



EAGLE WATCH

Materials

Activity One:

- ☆ Various literature selections that feature extinct or endangered organisms
- ☆ "Eagle Mystery" sample

Activity Two:

- ☆ copies of eagle information cards

Rationale

Scientific methods will be used to work on an as yet unsolved ecological mystery. A situation that might reduce biodiversity among birds.

Objectives

1. Students will use literary selections to imagine what the future of the eagle, or other affected organisms, could be like if solutions are not found for their environmental problems.
2. Students will use information cards that offer data progressively, they will move through the exercise to make inferences about an eagle die-off that occurred in Arkansas from 1994-1999. They will develop an action plan to investigate this problem and to determine how ecosystems might be impacted and diversity reduced under this plan.

Activity One: Eagle Mystery

PROCEDURE

1. Read and discuss various pieces of literature that feature extinct or endangered organisms, or scenarios of environmental problems caused by man. Examples are listed below. Have students talk about how these sketches made them feel. Did the sketches seem real? Could the image they present be changed in the real world, and if so how?

- The Passenger Pigeon and The Cormorant's Tale from *I Am Phoenix* by Paul Fleischmann, Harper Collins, 1985.
- Requiem from *Joyful Noise* by Paul Fleischmann, Harper and Row, 1988.
- The Fishers and The Star Thrower from *The Star Thrower* by Loren Eiseley, Harcourt Brace Jovanovich, 1978.
- Desperate I Walked from *The Innocent Assassins* by Loren Eiseley, Charles Scribner's Sons, 1973.
- The Last Butterfly from *Notes Of An Alchemist* by Loren Eiseley, Charles Scribner's Sons, 1972.

The *Eagle Mystery* handout can be used as a transition to the current situation happening in Arkansas. Have the students assess if their feelings change in reading about animals and events closer to home.



Activity Two: Eagle Action Plans

PROCEDURE

Divide the class into small groups. Give the groups the information cards, one at a time. Have students read the first card, then make two lists from the information given:

1. Inferences that can be made from the card.
2. Possible courses of action the students feel should be taken to gain new information.

Discuss the students' ideas, then move on to the next card until all the cards have been covered. Time needed for each card will vary.

Correlation to National Science Standards

Unifying Concepts and Processes, Science as Inquiry, Life Science

Correlation to Arkansas Frameworks

Science: 9-12: LS 1.1, LS 1.4, LS 2.10, LS2.13, LS 3.7



EAGLE MYSTERY

One of my favorite winter activities has always been to take part in the eagle watches held by a number of Arkansas State Parks. Arkansas ranks in the top ten states in the number of Bald Eagle sightings, with over one thousand eagles counted each winter. While scanning the chilly skies for signs of these majestic birds, I often think back to when thousands of eagles must have nested across Arkansas and raised their young along the state's abundant waterways. Fish, waterfowl, rodents, carrion and other foods were plentiful; nesting sites in tall trees and on cliffs were available. Arkansas was a perfect habitat in many ways.

Then circumstances began to change. Accidental and purposeful shootings of Bald Eagles and other raptors became more common in a world that seemed to care little for wild things. As man's population increased, vast areas of natural habitat were changed and destroyed to make room for our ever-escalating life styles. PCBs, DDT and other pesticides swept through food chains, magnifying at each step until whole webs faltered. Eagles who escaped thinning egg shells and embryonic deformation often fell prey to lead poisoning by feeding on waterfowl, which had ingested lead shot.

Eagles no longer nested in the natural state and were becoming rarer across their entire range. *Haliaeetus leucocephalus*, our natural symbol, was placed on the Federal Endangered Species List. Fortunately enough people recognized that our nation was being emptied of wildlife at an unprecedented rate, and citizens began to demand that our natural systems be protected. The Endangered Species Act opened the ecological decade of the seventies and Americans began to assume renewed responsibility for earth and her inhabitants.

In 1982 Arkansas had the first successful Bald Eagle nesting since 1930. That same year the Arkansas Game and Fish Commission (AGFC) began a Bald Eagle Hacking Program on the Buffalo National River. Young eagles from Minnesota and Wisconsin were raised in Arkansas on the premise that they would return, raise their young here and eventually reestablish breeding populations. The bird was on its way back. Destined to be an endangered species success story, the Bald Eagle was upgraded from the endangered to the threatened list, and it now is expected to be removed from the list in July, 2000.

But apparently we must be reminded again and again that in today's world it is no longer enough to love wilderness, it also is necessary to continually nourish and watch over it. In November of 1994 on the shores of Arkansas' Degray Lake, one of the most baffling forensic mysteries of the century began with a fishing trip.

INFORMATION CARD ONE

Thanksgiving day, 1994, two fishermen on Lake DeGray (about 25 miles from Lake Ouachita) came upon a Bald Eagle that was unable to fly and very unsteady on its feet. The bird's feathers were fluffed out, possibly in an attempt to keep warm. The men notified the Arkansas Game and Fish Commission, and the eagle was captured and taken to a veterinary clinic where it died the next day. In the following weeks other sick, dead and dying eagles were found in the same area. Since that day nearly 60 eagles have died at DeGray Lake, Lake Ouachita and Lake Hamilton. The deaths are the largest known cases of eagle mortality in the history of the United States.

INFERENCES

ACTION PLAN

INFORMATION CARD TWO

Sick coots began to show up around the same Arkansas areas where the sick eagles were found. Symptoms included reluctance or inability to fly, erratic flight with the posterior of the bird bobbing down while flying; circular swimming with one leg extended, and swimming upside down due to partial paralysis on one side of the body. Coots are a small duck-like member of the rail family and a favorite food of wintering bald eagles in Arkansas. The birds generally migrate to Arkansas from Canada and the upper Midwest during the fall and return north in the spring. The symptoms for eagles are similar. Affected eagle behavior is generally noticed only in the disease's latter stages and appears as erratic flight and walking. One eagle was found dead at Lake Ouachita in the winter of 1995-96, but cause of death could not be confirmed. The same disease appeared in 1997 in lakes in North Carolina and Georgia. Coots died at these locations, but no eagles were known to have been affected. Mortality generally begins in November and ends by March at these eastern locations.

INFERENCES

ACTION PLAN



INFORMATION CARD THREE

The Arkansas Eagle Mortality Task Force was organized in 1997 and is coordinating research on the problem. Representatives include public agencies, universities and private organizations. The Arkansas Game and Fish Commission and the U.S. Corps of Engineers are heading fieldwork. The task force at first identified the problem Coot and Eagle Brain Lesion Syndrome (CEBLS), but has now changed the name to Avian Vacuolar Myelinopathy (AVM). It is described as an avian disease believed to be caused by an unknown neurotoxin. It causes a signature lesion in the white matter (myelin sheath) of the brain and spinal cord of affected birds. Diseased specimens generally appear to be in good body condition externally and internally with the exception of microscopic neural lesions. Coots with CEBLS/AVM have been found in recent weeks at the Georgia and North Carolina lakes. No positive CEBLS/AVM have been found in Arkansas this fall and winter of 1998.

INFERENCES

ACTION PLAN

INFORMATION CARD FOUR

Due to the nature of CEBLS/AVM, bird specimens that have been frozen or are in an advanced state of decomposition cannot be used for accurate diagnosis of the disease. To date, the Bald Eagle and the American Coot are the only species known to be affected by CEBLS/AVM. Tests for the following diseases and toxins/compounds have been negative: bacterial, viral, prion and parasitic diseases, acute organophosphates and carbamates, algal toxins, arsenic, barbiturates, cyanide, heavy metal, organochlorines, organolead, salicylanilides, sodium fluoracetate, strychnine, thallium, organic and inorganic tin, T-61, mercury, fumonisin, nitrates/nitrites, vitamins A and E, bromethalin, hexachlorophene, bismuth and trauma. Tissues have been screened using High Pressure Liquid Chromatography (HPLC) and gas chromatography/mass spectrometry (GC/MS), analytical techniques that detect heat sensitive organic and inorganic compounds and heat stable nonvolatile compounds. No treatment has been found for stopping the progression of CEBLS/AVM.

INFERENCES

ACTION PLAN

INFORMATION CARD FIVE

Spring of 1999. There have been no signs in Arkansas of CEBLS/AVM, however mallards, wid-geons and ring-necked ducks from North Carolina have been found with brain changes similar to the Arkansas coots and eagles. Bald Eagles suffering from Avian Vacuolar Myelinopathy, the ailment's scientific name, have been collected from four new locations, one in North Carolina, one in Georgia and two in South Carolina.

The mystery of CEBLS/AVM has yet to be solved. Diagnostic, field and laboratory efforts indicate the cause is most likely a toxin, either one that is naturally occurring or man-made. Tests have been negative for toxins previously associated with vacuolar myelinopathy in other species. Research efforts still underway include:

- Clinical avian feeding trials conducted by the USGS National Wildlife Health Center and involving quail, kestrels, coots and domestic chickens with food sources of bass, shad, catfish, Egeria, Lemna, lake scum and affected coot gastrointestinal contents and muscle tissue.
- Water quality analysis with post-storm monitoring conducted by Ouachita Baptist University.
- Bald eagle movement and feeding behavior studies conducted by Arkansas State University.
- American coot banding and movement monitoring conducted by USACE, Arkansas Game and Fish Commission and Ouachita Baptist University.
- Toxicology analysis of affected avian tissues conducted by the National Center for Toxicological Research (NCTR).
- Collection and analysis of plankton and aquatic plants conducted by Henderson State University.
- Aquatic and upland plant inventories conducted by the Arkansas Natural Heritage Commission and Henderson State University.
- Preparation of a Geographical Information System database by the University of Georgia and FTN Associates.
- Foraging ecology of American Coots conducted by Texas A&M University.
- Epidemiological investigations by the University of Georgia's Southeastern Cooperative Wildlife Disease Study.

As part of the CEBLS/AVM research effort, Bald Eagles have been marked with standard aluminum National Bird Banding Lab leg bands, and with green, alphanumeric, aluminum leg bands. They also received temporary tail-mounted radio transmitters and feather notching. American Coots have been marked with neckbands of white, yellow, orange, light & dark blue, green and red. Sightings of these birds should be reported to either the Arkansas Game and Fish Commission or the Corps of Engineers.

DISCUSSION RATHER THAN INFERENCES AND ACTIONS

1. Any other avenues of investigation or action that could be taken.
2. Environmental implications of this disease/problem for the affected ecosystems.
3. Implications of this situation for the diversity of avians.
4. How might variability among coots and variability among bald eagles impact this issue, either positively or negatively?
5. Could the scenario have read differently if the birds had been native to Arkansas originally, growing up around the area where problems have occurred? Explain. Hint: Have researchers traced where the birds grew up and tested conditions in these areas?
6. Might genetic engineering techniques be of any use in solving or treating the CEBLS/AVM outbreaks? Explain how they might be or why they probably would not.

INFORMATION CARD SIX

December, 1999. Two bald eagles have died recently on Lake Ouachita, one from the mysterious disease that has killed 60 eagles in Arkansas since 1994, officials said Wednesday. Both adult males were found near the shore, one December 7 near Buckville on the north side and the other December 29 near Crystal Springs on the south. The eagle found December 7 died of avian vacuolar myelinopathy, the second carcass (which bore no visible wounds) is being tested at this time. A spokesman for the Arkansas Game and Fish Commission stated that the only known eagle deaths this winter have occurred at Lake Ouachita, but some coots at DeGray Lake have died from AVM. Scientists are continuing to observe and gather information on bird activities around Arkansas lakes. Hundreds of coots and several eagles have been trapped, banded, and released during the past two winters.

DISCUSSION

1. Does this information change your ideas in any way?
2. How do you think this scenario will continue to play out?
3. Can anything else be done that is not already being done? If so, what?



Eagle Update:

The National Wildlife Health Center of the US Geological Survey (USGS) coordinates AVM research across the country. They issue update bulletins which can be accessed on their website: http://www.umesc.usgs.gov/http_data/nwhc/news/mainavm.html

Their latest update (at press time) is listed below along with some practical information about anyone encountering sick birds.

USGS is conducting research on AVM using wing-clipped mallards and wild-caught coots in a sentinel study for the disease in North Carolina. So far the sentinel study has confirmed that the disease is site-specific, i.e. the lakes where birds are dying is the site of exposure. We have also determined that the time of onset is short, as soon as 5 days after placement on one of the lakes. Samples of water, vegetation, and sediments were immediately collected at the locations where mallards were observed to be feeding. Feeding trials are also underway to try and determine the route of exposure.

There is no evidence that AVM affects mammals. The risk to humans is unknown, however, as with any sick wild animal, birds suspected of having AVM should be considered unfit for consumption. Our standard precautions are that people handling any wildlife that is sick or died of unknown causes should do so with caution using waterproof gloves or an inverted plastic bag. Hunters should avoid shooting wildlife that are exhibiting unusual behavior, should use waterproof gloves when dressing out game, and should thoroughly cook meat before eating.

TEACHER PAGE

Following are possible inferences and action plans for each information card.

CARD ONE

INFERENCES: viral, bacterial or other parasitic disease; toxic pollutant

ACTION: check other water areas in Arkansas and other states; document external symptoms; autopsy for internal signs; survey other related species for similar symptoms; test food and water for toxins; check regurgitated eagle pellets for food sources and toxins.

CARD TWO

INFERENCES: neural toxin, disease or parasite; eagles getting the disease from eating sick/dead coots; disease began in Arkansas, probably at Lake DeGray and spread; may be seasonal

ACTION: microscope studies (light and electron) of coot and eagle nervous tissue (brain, spinal cord and peripheral nerves); continue checking other areas across the U.S., especially those adjacent to Arkansas; test coot food for toxins; check migrations, flyways, etc. for bird travel state to state; band birds to track; check water levels

CARD THREE

INFERENCES: Eagles in North Carolina and Georgia have some sort of immunity

ACTION: Body serum, tissue and DNA studies for antibodies, etc.

CARD FOUR

INFERENCES: New disease from mutated virus or bacteria; new toxic pollutant—especially an organic one

ACTION: Search historical data for similar symptoms/diseases that could have been misidentified or not identified; look for diseases that may have jumped species from reptiles, fish or mammals to birds; toxicology studies on nearby industries, dredging operations, etc.; test wetland plants for absorbed toxins.

CARDS FIVE & SIX: Answers will vary

ADDITIONAL RESOURCES:

A VHS documentary, "Saving the Eagles" on AVM disease (recipient of the first place award (nature and science category) at the Silver State Documentary Film Festival) may be viewed directly on the Arkansas Educational Telecommunications Network's website at:

<http://www.aetn.org>

or purchased for \$24.95 from AETN

Donaghey & Sesame Streets
P.O.Box 1250
Conway, Arkansas 72032



The U.S. Army Corps of Engineers, Vicksburg District also maintains AVM information on their website **<http://www.mvk.usace.army.mil/>**, including pictures, and excerpts from a 1998 CEBS field diagnostic video showing clinical signs in eagles and coots, available in Mpeg Format (14.2 MB) and RealPlayer Format.