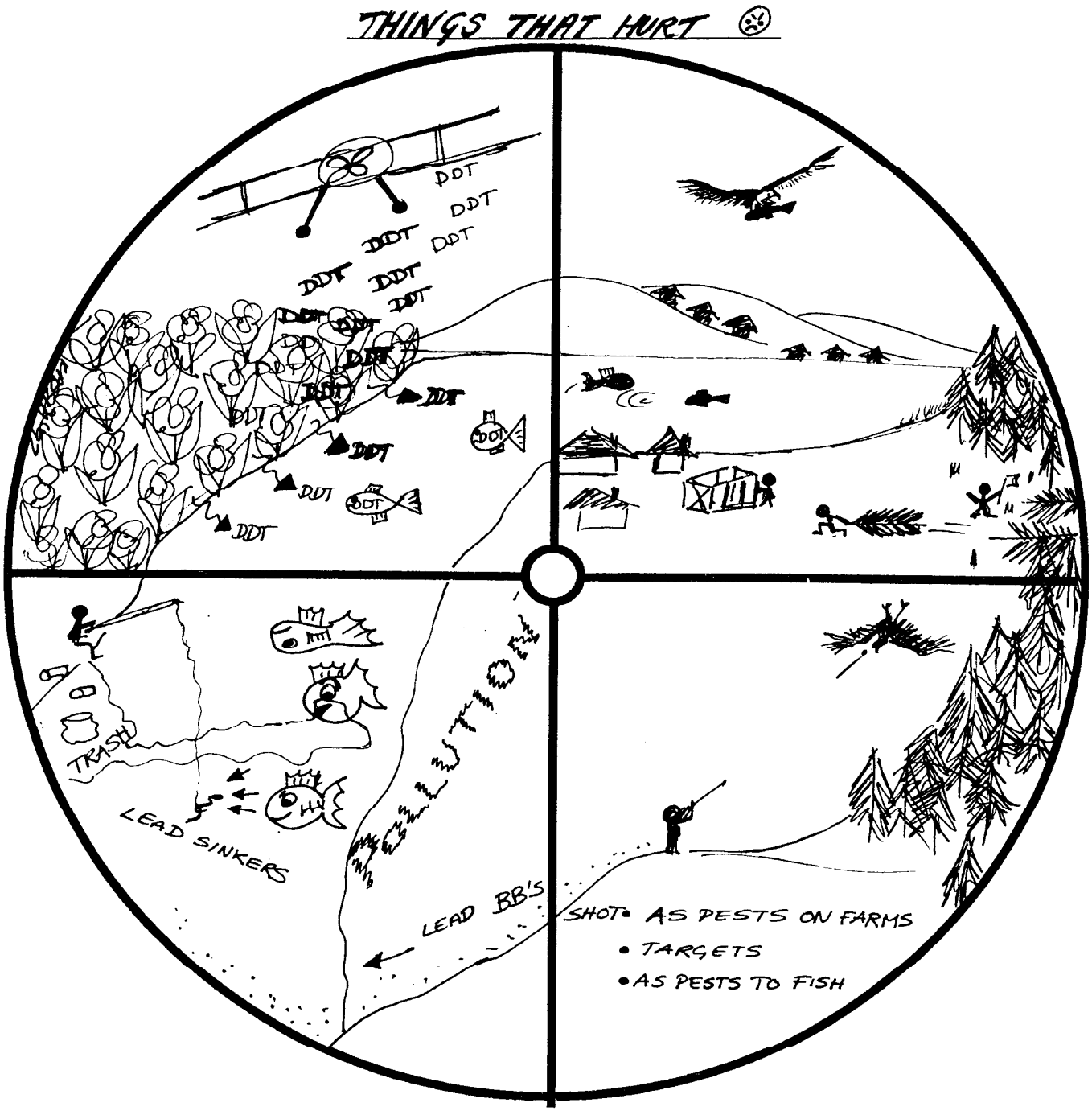
Directions

Help children learn about the effects, both harmful and beneficial, of human activities by completing the following activity.

1. Copy the enclosed wheels and have children cut out the circles and color the pictures. One circle represents harmful effects and the other represents positive actions done by human to help eagles.
2. Have the children paste the back of the two wheels together. Set this aside.
3. Take two fresh plates and have children cut a quarter of plate out as if it were a piece of pie.
4. Assemble the wheel by putting each of the cut plates on either side of the circle with the colored pictures on it. This should resemble a sandwich.
5. Take a paper fastener and push it through the plates.
6. Have children decorate each side of the plates to resemble an eagle by enlarging, cutting and coloring the enclosed wings, eagle head and tail feathers. One side should be decorated as a happy eagle and the other a sad eagle. Have the children examine the pictures to determine which circle represents helpful and harmful activities.
7. Have the children turn the wheel and discuss the harmful activities humans have done and their effects on bald eagles. Then flip the wheel over and discuss the helpful activities.

THINGS TO HELP ☺




THINGS THAT HURT
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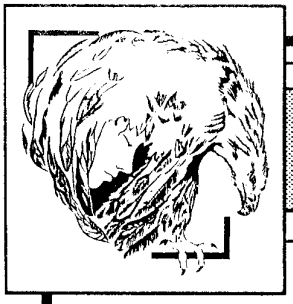
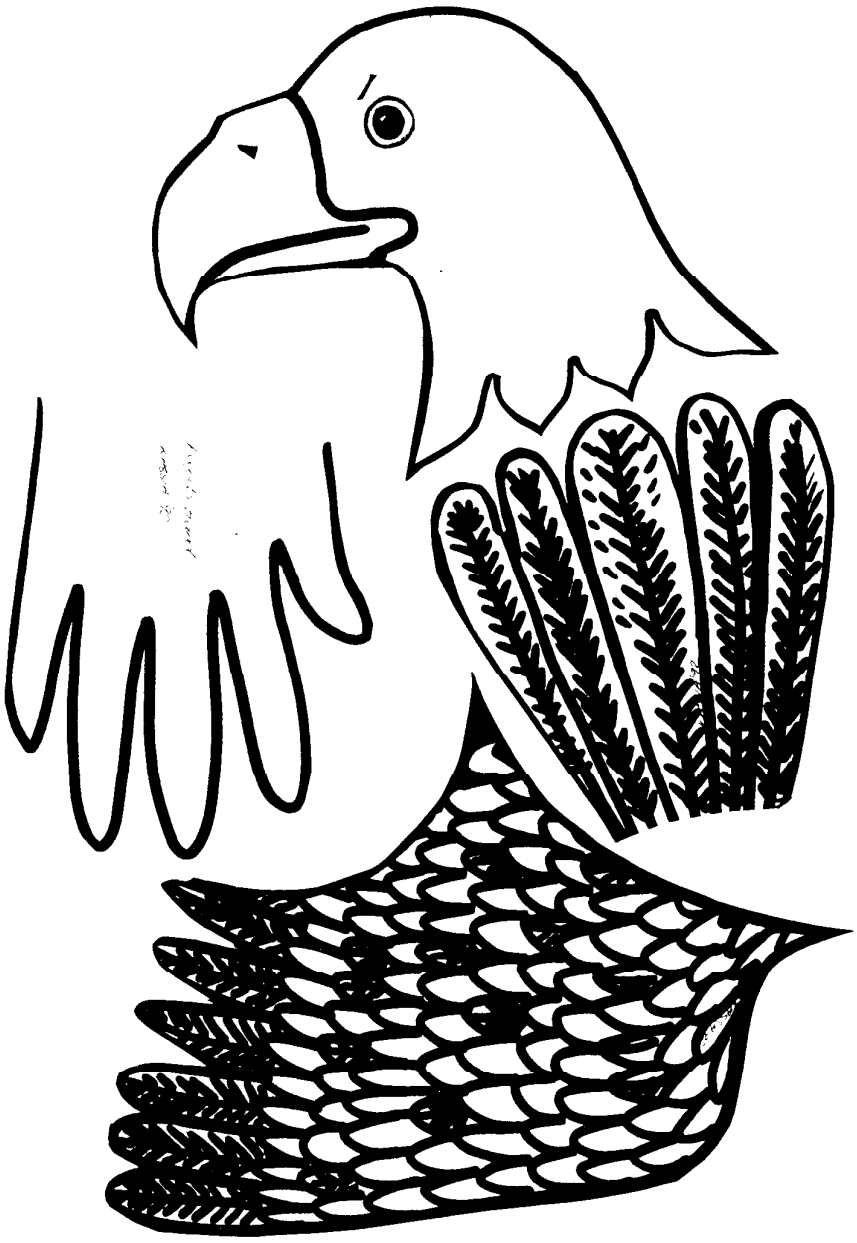
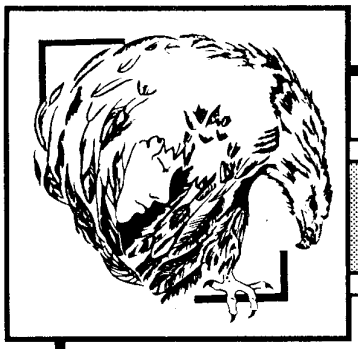
LEAD BB'S
SHOT
• AS PESTS ON FARMS
• TARGETS
• AS PESTS TO FISH



Wheels of Information

Eagle pattern: Enlarge and copy the patterns. Have students cut, color and paste the pieces to the finished wheel of information.





You can make a difference

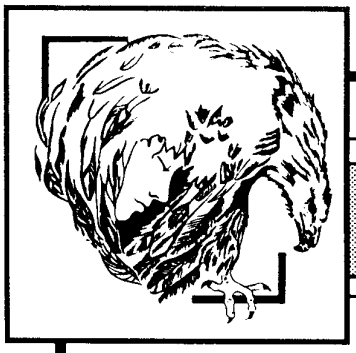
When an animal becomes extinct, it is gone forever and the beauty of the earth is diminished.

Ultimately, protection of endangered species must rely on preservation of its habitat--to save a plant or animal from extinction, we must save its home.

Habitat of endangered and threatened plants and animals may be protected in several ways. If the land is owned by federal, state or local governments, restrictions may be placed on its use. Bald eagle nests on state owned lands and in National Forests are protected by buffer zones and rules which restrict human use of the areas during nesting season. Private land owners are encouraged to manage their holdings for the benefit of the wild species which live there.

Actions speak louder than words

1) Don't pollute. Keep the environment clean.
2) Educate yourself and others about bald eagles.
3) Become involved. Let your voice be heard.
4) Write letters to elected officials.
5) Join the Adopt an Eagle Nest Program.
6) Adopt a raptor--help injured birds return to the wild.
7) Report nest locations to the DNR.
8) Report people harming or disturbing eagles.
9) Avoid disturbing nests between February 15 and August 1.



What you can do

The National Wildlife Federation says, "To help, keep an eye on local, state and federal government action that might affect the environment, learn the facts and make your views known in every forum available."

Speaking on the dilemma of bald eagles

"The answer lies with every American to take pride in and preserve the symbol of our national heritage. It is up to an educated public, aware of the consequences of extinction, to see that greater protection is given the Bald Eagle".

John Gottschalk, former Director of the Fish and Wildlife Service. (The Bald Eagle: Conservation note 20)

Do's and don'ts to saving bald eagles

1) If you are aware of bald eagles nesting, roosting or foraging sites in your area-- work closely with your state wildlife agency to protect these areas from disturbance.

2) If you witness or acquire evidence concerning the shooting of an eagle, notify the U.S. Fish and Wildlife Service (USFWS) or state conservation officer so the individual can be apprehended and prosecuted.

3) When hunting, make sure you are not shooting at an eagle. It's a violation of federal law to kill eagles, hawks, falcons, and other birds of prey. It is a federal offense to disturb an eagle nest.

4) Notify the U.S. Fish and Wildlife Service if you find a dead or wounded eagle. Agents from the USFWS will take injured raptors to rehabilitation centers where the birds can be treated and released.

5) Do not visit a eagle eyrie or roosting site, without state and federal permission.

6) Join a conservation group that actively promotes and protects eagles.

Information obtained from the NWF's publication *We Can Save The Eagle.*

Other activities

1. Develop a bulletin board of current events relating to bald eagles. Have students clip newspaper and magazine articles which feature eagles and their habitat.

2. Show video tapes / films / slide shows featuring bald eagles.

3. Have students define the following words: rehabilitation, symbolism, extirpation, pollutants, and DDT .

4. Have students research native legends and read a selection in class. Discuss how modern society views eagles compared to the Native American view point.

5. Have students research methods used to increase bald eagle populations in Wisconsin and in other states (hacking, captive breeding, habitat protection, laws and law enforcement, and education programs). Discuss the feasibility of each technique comparing cost effectiveness, public acceptance, biological success and long term versus short term results.

6. Develop a wheel of information. Show how contaminants such as DDT effect eagle populations. Discuss the history of pesticide use and the reasons people use pesticides. See Eagles in Society section.

7. Discuss why DDT is banned in the United States yet i still produced and sold to other countries such as Africa and Mexico. Also discuss what effect could chemical usage in these countries have on the wildlife and environment of North America.

8. Ask students what is the greatest threat to the bald eagle. Have students look into a hand mirror.

9. illustrate the concept of chemical buildup. Take a glass jar and fill it with water. Have participants drop marbles or rocks, which represent chemical pollutants, one by one into the water. Soon the water will be displaced representing saturation and contamination.

10. Investigate the Wisconsin state symbols or national symbols (state seal, flag, bird, fish, flower, tree, mammal, fossil, song, motto etc.). Have students define the word symbol, explain what a symbol represents, and how it affects society? Finally, list things which are symbolized by eagles (sports teams, towns).

11. Have students research how the Native American Indians used eagle feathers and parts as symbols. For example, investigate the different ways eagle feathers were used as head dress ornaments by the Plains Indians (different positions and cuts of the feathers represented various brave actions).

Other activities

12. Have students write to different Indian tribes in Wisconsin and other states to learn whether the bald or golden eagle was an important symbol in their culture as reflected in their dances and legends.

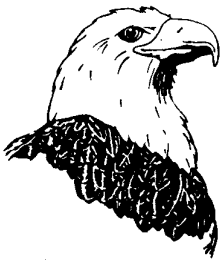
13. Debate: Ben Franklin felt the wild turkey rather than the bald eagle should have been our national symbol. He felt the eagle "did not get its living honestly." However, primarily due to John Adams and Thomas Jefferson, the bald eagle was chosen--a "free spirit, high soaring and courageous symbol." Examine the natural history of both the wild turkey and bald eagle and decide whether Ben Franklin was correct in his opinion. Discuss what characteristics wild turkeys have that would make them a good national symbol. (Alaska State Museum Teachers Manual.)

14. Research the following laws; The Endangered Species Act 1973, The Bald Eagle Protection Act 1940, The Migratory Bird Act 1918, The Lacey Act 1900, and CITES 1975. Discuss what events and factors led to this legislation and how it was produced,.whether the laws are fulfilling their intent, and if additional laws are needed or existing laws need strengthening.

15. Read about eagles: *Ranger Rick magazine* , "We Can Save The Eagle", "What can a concerned citizen do?"; *Ranger Rick Magazine*, January 1982, "Born--1782" (pp. 32-33), "The Indians and the Eagles" (pp. 17-21); "Treetop Taggers" (pp. 41-43).

16 .To discuss habitat requirements, fill out the worksheet "from our perspectives" either as a field trip or classroom activity. The habitat requirements of eagles must be researched and then compared to the community in which the participants live. (Alaska State Museum Teachers Manual.)

17. Research and discuss what happened to cause the extinction of the Dodo Bird, the Great Auk, and the Passenger Pigeon. Discuss two common North American species which escaped near extinction. (Alaska State Museum Teachers Manual.)



Glossary

Adaptation:	a change in structure or habit of an organism that produces better adjustment to its surroundings or better survival skills.
Carrion:	dead and decaying animal flesh.
DDT:	a chlorinated hydrocarbon insecticide. The sale of DDT in the U.S. was banned in 1972 due to its persistence in the environment and potential harm to wildlife and humans.
Eagle:	a large diurnal (daytime) bird of prey noted for its strength, size, keen vision and powerful flight.
Ecological niche:	the physical space (habitat) a plant or animal occupies and the role that organism plays in a natural community.
Endangered species:	an animal or plant species that is in danger of extinction throughout all or a significant portion of its range.
Extinct species:	an animal or plant species that has died out forever and will never reproduce again.
Fledgling:	a young bird that has the feathers needed to fly from its nest.
Food chain:	the transfer of food energy from one organism to another in a series of plants and animals that feed upon one another.
Habitat:	the specific natural environment (home) of an organism or group of organisms; provides water, food and shelter.
Migration:	a seasonal movement from one region to another.
Predator:	an animal that lives by killing and eating other animals (prey).
Raptor:	a predatory bird with talons adapted for seizing prey.
Talons:	the sharp claws of a bird of prey.
Territory:	area defended by an animal against others of its kind.
Wingspan:	the length of a bird's wings measured between the outermost tips.

Resources

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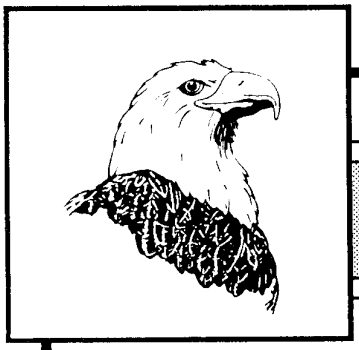

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Books for young readers:

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Nature Scope is an environmental education activity series produced by the National Wildlife Federation, Washington, DC.

Zoobooks by various authors is a series of publications including *Birds of Prey* and *Eagles.* Available from Wildlife Education, Ltd., 930 West Washington St., San Diego, CA 92103

Videos

Animals and their Homes -- A 18 minute tape on a tour of animals, birds, insects, and fish homes. Available from Bavi, 1327 University Ave., Madison, WI 53715-2499.

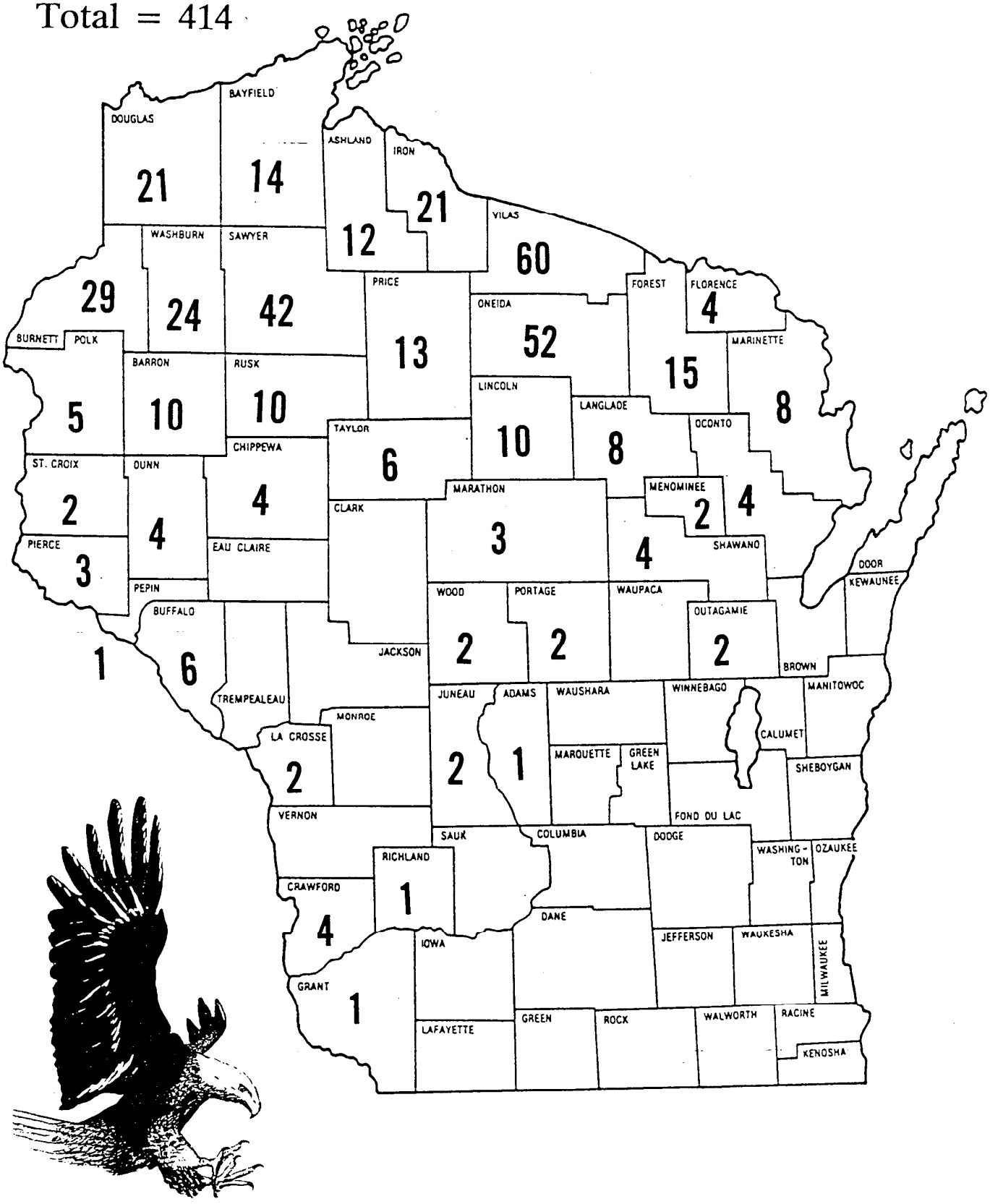
Bald Eagle/Sandhill Crane -- A 60 minute tape on the life of the bald eagle from egg to adult and on the sandhill crane. Available at the Public Library.

Year of the Eagle -- A 20 minute tape on the biology and status of the bald eagle in the United States. Available via inter-library loan from the State Reference and Loan Library.

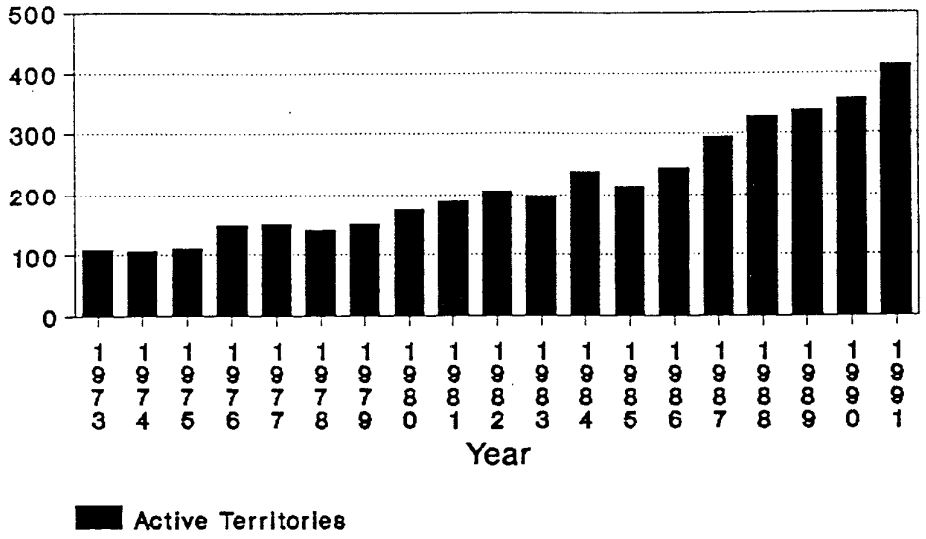
Bald Eagles In Wisconsin -- A 20 minute tape on the bald eagle in Wisconsin. Produced by the WDNR. Available via inter-library loan from the State reference and Loan Library.

BALD EAGLE ACTIVE TERRITORIES - 1991

Total = 414



Breeding Eagle Survey
Results, 1973-91



October, 1991

QUICK FROZEN CRITTERS

Objectives

Students will be able to: 1) discuss predator/prey relationships, including adaptations; 2) describe the importance of adaptations in predator/prey relationships; and 3) recognize that limiting factors—including predator/prey relationships—affect wildlife populations.

Method

Students play an active version of "freeze tag."

Background

NOTE:
This activity is best done after one or more that introduces the concepts of "adaptation" and "limiting factors." See the cross references for suggestions.

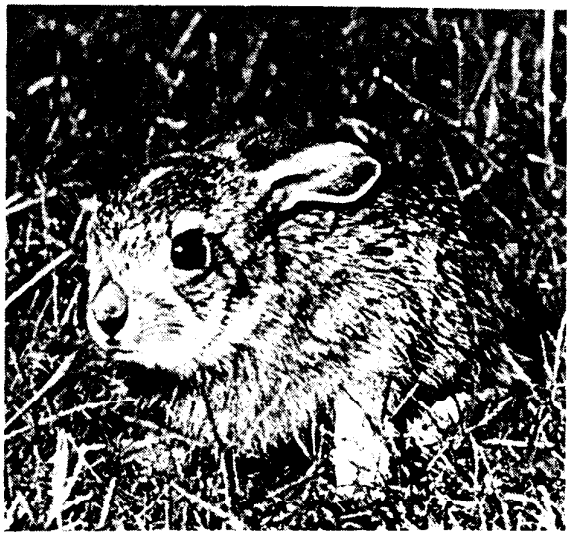
Predator: An animal that kills and eats other animals for food.

Prey: An animal that is killed and eaten by other animals for food.

Limiting Factors: There are many influences in the life history of any animal. When one of these (e.g., disease, climate, pollution, accidents, shortages of food) exceeds the limits of tolerance of that animal, it becomes a limiting factor. It then drastically affects the well-being of that animal. Predators are limiting factors for prey. Prey are limiting factors for predators.

Animals display a variety of behaviors in predator/prey relationships. These are adaptations to survive.

Some prey behaviors are: signalling to others, flight, posturing in a fighting position, scrambling for cover, and even "freezing" on the spot to escape detection or capture by predators. The kind of behavior exhibited partly depends on how close the predator is when detected by the prey. Each animal has a threshold for threat levels. If a predator is far enough away for the prey to feel some safety, the prey may signal to others that a predator is near. If the predator comes closer, the prey may try to run away. If the predator is too close to make running away feasible, the prey may attempt to scurry to a hiding place. If the predator is so close that none of these alternatives is available, the prey may freeze in place. The closer the predator comes to the prey animal, the more likely it is that the prey will "freeze" in place. This "freezing" occurs as a kind of physiological shock in the animal. (Shelter or camouflage may also make them invisible to the predator when they freeze.) Too often people who come upon animals quickly and see them immobile infer that the animals are unafraid when, in reality, the animals are "frozen", or, as the adage goes, "frozen stiff."



The major purpose of this activity is for students to recognize the importance of adaptations to both predators and prey and to gain insight into limiting factors affecting wildlife populations.

Age: Grades 4—6 (can be modified for younger and older students; simplify the discussion for younger students.)
Subjects: Science, Physical Education (Language Arts optional: See Variations and Extensions.)
Skills: analysis, description, discussion, evaluation, generalization, kinesthetic concept development, observation, psychomotor development
Duration: 20 to 45 minutes
Group Size: best with at least ten students; one "predator" per every four to six "prey."
Setting: indoors or outdoors
Conceptual Framework Reference: III.D., III.D.1., III.D.2., III.E., III.E.1., III.E.2.
Key Vocabulary: predator, prey, adaptation

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Materials

food tokens (pieces of cardboard), enough for three per student; gym vests or other labelling devices to mark predators; four or five hula hoops to serve as "cover" markers; pencil and paper to record number of captures, if desired

Procedure

1. Select any of the following pairs of animals:

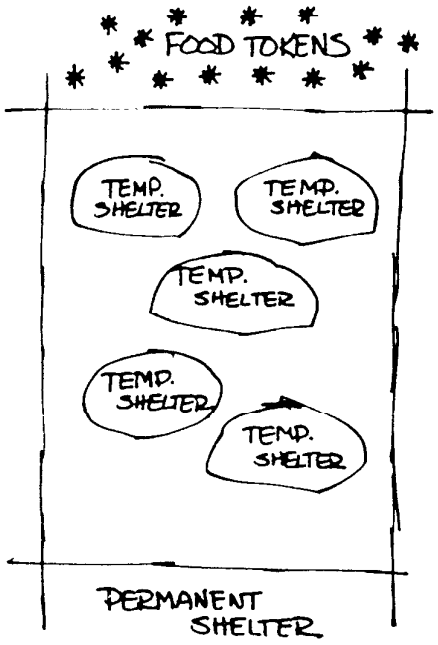
Prey	Predators
cottontails	coyotes
ground squirrels	hawks
deer	cougar
quail	foxes

Identify students as either "predators" or "prey" for a version of "freeze tag"—with approximately one predator per every four to six prey.

2. Using a gymnasium or playing field, identify one end of the field as the "food source" and the other end as the "shelter."

3. Four to five hula hoops are placed in the open area between the "shelter" and the "food." These represent additional shelter or "cover" for the prey and can be randomly distributed on the field. (If hula hoops are not available, string might be used—or chalk on asphalt.)

4. Food tokens are placed in the "food source" zone on the ground. Allow three food tokens for each prey animal. For example:



5. Predators should be clearly identified. Gym vests or safety patrol vests might be available.

6. Use a whistle or some other pre-arranged signal to start each round. When a round begins, prey start from their "shelter." The task of the prey animals is to move from the primary shelter to the food source, collecting one food token each trip, and returning to the primary shelter. To survive, prey have to obtain three food tokens. Their travel is hazardous, however. They need to be alert to possible predators. If they spot a predator, they can use various appropriate prey behaviors—including warning other prey that a predator is near. Prey have two ways to prevent themselves from being caught by predators; they may "freeze" any time a predator is within five feet of them; or they may run to cover (with at least one foot within one of the hula hoops.) Frozen prey may blink, but otherwise should be basically still without talking.

7. Predators start the game anywhere in the open area between ends of the field, and thus are randomly distributed between the prey's food and primary shelter. Predators attempt to capture prey to survive, tagging only *moving* (not "frozen") prey. (Optional: Prey can have bandannas in their pockets that the predators have to capture to represent the successful predation.) Predators must each capture two prey in order to survive. Captured prey are taken to the sidelines by the predator who captured them.

DEADLY LINKS

Objectives

Students will be able to: 1) give examples of ways in which pesticides enter food chains; and 2) describe possible consequences of pesticides entering food chains.

Method

Students become "hawks," "shrews," and "grasshoppers" in a highly-involving physical activity.

Background

People have developed pesticides to control organisms. Herbicides are used to control unwanted plants; insecticides to control unwanted insects, etc. When these pesticides involve use of poisons, the poisons frequently end up going where they are not wanted. Many toxic chemicals have a way of persisting in the environment, and often get concentrated in unexpected and undesirable places —from food and water supplies to wildlife and people, too.

For example, a pesticide (a chemical—frequently synthesized from inorganic compounds—used to kill something identified as a "pest" under some conditions) called DDT used to be applied regularly to crops as a means of controlling insects that were damaging the plants or trees. Then

Age: Grades 4-9
Subjects: Social Studies, Science, Physical Education
Skills: analysis, classification, comparing similarities and differences, computation, description, discussion, evaluation, generalization, kinesthetic concept development, synthesis
Duration: one 30-45 minute period
Group Size: minimum of ten students preferred
Setting: large playing area
Conceptual Framework Reference: I.C., I.C.3., I.C.4., I.D., II.B.2., II.B.3., II.B.4., III.B., III.B.1., III.B.2., IV.A.4., IV.C.3., VI.A., VI.A.2., VI.A.3., VI.A.4., VI.A.5., VI.B., VI.B.1., VI.B.2., VI.B.3. VI.C., VI.C.1., VI.C.6., VI.C.12., VI.C.13., VI.C.14., VI.C.15., VI.C.16., VI.D., VII.A.2., VII.A.4., VII.B., VII.B.1., VII.B.2., VII.B.3., VII.B.4., VII.B.5., VII.B.6., VII.B.7.
Key Vocabulary: pesticide, insecticide, herbicide, food chain, accumulate, toxic, chemicals, trade-offs, organic, inorganic

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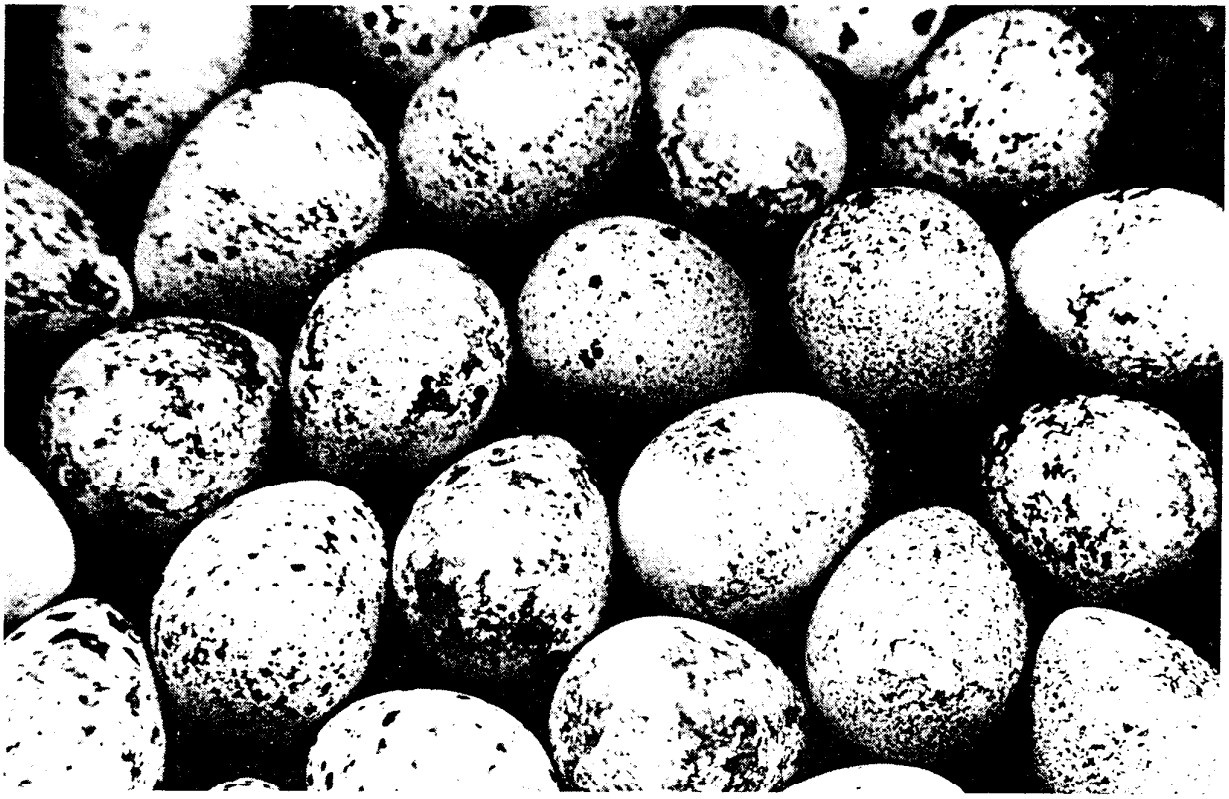
it was discovered that DDT entered the food chain with damaging results. For example, fish ate insects that were sprayed by the chemical; hawks, eagles, and pelicans ate the fish. The poisons became concentrated in the birds—sometimes weakening and killing them directly, and over time resulting in side effects like egg shells so thin that the eggs would not hatch, or were crushed by the parents in the nesting process. The impact on species, including the bald eagle and the brown pelican, has been well documented. Use of DDT has now been prohibited by law in the United States; however, at least one temporary waiver was granted in recent years to allow its limited use. It has not been prohibited worldwide, and therefore still enters the food chain.

Damaging fertilizers as well as pesticides are used by many farmers as a part of the agricultural industry. Again, use of such chemicals—particularly the inorganic, synthesized compounds—has varying side effects. For example, a pesticide (either insecticide, to kill insects, or herbicide, to kill unwanted plants) may be sprayed or dusted on a crop. The pesticide may settle into the soil, or stay on the crop, until it is washed by rain or irrigation into other water sources like groundwater, lakes, streams, rivers, and oceans. Testing the water after this has occurred typically does not show a particularly high concentration of these human-made chemicals—but testing the fish often does! Waterfowl and other species may also be affected—including human beings, if people eat contaminated fish or waterfowl, for example. In other words, wildlife and people become the concentrators of the pesticide because the chemicals do not pass out of their bodies but accumulate in their bodies over time.

The major purpose of this activity is for students to recognize the consequences of accumulation of some pesticides in the environment.



Materials

white pipe cleaners and colored pipe cleaners (two-thirds white, one-third colored); or white paper dots and colored paper dots (same proportion as above); or any other materials (two-thirds white, one-third colored) that can be picked up by students easily; 30 of these items per each student is recommended; one paper bag per grasshopper

Procedure

1. Tell the students that this is an activity about "food chains." If they are not familiar with the term, spend time in establishing a definition. (Food chain: a sequence or "chain" of living things in a community, based on one member of the community eating the member above it, and so forth; e.g., grasshopper eats plants like corn, shrews or other rodents eat grasshoppers, hawks eat rodents.)

2. Divide the students into three groups. In a class of 26 students, there would be two "hawks," six "shrews," and 18 "grasshoppers." (Work with approximately three times as many shrews as hawks, and three times as many grasshoppers as shrews.) Optional: Have grasshoppers, hawks, and shrews labelled so they can easily be identified; e.g., arm ties for grasshoppers, red bandannas for "red-tail hawks" and brown arm ties for shrews.

3. Hand each "grasshopper" a small paper bag or other small container. The container is to represent the "stomach" of whatever animal is holding it.

4. With the students' eyes closed, or otherwise not watching where you place the "food," distribute the white and colored paper dots (or whatever material you use) around in a large open space. Outside on a playing field if it is not windy, or on a gymnasium floor will work; a classroom will also work if chairs and tables or desks can be moved back.

5. Give the students their instructions. The grasshoppers are the first to go looking for food. The hawks and shrews are to sit quietly on the sidelines watching the grasshoppers; after all, the hawks and shrews are predators, and are watching their prey! At a given signal, the grasshoppers are allowed to enter the area to collect food and place the food in their stomachs (the bags). The grasshoppers have to move quickly to gather food. At the end of **30 seconds**, the grasshoppers are to stop collecting food.

6. The shrews are now allowed to hunt the grasshoppers. The hawks are still on the sidelines quietly watching the activity. The amount of time available to the shrews to hunt grasshoppers should take into account the size area you are working in. In a classroom, 15 seconds may be enough time; on a large playing field, 60 seconds may be better. Each shrew should have time to catch one or more grasshoppers. Any grasshopper caught by a shrew—that is, tagged or touched by the shrew, must give its bag of food to the shrew and then sit on the sidelines.

7. The next time period (from 15 to 60 seconds, or whatever time you set) is time for the hawks to hunt for food. The same rules follow. Any shrews still alive may hunt for grasshoppers; grasshoppers are hunting for the food chips that represent corn or other plants; and the hawks are hunting for the shrews. If a hawk catches a shrew, the hawk gets the food bag and the shrew goes to the sidelines. At the end of the designated time period, ask all the students to come together in a circle, bringing whatever food bags they have with them.

8. Ask the students who are "dead," having been consumed, to identify what animal they are and what animal ate them. (If they are wearing labels, this will be obvious.) Next ask the hawks to empty their food bags out onto the floor or on a piece of paper where they can count the number of food pieces they have. They should count the total number of white food pieces and the total number of multi-colored food pieces they have in their food sacks. List any grasshoppers and the total number of white and multi-colored food pieces each has; list the number of shrews left and the number of white and multi-colored pieces each has; and finally, list the two hawks and the number of white and multi-colored food pieces each has.

9. Inform the students that there is something called a "pesticide" in the environment. This pesticide was sprayed onto the crop the grasshoppers were eating, in order to prevent a lot of damage by the grasshoppers. If there was a lot of crop damage by the grasshoppers, the farmers would have less of their crop to sell, and some people and domestic livestock might have less of that kind of food to eat—or it might cost more to buy it because a smaller quantity was available. This particular pesticide is one that is poisonous, accumulates in food chains, and stays in the environment for a long time. In this activity, all of the multi-colored food pieces represent the pesticide. All of the grasshoppers that were not eaten by shrews may now be considered dead, **if they have any multi-colored food pieces in their food supply.** Any shrews for which half or more of their food supply was multi-colored pieces would also be considered dead. The one hawk with the highest number of multi-colored food pieces will not die at this time; however, it has accumulated so much of the pesticide in its body that the egg shells produced by it and its mate during the next nesting season will be so thin that the eggs will not hatch successfully. The other hawks are not visibly affected at this time.

10. Talk with the students about what they just experienced in the activity. Ask them for their observations about how the food chain seems to work, and how toxic substances can enter the food chain, with a variety of results. The students may be able to give examples beyond those of the grasshopper-shrew-hawk affected by the pesticide in this activity.

Extensions

1. Consider and discuss possible reasons for use of such chemicals. What are some of the trade-offs? What are some of the consequences?
2. Offer and discuss possible alternatives to uses of such chemicals in instances where it seems the negative consequences outweigh the benefits. For example, some farmers are successfully using organic techniques (e.g., sprays of organic, non-toxic substances; crop rotation; companion planting); biological controls (e.g., predatory insects); and genetic approaches (e.g., releasing sterile male insects of the "pest species") in efforts to minimize damages to their crops.
3. Find out what research is going on to develop and test effects of pest control efforts—from effects of possibly toxic chemicals, to non-toxic alternatives. With what impacts? Trade-offs? Potential?
4. Check newspapers for relevant local, national, or international examples of such issues.
5. Conduct the activity using different examples; e.g., people, shellfish.

Evaluation

Give three examples of ways in which pesticides could enter a food chain.

Discuss two possible consequences of pesticides entering the food chain for each of the examples you gave above.

An ecologist studied the presence of a toxic chemical in a lake. He found the water had one molecule of the chemical for every one billion molecules of water. This is called one part per billion (1ppb). The algae had one part per million (1ppm) of the toxic chemical. Small animals, called zooplankton, had 10 ppm. Small fish had 100 ppm. Large fish had 1,000 ppm. How do you explain this increase in this toxic chemical to 1,000 ppm for the large fish? Use a drawing to help support your answer.

The ecologist found the chemical was a pesticide which had been sprayed on cropland 100 miles away from the lake. How did so much of it get into the lake?

Build an Eagle Wing

A Bald Eagle has a wing span, tip to tip, of up to 7 ½ feet (2.2 meters). Yet an average male Bald Eagle weighs about 9 pounds and an average female weighs about 12 pounds. (Try lifting a 10-pound sack of flour or sugar for comparison.) It is the combination of large wings and light weight that makes the eagles masters of the air.

Build an Eagle Wing Includes:

- Eagle wing pattern on page 31
- Eagle body on pages 26 and 27

You Need:

- Crayons, color pencils, or fine tip markers
- Scissors
- Paste or glue
- Two 3/4" brads, also called paper fasteners

Before Assembling:

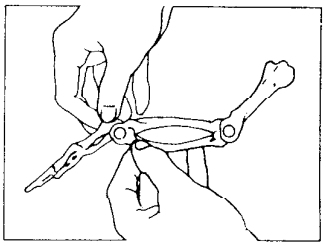
Cut page 31 out of the book. Color all the pieces. With the eagle wing pattern in front of you, read the following information about eagle flight anatomy. You will be told when to cut out the different pieces and how to assemble the wing step-by-step.

The Bones

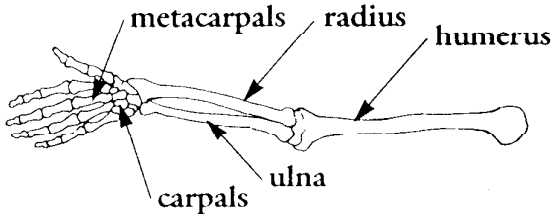
The eagle's body, like that of most birds, is designed to be light.

- The whole skeleton weighs less than the feathers!
- Many bones are hollow and porous. They may have struts inside for strength.
- Shoulder, rib, and wing bones are slender.
- The skull is thin, and there are no heavy teeth.
- Birds breathe oxygen from the air. In addition to lungs, birds have extra air sacs that extend into their hollow bones. They help with breathing. They keep the body light. Air sacs also serve as a cooling system. Flying can be hot work!

1. Cut out the bones from your eagle wing pattern along the dashed lines. Place area A of the **humerus** bone over area A of the **radius** and **ulna** bones and poke through the Xs with a brad. Place area B of the radius and ulna bones over area B of the **carpo-metacarpus** and poke through the Xs with a brad.



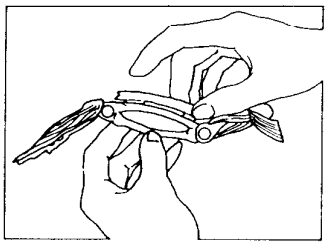
The brads allow movement like the joints of a real wing. Compare the wing skeleton with the diagram of the human arm below.



The Muscles

Breast muscles power the wings. If you could look at them, they would be dark in color. That shows they have a good blood supply, pumped by a strong heart, to bring oxygen to working muscles. Chicken breast (white meat) has poor blood supply. That's why chickens do not set long-distance flying records!

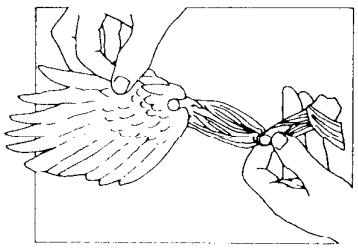
2. Cut out the muscles along the dashed lines. Place the muscles over the bones and fold the tabs to the back, matching the symbols. Paste the tabs so that you can lift the muscles up and still see the bones. Part of the humerus bone will still show.



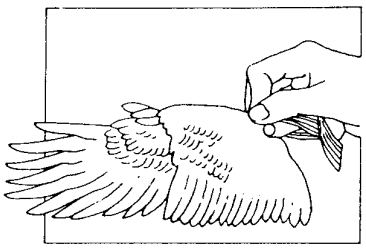
The Feathers

Feathers are made of keratin like your finger nails. They do not grow evenly all over a bird's body, but grow from special cells in feather tracts. (Look at a plucked chicken. Can you see rows of bumps? These mark the feather tracts.) Each cell grows the right kind of feather for that part of the body.

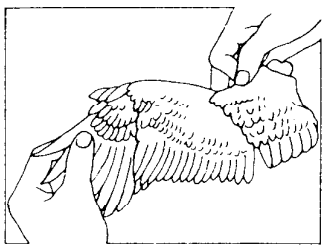
3. Cut out the feathers. Place the wing tip feathers, called the **primaries**, over the bones and muscles first. Note how the feathers fit around the brad. Fold the tabs behind and paste.



4. Next, place the **secondary** wing feathers over the lower arm muscles and bones. The right side will fit around the brad, and the left side should be allowed to overlap the primary feathers and hide the brad. Fold the tabs behind and paste.



5. The last group of feathers closest to the body are called the **tertials**. Place them over the humerus bone and muscles. Allow the feathers to the left to cover the brad. The breast muscles and humerus bone will still show on the left side. Fold the tab over to the back and paste.

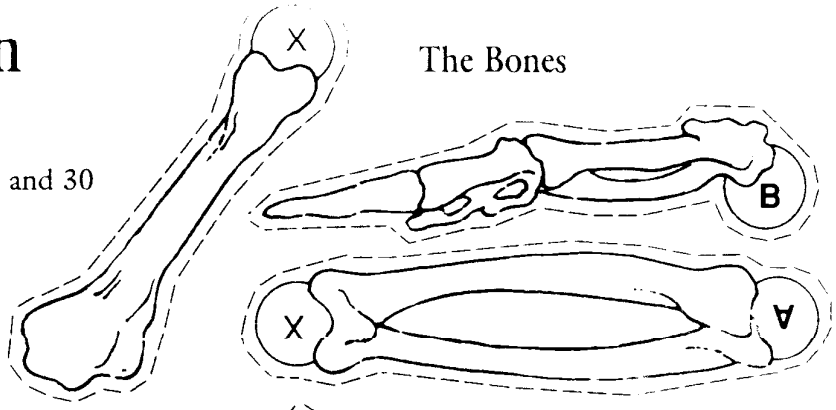


Now the eagle wing is complete. You can lift up the feathers to view the muscles and bones, and the brads allow you to observe how the wing is jointed.

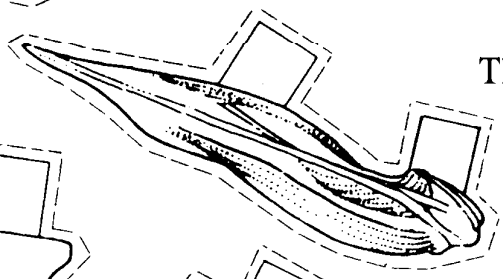
Paste the wing onto the eagle on page 27 by matching area C on the back of the humerus bone to the gray area (C) on the eagle. Notice how the flight muscles attach the breast to the humerus bone. By folding the wing over, it can be enclosed in the book.

Eagle Wing Pattern

Cut out this page, then follow the assembly directions on pages 29 and 30 to build an Eagle wing.

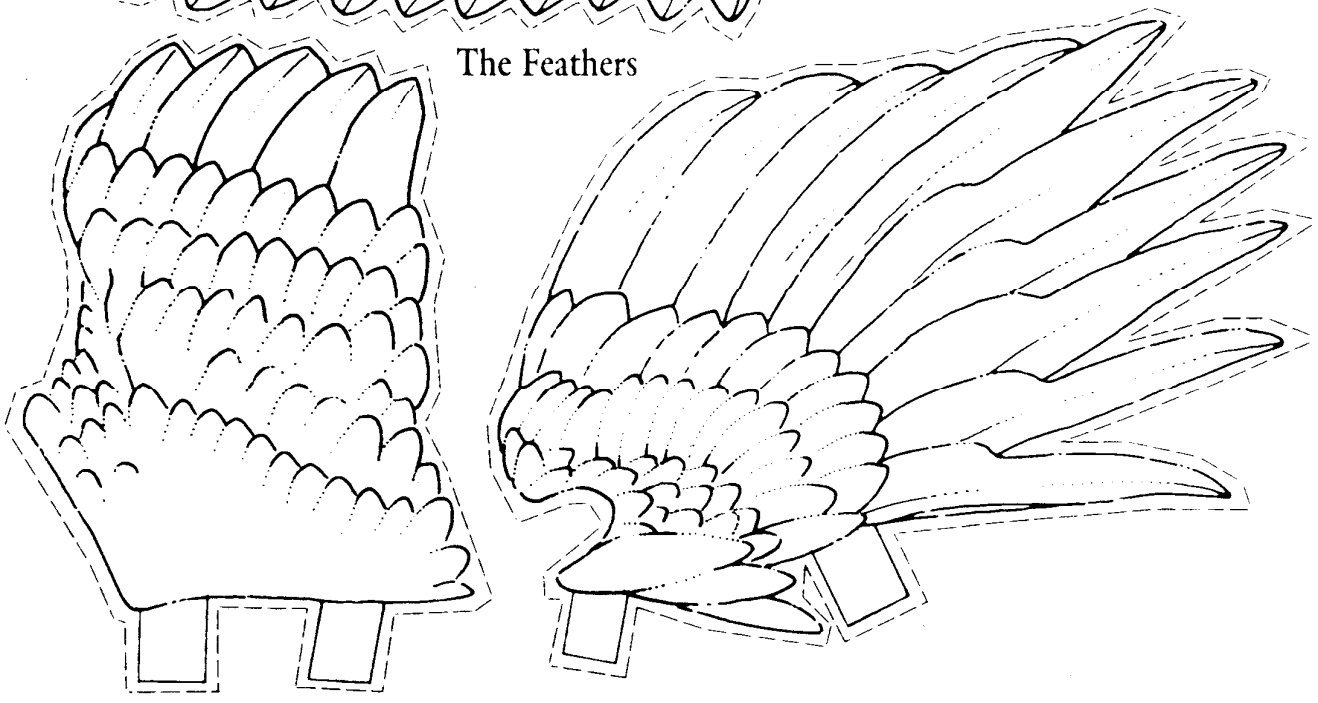


The Bones



The Muscles

The Feathers



alula
lesser covert feathers
primary covert feathers
middle covert feathers
greater covert feathers
primary feathers
tertials
secondary feathers
greater covert feathers
middle covert feathers
lesser covert feathers
breast muscles
bicep
tricep
"lower arm muscles"
wing tip muscles
ulna
radius
carpometacarpus
humerus
A
B
C
X
X

NAME _____ DATE _____

WORKSHEET
(for use on a fieldtrip or in the classroom)

"FROM OUR PERSPECTIVE--HOMES FOR BALD EAGLES"
(In writing the answer to each of these questions, remember that you are answering them as you would if YOU were a BALD EAGLE!!!)

1. Imagine you are a bald eagle. You were captured elsewhere and have been released in this new area(YOUR community). What do you think of this new site?

2. Does it supply the right kinds of food for you?

3. The right amount of water?

4. The kind of cover that you need to escape predators,and to raise young?

5. Is there enough food, cover, and water within a small enough area that you could survive for a long time?

6. Overall, how would you rate this area as habitat for your species??

7. Can you find any evidence that other bald eagles live here already? _____Describe any signs you find.

8. Do you think that the population of your species in this area is large or small?_____Why?

9. Is there any evidence that people are in the area? _____ How have they changed the site?

10. Do these changes make it a better place for you (the Bald Eagle) to live, or not?_____Why?

11. Given a choice in the matter, would you LIKE to live here?

Adapted from:
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