



# Teaching Wildlife Habitat Evaluation

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Learning how to evaluate wildlife habitat provides an excellent way to increase understanding of wildlife ecology and management practices. This is knowledge that youth will be able to use throughout their lives. This publication will help you teach wildlife habitat evaluation and, if you wish, prepare a team for the Wildlife Habitat Evaluation Program (WHEP) Career Development Event (CDE). Competing in this event helps students focus on the subject and challenges them to learn all they can.

Participants are challenged to identify wildlife, wildlife equipment and foods; evaluate aerial photographs; and work as a team to write a management plan. The preparation and CDE competition help youth learn the lifelong skills of teamwork, observation, analysis, concentration, communication, and presentation (oral and written). Writing a wildlife management plan requires open-ended problem solving. Knowledge gained

through studying for and participating in this event will help youth understand how to create wildlife habitat—wherever they live—throughout their lives.

The Wildlife Habitat Evaluation Program has a demonstrated impact on participants' lives. Through surveys, some participants report that they have already used some wildlife management concepts by the time the competition takes place (55%). Many report that they plan to use wildlife management tools in the future (86%), and a significant number of youth said the knowledge they gained in studying for this contest influenced their college and career plans (27%).

The WHEP CDE, sponsored by Purdue University and the Indiana Department of Natural Resources (IDNR), involves many practicing wildlife biologists and college students who study wildlife as judges. The Indiana competition is open to any high school



team (3–4 members). The top 4-H and FFA teams earn the right to compete at their respective national competitions. Teams not composed entirely of 4-H or FFA members are not eligible for the national 4-H and FFA events. Preregistration with payment is required. The registration deadline, contest dates, and registration form are linked at the Indiana WHEP CDE Web site: [www.four-h.purdue.edu/whep](http://www.four-h.purdue.edu/whep)

## OVERVIEW OF EVENTS

Participants complete four activities in the Indiana WHEP CDE. Three of the activities—Aerial Photos, Foods, and Wildlife Identification—are completed by participants working on their own. In the fourth activity, Wildlife Management Plan, three or four youth compete as a team. These activities are described below:

- **Aerial Photos** (individual event)—Youth use aerial photographs to rank the habitat for eight wildlife species. Four photographs are ranked from the most favorable habitat for a particular species to the least favorable habitat.
- **Foods** (individual event)—Youth identify ten common wildlife foods and the animals that eat these foods.
- **Wildlife Identification** (individual event)—Youth identify fifty items, which can be related to wildlife, species, or equipment.
- **Wildlife Management Plan** (team event)—This activity has two parts:
  1. Participants are given landowner objectives for a specific area. The area may include urban, rural, and/or wetland habitats. Teams work together to write a wildlife management plan and sketch how the area should look when managed for specific wildlife species.

2. Each team gives an oral presentation describing the property to be managed and their wildlife management plan. Presentations are limited to five minutes. Each team member must participate in the oral presentation.

These activities are described in more detail below.

## AERIAL PHOTOS

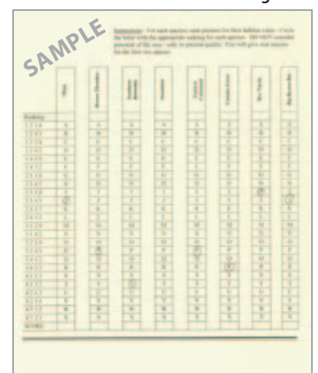
*Objective:* Youth learn to identify important habitat features from aerial photographs and rank which habitat shown in the photos is best for a particular species. This exercise helps youth grasp and begin to master concepts related to larger scale ecosystems.



### Teaching This Activity

- The species will be taken from those listed in Appendix A.
- A sample of the Scantron scoresheet used in this activity is shown in Figure 1 and Appendix B. A Hormel system is used for scoring this activity.

Figure 1



- Participants must understand the habitat requirements of each species they are judging, since the number and arrangement of habitat features (e.g., presence of corridors or level of fragmentation) affect the suitability for target species.
- Participants must be able to distinguish trees, shrubs, crop fields, water, roads, buildings, and other features in aerial photographs.
- Participants should understand wildlife habitat terminology and concepts, such as species richness, plant succession, and edges as well as habitat requirements of individual species listed in Appendix A.
- Participants use problem-solving skills to apply what they have learned regarding habitat needs of an individual species as they assess wildlife habitat on a larger, more abstract scale than they would encounter on the ground. They must make comparisons between different wildlife habitats to determine which one best serves the needs of a species.
- Purdue Extension publication 4-H-910, *Wildlife Habitat Evaluation with Aerial Photographs*, contains a variety of aerial photographs and a brief explanation of what youth should see in each. (See “Resources.”)

## FOODS

**Objective:** Youth learn to identify the foods that wildlife species typically eat. This knowledge is critical for managing wildlife because the proper foods must be available to encourage species or absent to discourage species from using a particular habitat.

### Teaching This Activity

- The food categories and wildlife species used in the CDE are given in Appendix C.



- Participants should study the matrix in Appendix C to learn the common foods for each wildlife species that they may be tested on. Note:
  - ▶ The food groups have been generalized for the purposes of judging. If the animal shown commonly eats *any* species in a food group (e.g., grain includes corn, soybeans, rice, and wheat), then that food group (e.g., grain) should be selected for that animal. Youth do not need to learn the specific food that a particular animal would eat (e.g., a Mallard would eat swamp smartweed, but participants simply need to know that a Mallard eats aquatic plants).
  - ▶ Participants may find it easier to remember general categories if they can recognize patterns (e.g., what most birds eat or what mammals eat).
  - ▶ Participants also must identify the food category represented by each food displayed at the competition. For example, if a cattail is shown, a participant’s list must state “aquatic plant” as the category to which cattails belong.
  - ▶ It should be understood that many of the species will, on occasion, eat foods in categories that are not marked, especially in times of food shortage. However, for the WHEP CDE Foods activity, participants must learn the foods given in Appendix C.

- Scantron sheets (sample found in Appendix D) will be used for scoring. Participants will be shown ten food items, which they must identify and write in on the left-hand side. Then, they must fill in the “bubbles” under that food beside each animal listed on the right that eats from that general food group.
- Flash cards can help youth learn the foods categories. A set of the WHEP Foods Flash Cards are available online (see “Resources”).



## WILDLIFE IDENTIFICATION

**Objective:** Youth learn to identify wildlife and wildlife equipment.

### Teaching This Activity

- Appendix E lists the species and equipment that participants may be tested on for this activity.
- Pictures and information about many of these species are found in the WHEP resources listed below. See the “Resources” section for Web links:
  - ▶ Animal identification flash cards
  - ▶ *National 4-H WHEP Manual*

There are also many other resources that can be found by using a general Web search.

- Participants will be shown actual specimens of wildlife species and equipment that they must identify. They will complete this activity using a multiple-choice format on Scantron scoring sheets.

## WILDLIFE MANAGEMENT PLAN

**Objective:** Three to four youth work as a team to write a wildlife management plan for specified wildlife when shown property to be managed. Habitats may be urban, rural, wetlands, or a combination. The wildlife species listed will often have conflicting habitat requirements.

### Teaching This Activity

- This is a very challenging activity because participants must do three complex subactivities:
  - ▶ View an area and assess the current conditions for specified wildlife species, addressing what is lacking and how to add what is needed while balancing conflicting wildlife needs and addressing landowner wishes, and sometimes, budget.
  - ▶ Work together to sketch and write the management plan. Participants must indicate where management practices should be applied on an area map and include how they will evaluate the success of their plan.
  - ▶ Present their plan to a judge. Participants must demonstrate that each team member contributed to both the written plan development and oral presentation of the plan.
- Appendix A lists the species that participants may be tested on.
- A Field Condition Sheet indicates the landowner objectives and any other pertinent information. If any information is omitted, it is not considered necessary to the development of the wildlife management plan. The team must interpret the landowner objectives, state

the wildlife management practices to be used, and explain how the practices will positively or negatively affect the designated species. Generally, three to five species must be managed simultaneously. The Field Condition Sheet generally contains the following information: landowner's objectives, aerial photograph or sketch map of the property, definition of property boundaries and the size of the tract, population conditions for some of the species, and special considerations, which may include costs.

- Participants must know common wildlife management practices used to manage habitat for specific species and determine which practices are needed to improve the area to be managed by increasing the required habitat component in shortest supply. Participants must be familiar with all of the habitat management practices appropriate for urban, rural, and wetland habitats, and determine which practices, if any, are required to improve the habitat deficiencies in their management area for their selected species.
- Participants will need to combine the knowledge that they learned in the Aerial Photos and Foods activities to write a wildlife management plan. This includes understanding wildlife needs and management practices, and the ability to evaluate larger scale habitat configurations.

## RESOURCES

### INDIANA WHEP

#### Web site

- Indiana WHEP Web site:  
[www.four-h.purdue.edu/whep](http://www.four-h.purdue.edu/whep)  
This Web site has resources for the Indiana WHEP CDE coach. Contest date and

location, general information, training materials, examples of management plans and scorecards, and pictures from previous events are included.

*Publications available for free at*  
[www.four-h.purdue.edu/whep](http://www.four-h.purdue.edu/whep)

- *Developing a Wildlife Habitat Management Plan (4-H-991-W)*  
This publication will help coaches teach youth how to write a good management plan.
- *Wildlife Habitat Evaluation Food Flash Cards (4-H-993-W)*  
These flash cards can be used to help youth identify the general food categories eaten by the animals shown on the card face.
- *Wildlife Habitat Evaluation Program: Wildlife ID & Equipment Flash Cards (FNR-205-W)*  
These flash cards can be used to help youth identify wildlife and wildlife equipment.

*Publications available for purchase at*  
[www.the-education-store.com](http://www.the-education-store.com)

(Search by publication number.)

- *Wildlife Habitat Evaluation with Aerial Photographs (4-H-910)* This publication will help youth learn to evaluate wildlife habitat from aerial photographs.
- *Wildlife Habitat Evaluation Food Flash Cards (4-H-993)*  
This is a printed version of the 4-H-993-W cards described above.



- *Wildlife Habitat Evaluation Program: Wildlife ID & Equipment Flash Cards* (FNR-205)  
This is a printed version of the FNR-205-W cards described above.

#### Rules

- Rules for the Indiana WHEP CDE are at: [www.four-h.purdue.edu/cde](http://www.four-h.purdue.edu/cde) (Choose “Ag Judging Handbook.” Look for “Wildlife Habitat” in the Contents.

## NATIONAL 4-H WHEP

The 4-H team representing Indiana at the National 4-H WHEP contest must prepare for it using the national resources. Many of the coach resources for our region (Eastern Deciduous Forest) will be useful to all Indiana coaches.

#### Web site

National WHEP Web site: [www.whep.org](http://www.whep.org)

- This Web site has information about the history and benefits of the Wildlife Habitat Evaluation Program. The *National WHEP Manual* (see below) is available through this Web site. Information about the National 4-H WHEP contest and past contests is also available.

#### Publications

- *National Wildlife Habitat Evaluation Program Manual*  
[www.whep.org](http://www.whep.org)  
(Look for “National WHEP Manual.”)  
This manual includes wildlife species information, information on regional wildlife (Indiana is in the Eastern Deciduous Forest), and a glossary of terms.

#### National Competition Guidelines

- Rules for the National WHEP Contest will be posted on the National WHEP Web site— [www.whep.org](http://www.whep.org) —when they are available. Any additional requirements will be shared directly with the coach representing Indiana.

## ADDITIONAL RESOURCES

- *Ag Judging Handbook*, “Teaching Oral Reasons” section. Available online at: [www.four-h.purdue.edu/cde](http://www.four-h.purdue.edu/cde)  
The “Teaching Oral Reasons” section is located near the end of this publication.
- Appendix F of this publication lists which of the Indiana Academic Standards (2006) can be addressed when teaching wildlife habitat evaluation.



## Appendix A — Species for Aerial Photos and Wildlife Management Plan Activities

1. American Robin	20. Largemouth Bass
2. Beaver	21. Mallard
3. Big Brown Bat	22. Mink
4. Bluegill	23. Mourning Dove
5. Blue-winged Teal	24. Muskrat
6. Bobcat	25. Northern Bobwhite
7. Box Turtle	26. Northern Flicker
8. Brown Thrasher	27. Northern Leopard Frog
9. Bullfrog	28. Ovenbird
10. Canada Goose	29. Raccoon
11. Common Nighthawk	30. Red-winged Blackbird
12. Eastern Bluebird	31. Rock Dove (Pigeon)
13. Eastern Cottontail	32. Ruby-throated Hummingbird
14. Eastern Gray Squirrel	33. Ruffed Grouse
15. European Starling	34. Song Sparrow
16. Great Horned Owl	35. White-tailed Deer
17. House Finch	36. Wild Turkey
18. House Sparrow	37. Wood Duck
19. House Wren	

## Appendix B — Scorecard for Aerial Photos Activity

**SAMPLE**

**Instructions:** For each species, rank pictures for their habitat value. Circle the letter with the appropriate ranking for each species. DO NOT consider potential of the area - only its present quality. You will give oral reasons for the first two species.

	Mink	Brown Thrasher	Northern Bobwhite	Ovenbird	Eastern Cottontail	Canada Goose	Box Turtle	Big Brown Bat
Ranking								
1 2 3 4	A	A	A	A	A	A	A	A
1 2 4 3	B	B	B	B	B	B	B	B
1 3 2 4	C	C	C	C	C	C	C	C
1 3 4 2	D	D	D	D	D	D	D	D
1 4 2 3	E	E	E	E	E	E	E	E
1 4 3 2	F	F	F	F	F	F	F	F
2 1 3 4	G	G	G	G	G	G	G	G
2 1 4 3	H	H	H	H	H	H	H	H
2 3 1 4	I	I	I	I	I	I	I	I
2 3 4 1	J	J	J	J	J	J	J	J
2 4 1 3	K	K	K	K	K	K	K	K
2 4 3 1	L	L	L	L	L	L	L	L
3 1 2 4	M	M	M	M	M	M	M	M
3 1 4 2	N	N	N	N	N	N	N	N
3 2 1 4	O	O	O	O	O	O	O	O
3 2 4 1	P	P	P	P	P	P	P	P
3 4 1 2	Q	Q	Q	Q	Q	Q	Q	Q
3 4 2 1	R	R	R	R	R	R	R	R
4 1 2 3	S	S	S	S	S	S	S	S
4 1 3 2	T	T	T	T	T	T	T	T
4 2 1 3	U	U	U	U	U	U	U	U
4 2 3 1	V	V	V	V	V	V	V	V
4 3 1 2	W	W	W	W	W	W	W	W
4 3 2 1	X	X	X	X	X	X	X	X
SCORE								



## Appendix C — Wildlife Foods

		WILDLIFE SPECIES																				
		American Kestrel	American Robin	Beaver	Big Brown Bat	Bluegill	Blue-winged Teal	Bobcat	Box Turtle	Brown Thrasher	Bullfrog	Canada Goose	Common Nighthawk	Coyote	Eastern Bluebird	Eastern Cottontail	Eastern Gray Squirrel	European Starling	Great Horned Owl	House Finch	House Sparrow	
FOOD	Aquatic Plants			X		X	X		X													
	Bark			X												X	X					
	Birds	X						X			X			X			X		X			
	Buds			X					X							X	X					
	Carrion							X	X					X								
	Centipedes & Millipedes		X						X	X					X							X
	Crayfish					X					X			X								
	Earthworms		X			X	X		X	X	X				X				X			
	Eggs					X								X			X					X
	Ferns								X							X						
	Fish					X					X											
	Forbs			X					X			X				X						
	Frogs & Salamanders	X				X			X	X	X			X						X		
	Fruits & Berries, Fleshy		X						X	X				X	X	X	X	X				
	Fungi								X								X					
	Grain									X		X		X		X	X	X		X	X	
	Grass			X								X				X						
	Hard Mast <sup>1</sup>									X							X					
	Insects	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Leaves & Twigs			X												X	X					
	Lichens								X													
	Lizards	X						X		X				X						X		
	Mammals	X						X			X			X						X		
	Mussels																					
	Nectar																					
	Scorpions	X																				
	Seeds						X		X	X				X	X	X	X	X			X	X
	Snails		X			X	X		X	X	X	X		X								
Snakes	X						X			X			X						X			
Spiders	X	X			X			X	X	X				X				X		X	X	
Soft Mast <sup>2</sup>		X						X	X					X	X	X				X	X	
Tubers						X		X			X		X									
Turtles										X			X									

<sup>1</sup>Hard mast includes nuts (e.g., walnuts, acorns, beechnuts).

<sup>2</sup>Soft mast generally refers to berries (seeds that are covered by a fleshy fruit), but maple seeds (samaras) are referred to as soft mast even though they are not actually covered with a fleshy fruit.

Appendix C — Wildlife Foods (continued)

		WILDLIFE SPECIES																			
		House Wren	Largemouth Bass	Mallard	Mink	Mourning Dove	Muskrat	Northern Bobwhite	Northern Flicker	Ovenbird	Raccoon	Red-tailed Hawk	Red-winged Blackbird	Rock Dove (Pigeon)	Ruby-throated Hummingbird	Ruffed Grouse	Rufous-sided Towhee	Song Sparrow	White-tailed Deer	Wild Turkey	Wood Duck
FOOD	Aquatic Plants			X			X												X		X
	Bark																		X		
	Birds		X		X						X	X									
	Buds							X								X			X	X	
	Carrion				X						X	X									
	Centipedes & Millipedes	X					X	X	X	X							X	X		X	
	Crayfish		X		X		X				X										
	Earthworms	X	X	X	X		X		X	X						X	X	X		X	X
	Eggs		X		X						X										
	Ferns																		X		
	Fish		X		X						X										
	Forbs						X									X			X	X	
	Frogs & Salamanders		X		X		X				X									X	
	Fruits & Berries, Fleshy						X				X					X	X	X	X	X	X
	Fungi																		X	X	
	Grain			X		X	X				X		X	X		X			X	X	X
	Grass						X	X											X	X	
	Hard Mast <sup>1</sup>			X			X	X			X					X			X	X	X
	Insects	X	X	X	X		X	X	X	X			X		X	X	X	X		X	X
	Leaves & Twigs															X			X	X	
	Lichens																		X		
	Lizards										X	X								X	
	Mammals		X		X						X	X									
	Mussels			X	X		X				X										
	Nectar														X						
	Scorpions							X												X	
	Seeds			X		X	X	X			X		X	X		X	X	X	X	X	X
	Snails		X	X	X					X	X					X		X		X	X
	Snakes		X		X						X	X									
	Spiders	X					X	X	X	X			X		X		X	X		X	
	Soft Mast <sup>2</sup>			X			X	X			X		X			X	X	X	X	X	X
	Tubers			X	X		X				X									X	X
Turtles		X		X						X											

<sup>1</sup>Hard mast includes nuts (e.g., walnuts, acorns, beechnuts).

<sup>2</sup>Soft mast generally refers to berries (seeds that are covered by a fleshy fruit), but maple seeds (samaras) are referred to as soft mast even though they are not actually covered with a fleshy fruit.

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Appendix D — Scoresheet for Wildlife Foods Activity

**ParSCORE™ STUDENT ENROLLMENT SHEET**

**ParSCORE™ SCORE SHEET**

**EXAM NUMBER**

**TEST FORM**

**INSTRUCTIONS**

1. USE AND FOLD CAREFULLY  
 2. FILL IN BUBBLE COMPLETELY  
 3. MAKE COMPLETELY NO CHANGES  
 4. MUST FOLD AS SHOWN

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

**STUDENT ENROLLMENT SHEET**

**STATE**

**LOCALITY**

**DATE**

**TIME**

**CLASS**

**SECTION**

**NAME**

**SCORE**

**GRADE**

**TEACHER**

**WILDLIFE**

**LAST NAME**

**FIRST NAME**

**MI**

**1** WORMS

**2** GRASS

**3** SNAKE

**4** FLOWERS OR TUBERS

**5** FROGS SALAMANDERS

**6** AUTO

**7** CENTIPEDS MILIPEDS

**8** EGG

**9** FERN

**10** MAMMAL

**AMERICAN kestrel**

**AMERICAN robin**

**BEAVER**

**BIG brown bat**

**BLACK-capped chickadee**

**BLUEBIRDS**

**BLUEJAIL**

**BOBCAT**

**BOX turtle**

**BROWN thrasher**

**BUTTERFLIES**

**CANADA goose**

**COYOTE**

**EASTERN bluebird**

**EASTERN cottontail**

**EASTERN gray squirrel**

**FROGS**

**GREAT horned owl**

**HOUSE Finch**

**HOUSE Wren**

**HUMMINGBIRD**

**LARGemouth bass**

**MAILLARD**

**MINK**

**MOURNING dove**

**MUSKRAT**

**NORTHERN bobwhite**

**NORTHERN flicker**

**OVENBIRD**

**RACCOON**

**RED-tailed hawk**

**RED-winged blackbird**

**ROCK dove**

**RUFFED grouse**

**RUFous-sided towhee**

**SONG sparrow**

**WHITE-tailed deer**

**WILD turkey**

**WOOD duck**

## Appendix E — Species and Equipment for Wildlife Identification Activity

The following common Indiana wildlife species and wildlife equipment will be used in the identification portion of the WHEP CDE. These were chosen by the State WHEP CDE Committee as important for Indiana youth to learn about. Pictures of the species and equipment listed below can be found in the *WHEP Wildlife ID & Equipment Flash Cards* (FNR-205-W and FNR-205). The *National WHEP Manual* also includes information about species and equipment. Information about both of these publications can be found in the “Resources” section of this publication (pp. 5–6). Species and equipment indicated by an asterisk (\*) below are not included in the national list.

BIRDS	MAMMALS	OTHER SPECIES
<ol style="list-style-type: none"> <li>1. American Kestrel</li> <li>2. American Robin</li> <li>3. American Woodcock*</li> <li>4. Blue-winged Teal</li> <li>5. Broad-winged Hawk</li> <li>6. Brown Thrasher</li> <li>7. Canada Goose</li> <li>8. Common Nighthawk</li> <li>9. Eastern Bluebird</li> <li>10. European Starling</li> <li>11. Grasshopper Sparrow</li> <li>12. Great Horned Owl</li> <li>13. Hairy Woodpecker</li> <li>14. House Finch</li> <li>15. House Sparrow</li> <li>16. House Wren</li> <li>17. Mallard</li> <li>18. Mourning Dove</li> <li>19. Northern Bobwhite</li> <li>20. Northern Flicker</li> <li>21. Northern Harrier</li> <li>22. Ovenbird</li> <li>23. Red-eyed Vireo</li> <li>24. Red-tailed Hawk</li> <li>25. Red-winged Blackbird</li> <li>26. Ring-necked Pheasant</li> <li>27. Rock Dove (Pigeon)</li> <li>28. Ruby-throated Hummingbird*</li> <li>29. Ruffed Grouse</li> <li>30. Rufous-sided Towhee</li> <li>31. Song Sparrow</li> <li>32. Wild Turkey</li> <li>33. Wood Duck</li> <li>34. Yellow-rumped Warbler</li> </ol>	<ol style="list-style-type: none"> <li>1. Beaver</li> <li>2. Big Brown Bat</li> <li>3. Bobcat</li> <li>4. Coyote</li> <li>5. Eastern Cottontail</li> <li>6. Eastern Fox Squirrel</li> <li>7. Eastern Gray Squirrel</li> <li>8. Eastern Mole*</li> <li>9. Meadow Vole*</li> <li>10. Mink</li> <li>11. Muskrat</li> <li>12. Raccoon</li> <li>13. Red Squirrel</li> <li>14. Short-tailed Shrew*</li> <li>15. Southern Flying Squirrel*</li> <li>16. Virginia Opossum*</li> <li>17. White-tailed Deer</li> <li>18. Woodchuck*</li> </ol>	<ol style="list-style-type: none"> <li>1. American Toad*</li> <li>2. Black Rat Snake*</li> <li>3. Bluegill</li> <li>4. Box Turtle</li> <li>5. Bullfrog</li> <li>6. Channel Catfish*</li> <li>7. Copperhead*</li> <li>8. Crappie*</li> <li>9. Creek Chub*</li> <li>10. Eastern Newt*</li> <li>11. Fence Lizard*</li> <li>12. Five-lined Skink</li> <li>13. Garter Snake*</li> <li>14. Largemouth Bass</li> <li>15. Northern Leopard Frog*</li> <li>16. Painted Turtle*</li> <li>17. Red-backed Salamander*</li> <li>18. Snapping Turtle*</li> <li>19. Spring Peeper*</li> <li>20. Tiger Salamander*</li> </ol>
<b>EQUIPMENT</b>		
	<ul style="list-style-type: none"> <li>Calipers*</li> <li>Chemical immobilization darts*</li> <li>Ear tags*</li> <li>GPS unit*</li> <li>Hoop net*</li> <li>Jabstick*</li> <li>Leg bands*</li> <li>Live trap*</li> </ul>	<ul style="list-style-type: none"> <li>Minnow trap*</li> <li>Pesola scale*</li> <li>Pneumatic dart gun*</li> <li>Rocket net*</li> <li>Snake tongs*</li> <li>Telemetry antenna*</li> <li>Telemetry receiver*</li> <li>Transmitter/collar*</li> </ul>

## Appendix F — Indiana Academic Standards for Science, 2006

The following Indiana Academic Standards for Science can be addressed when teaching the Wildlife Habitat Evaluation Program.

### Grades 6–8

- 6.4.1 Explain that one of the most general distinctions among organisms is between green plants, which use sunlight to make their own food, and animals which consume energy-rich foods.
- 6.4.8 Explain that in all environments, such as freshwater, marine, forest, desert, grassland, mountain, and others, organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter. Note that in any environment, the growth and survival of organisms depend on the physical conditions.
- 6.4.9 Recognize and explain that two types of organisms may interact in a competitive or cooperative relationship, such as producer / consumer, predator / prey, or parasite / host.
- 7.4.9 Understand and explain that as any population of organisms grows, it is held in check by one or more environmental factors. These factors could result in depletion of food or nesting sites and / or increased loss to increased numbers of predators or parasites. Give examples of some consequences of this.
- 8.4.8 Describe how environmental conditions affect the survival of individual organisms and how entire species may prosper in spite of the poor survivability or bad fortune of individuals.

### Biology

- B.1.18 Explain that the regulatory and behavioral responses of an organism to external stimuli occur in order to maintain both short- and long-term equilibrium.
- B.1.38 Understand and explain the significance of the introduction of species, such as zebra mussels, into American waterways, and describe the consequent harm to native species and the environment in general.
- B.1.39 Describe how ecosystems can be reasonably stable over hundreds or thousands of years. Understand that if a disaster such as flood or fire occurs, the damaged ecosystem is likely to recover in stages that eventually result in a system similar to the original one.
- B.1.40 Understand and explain that like many complex systems, ecosystems tend to have cyclic fluctuations around a state of rough equilibrium. However, also understand that ecosystems can always change with climate changes or when one or more new species appear as a result of migration or local evolution.
- B.1.41 Recognize that and describe how human beings are part of the Earth's ecosystems. Note that human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems.

## Appendix F — Indiana Academic Standards for Science, 2006 (continued)

- B.1.43 Understand that and describe how organisms are influenced by a particular combination of living and non-living components of the environment.
- B.1.45 Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of the way organisms develop within ecosystems.
- B.1.46 Recognize and describe that a great diversity of species increases the chance that at least some living things will survive in the face of large changes in the environment.
- B.1.47 Explain, with examples, that ecology studies the varieties and interactions of living things across space while evolution studies the varieties and interactions of living things across time.

### Earth and Space Science I

- ES.1.20 Describe the relationship among ground water, surface water, and glacial systems.
- ES.1.21 Identify the various processes that are involved in the water cycle.

### Environmental Science, Advanced

- ENV.1.2 Understand and describe that if a disaster such as flood or fire occurs, the damaged ecosystem is likely to recover in stages that eventually result in a system similar to the original one.
- ENV.1.3 Understand and explain that ecosystems have cyclic fluctuations, such as seasonal changes or changes in population, as a result of migrations.
- ENV.1.4 Understand and explain that human beings are part of the Earth's ecosystems, and give examples of how human activities can, deliberately or inadvertently, alter ecosystems.
- ENV.1.9 Diagram the cycling of carbon, nitrogen, phosphorus, and water.
- ENV.1.10 Identify and measure biological, chemical, and physical factors within an ecosystem.
- ENV.1.12 Explain the process of succession, both primary and secondary, in terrestrial and aquatic ecosystems.
- ENV.1.19 Demonstrate and explain how the factors such as birth rate, death rate, and migration rate determine growth rates of populations.
- ENV.1.20 Demonstrate how resources, such as food supply, influence populations.
- ENV.1.27 Understand and describe the concept of integrated natural resource management and the values of managing natural resources as an ecological unit.
- ENV.1.34 Differentiate between natural pollution and pollution caused by humans and give examples of each.
- ENV.1.35 Compare and contrast the beneficial and harmful effects of an environmental stressor, such as herbicides and pesticides, on plants and animals. Give examples of secondary effects on other environmental components.

**Agricultural Education: Natural Resource Management**

- G.** Students shall develop and exhibit communication skills which are important for natural resource managers.
  - NRM.G.1 Examine the need for communication skills in the natural resources professions.
  - NRM.G.2 Describe the important features of a descriptive, interpretive and persuasive presentation.
  - NRM.G.3 Exhibit proper introduction techniques.
  - NRM.G.4 Make an oral presentation appropriate to a given situation.
  - NRM.G.5 Write a presentation on a natural resource topic.
  
- H.** Students shall integrate interrelated aspects of the environment in proposing resource management practices.
  - NRM.H.1 Define ecology.
  - NRM.H.2 Define and provide examples of environmental conservation, preservation, exploitation and stewardship.
  - NRM.H.3 Propose an example of biotic succession.
  - NRM.H.4 Analyze a basic food chain, including the transfer of energy through the chain.
  - NRM.H.5 Evaluate an instance where people have altered the local and/or global balance of nature and give positive and negative results.
  - NRM.H.6 Give an example of how an ecological succession can be altered so it will remain at a secondary stage rather than advancing to the climax stage, and how this action affects production.
  - NRM.H.7 Identify agencies at the county, state, and federal levels with environmental management responsibilities.
  
- N.** Students shall identify common species of fur-bearing wildlife of Indiana and recommend wildlife management practices.
  - NRM.N.1 Identify on sight fur-bearing animals indigenous to Indiana and describe their life cycles.
  - NRM.N.2 Define wildlife management, habitat, native wildlife, exotic species, and migration.
  - NRM.N.3 Examine the impact of agriculture on wildlife populations, recommend methods to improve wildlife habitat and recognize the concepts of “edge,” “biodiversity,” “habitat,” “food chain,” and “niche.”
  - NRM.N.4 Define the term population curve and demonstrate how reproduction and mortality affect the curve.
  - NRM.N.5 Evaluate hunting and fishing regulations including the scientific basis for such restrictions.



- O. Students shall assess the importance of predators and endangered species, and the roles each plays in the natural community.
  - NRM.O.1 Define endangered species, predators, and threatened species and list examples of each.
  - NRM.O.2 Examine possible causes of extinction.
  - NRM.O.3 Analyze management strategies that have repopulated endangered and threatened species.
  
- P. Students shall analyze the characteristics and management of waterfowl.
  - NRM.P.1 Define drake, duck, hen, gander, goose, gosling, dabbling (puddle) duck, and diving duck.
  - NRM.P.2 Describe the characteristics of waterfowl, including family name, habitat, characteristics of the young, and life cycle.
  - NRM.P.3 Diagnose the purposes of waterfowl management and evaluate techniques used in such management.
  - NRM.P.4 Define waterfowl migration and list the major flyways in North America.
  - NRM.P.5 Be able to identify on sight species of waterfowl that migrate through Indiana and species that winter in Indiana.
  
- Q. Students shall analyze the characteristics and management of Indiana fish.
  - NRM.Q.1 Classify fish according to their place in the food chain, including plant eaters, plankton feeders, insect eaters, omnivores and predators.
  - NRM.Q.2 Illustrate the physical characteristics used to identify fish species.
  - NRM.Q.3 Explain the proper role of stocking in managing fishery resources and identify fish species propagated in Indiana hatcheries.
  - NRM.Q.4 Identify the habitat requirements and life cycles of representative warmwater and coldwater fishes, and hypothesize how fish habitat may be altered.
  - NRM.Q.5 Evaluate the economic and recreational values of Indiana’s fishery resources.
  - NRM.Q.6 Illustrate the management practices used to raise fish in ponds or hatcheries.

**PURDUE AGRICULTURE**

Rev 11/10

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