Amphibians and Wetlands: understanding habitat loss, population dynamics, and complex life cycles

Designed and presented by Purdue students Chad Wright, Bailey Uetrecht, Michael Hiatt, Courtney Yoder and Henry Leggett, with Purdue faculty Kerry Rabenold and Ximena Bernal, Ross Reserve Artist-in-Residence Gabriela Sincich, and Mayflower Mills teacher Christy Harshbarger [report drafted by Chad Wright].

The purpose of this outreach project was to determine how well a primary school class was able to process academic information regarding declining amphibian populations and disappearing wetland habitats. This information was then analyzed and subsequently utilized to design a lesson plan. The program was presented over three visits at weekly intervals: an introductory presentation at the school, a field trip to natural wetlands, and a follow-up visit focused on providing an opportunity to express what they had learned through art. The data in the project were obtained through basic datasheets, small group discussions, informal interviews with participating undergraduate students, and a brief questionnaire completed by the 3rd/4th-grade teacher. The interdisciplinary goal was to approach issues in ecology and conservation biology from multiple disciplinary angles, and to integrate insights from university scientists, undergraduate and graduate students, K-12 teachers, and artists to develop a strategy to both inform and motivate primary-school students. We presented key concepts and evaluated the effectiveness of those presentations, including:

- ecosystem services provided by wetlands
- ecological communities and conservation of biological diversity
- impacts of pollution, climate and land-use changes on wetland habitats
- endangered species, population monitoring, and citizen science
- complex life-cycles and complex habitat requirements
- vulnerability of amphibian populations to disturbance, pollution, and exotic species
- acoustic communication, mating systems, and parental care

The issue addressed in this project was the ability of the students to effectively understand the concepts and topics discussed with respect to wetland loss and amphibian declines. This problem was selected for study due to the complex nature of the topics and the necessary application of ideas in basic science to practical conservation practices. It was hypothesized that although the students may be able to exhibit some level of knowledge (e.g. terminology, species classification, species facts), they may not be able to analyze the need for and impact of conservation. We concluded that the students were able to effectively understand, apply, and evaluate the concepts presented during the course of this project

The ability to understand the information was evaluated by presenting basic scientific information regarding five species of Anura – Spring Peeper (*Pseudacris crucifer*), Western Chorus Frog (*Pseudacris triseriata*), Southern Leopard Frog (*Lithobates sphenocephalus*), Eastern Gray Tree Frog (*Hyla versicolor*), and the American Toad (*Anaxyrus americanus*). This information included: organism description, call description, range, diet, habitat, life cycle, mating system and breeding habitat / season. The students observed some species in a natural setting at the Celery Bog Nature Area and the Ross Biological Reserve. During each of the project sessions, the students were asked questions regarding the material presented on the Anuran species. Their level of knowledge was assessed using a standard list of questions asked of the presenters (Purdue staff and students) and evaluated using a numeric scale (1-5). The students were then provided with an opportunity to explain how the topics were interconnected and how changes can be propagated throughout the ecosystem.

A multidisciplinary approach was necessary to explore this problem due to the number of disciplines involved in learning. First and foremost the overlapping fields of ecology, conservation biology, and natural history were required to gain a thorough understanding of wetland environments and amphibian declines. This information was critical to providing the students with current and accurate information regarding the frog species populations. Four Purdue undergraduates enrolled in a Conservation Biology course participated and helped to formulate the program along with Professors Ximena Bernal and Kerry Rabenold and graduate student Henry Legett from Biological Sciences. The field of educational psychology was needed to understand the process of learning and how that applies to information retention and synthesis. Christy Harshbarger, a teacher at Mayflower Mill Elementary School provided pedagogical guidance and feedback, including help in fitting the program into curriculum standards. Designing the artistic component, meant to engage students emotionally with the beauty and complexity of natural systems, was done in collaboration with professional artist Gabriela Sincich-Sosa. The program also involved population monitoring protocols that depend upon sampling theory and statistical analysis of spatially explicit data.

This project required collaboration from other individuals, specifically those in the field of education. The faculty involved, Drs. Ximena Bernal and Kerry Rabenold, provided examples and strategies used to deliver an effective presentation to younger students. They have had ample experience talking to primary-school children about ecological and environmental issues. Ms. Gabriela Sincich-Sosa also provided critical guidance in preparing and presenting information regarding amphibian decline. Ms. Sincich-Sosa provided the necessary feedback to create a meaningful, but fun, concluding activity in which students were provided materials and some basic guidance to facilitate their expression of ideas in a landscape representation on paper.

The results of this investigation suggest that the primary school students increased their understanding of amphibian decline. This conclusion was based upon information provided by the collaborating teacher and the informal assessments performed throughout the project. Overall the results of this project indicate that the students were able to effectively comprehend, understand, and apply the concepts and ideas presented on a large scale. Moreover, the students demonstrated an ability to synthesize the material and apply conservation strategies to other species inhabiting wetland areas.

The students were provided with an opportunity to showcase their ability to accurately identify frog calls. This was performed using an audio speaker playing recordings of frog calls. The students were provided with a simplified data sheet based on the Indiana Amphibian Monitoring protocol (Appendix D), and were asked to fill the data sheet according to the number and species of frog heard in the audio playback. The average score, variance, and number of responses were determined for the data set. These data were then plotted against expected data. The expected data were determined by analyzing the known calls for number and species per trial; the actual number of calling frogs was not determined, only the type of species was actually known. The five trials consisted of a progression of recordings of increasing complexity from the calls of a few individuals of one species to many individuals of five species. The students had never been required to identify any type of call, which may have been a source of stress. We concluded that a longer training period and refresher would be needed for the students to really grasp the meaning of the data collected in the Amphibian Monitoring protocol.

During the art program, after a brief summary of previous parts of the program, the students were asked to create artwork showcasing the main ideas presented (Photograph 1). The students were assessed using a 1-5 scale by Purdue undergraduate students recording whether students demonstrated understanding of the key concepts of biological diversity in and impacts on wetland environments (Appendix F). After analyzing the results from these evaluations, it was determined that students were able to fully understand, comprehend, and synthesize the concepts and ideas presented. They did not, however, demonstrate very detailed knowledge of specific threats to wetland environments. Increasing awareness of habitat destruction or loss is important in allowing the students to develop an appreciation for the value of the natural resources. Based on results obtained during this project, the students were able to comprehend the issues facing the amphibian populations.


Photograph 1 - Sample art project

Amphibian Project Outline

PRE-TRIP VISIT

The pre-trip visit was used to introduce the main ideas of this exercise as they relate to the grade level's curriculum. The content of this project is based upon Indiana's Academic Standards for Science. The key points of the introduction will cover:

- Overview of the exercise
- Review of types of wetlands, their importance to biological diversity and to people, the variety of life in wetlands, and relationships with surrounding landscapes
- Basic amphibian taxonomy, diversity, habitats, ranges, breeding systems, anatomy, physiology, communication, and defensive strategies including camouflage
- Background information with regard to complex life cycles and developmental pathways
- Description of amphibian decline, and wetland loss, human-caused impacts, and how losses are detrimental to biodiversity
- Introduction to population dynamics, monitoring protocols, and "citizen science"
- Provide "scientific notebook" to record questions, predictions, identify problems, and brainstorm solutions

The time required to deliver and discuss the main ideas was 75 minutes, including a multi-person PowerPoint presentation with many illustrations of wetlands, amphibians, and research methods. After the group presentation and discussion, breakout groups focused on single-species attributes and threats (with live specimens) for five focal early-breeding species. Students rotated among the five stations.

FIELD TRIP

The field trip focused on observing natural environments, performing and evaluating investigations, and documenting findings. The observations / investigations were based upon big ideas – amphibian lifecycles, amphibian decline, environmental impacts, and possible solutions. We sampled a number of different types of wetland including a large open-water marsh ("Celery Bog"), a woodland vernal pool, an open pond, and some small experimental micro-wetlands. We discussed the forms of life we found, plant communities and their importance to amphibians, seasonal and weather constraints on the breeding cycle. Simple equipment was provided (e.g. sampling nets, basins, forceps), as were data sheets (modeled on the Indiana Amphibian Monitoring Program). After a refresher of frog calls, we set up a mock data collection session, with datasheets in which they were asked to score for the focal six species using the datasheet. Calls were provided through an outdoor speaker in a progression of choruses of increasing numbers of species and individuals. From departure to return to the school, the field trip took six hours. While in the field several big idea were discussed:

- How weather patterns impact the amphibian lifecycle
- Effects and sources of pollution impacting aquatic habitats and amphibians
- Maintenance of body temperature by ectotherms, defensive strategies to avoid predation
- Other species using wetlands and their requirements and challenges
- How amphibians are impacted by people
- The functions and limitations of acoustic signaling
- The complexity of the web of life in a wetland
- The importance of physical complexity in the habitat

POST-TRIP VISIT

The post-trip visit to the school was used to discuss observations and findings recorded during the field trip, and to express concepts learned through an artistic representation of wetlands, amphibians and human impacts. Basic materials were provided along with some guidance in creating a wetland scene using colored paper shapes and drawings. The students were given wide latitude in their expression, and an ample 90 minutes, and most of them chose to illustrate both “healthy” and “damaged” ecosystems with a variety of life in them, including amphibians. There was consensus from both students and presenters that this freedom was welcome and helped draw out the variety of messages received and sensitivities of the students. The principle behind this exercise was that the emotional engagement of art and the close attention it requires would help to incorporate ecological ideas in the students’ thinking.

Appendix A - Grade 2 Academic Standards

Introduction to Indiana’s Academic Standards for Science – 2010

Indiana’s Academic Standards for Science were last revised in 2000. This new document, Indiana’s Academic Standards for Science – 2010, reflects the ever-changing science content and the underlying premise that science education should be an inquiry-based, hands-on experience. These standards were adopted by the Indiana State Board of Education in April, 2010, and will be implemented in the 2011-12 school year.

Indiana’s Academic Standards for Science – 2010 reflect a few significant changes that are worth noting. Primarily, there are fewer standards and each grade level focuses on the big ideas for each of these sub-disciplines: physical science; earth science; life science; and science, technology and engineering. The overarching organization of the standards has also changed; they are divided into two sections: Process Standards and Content Standards, which are described in greater detail below.

Process Standards

The Process Standards are the processes and skills that students are expected to learn and be able to do within the context of the science content. The separation of the Process Standards from the Content Standards is intentional; in doing so we want to make explicit the idea that what students are doing while they are learning science is extremely important. The Process Standards reflect the way in which students are learning and doing science and are designed to work in tandem with the science content, resulting in robust instructional practice.

The Process Standards are organized in the following grade bands: K-2, 3-5, 6-8. Within each grade band, the Process Standards address a particular topic or topics. Kindergarten introduces The Nature of Science, while grades 1 through 5, reflect two parts: The Nature of Science and The Design Process. In grades 6 through 8, Reading for Literacy in Science and Writing for Literacy in Science have been added to emphasize these processes in science. For high school, the Process Standards include Reading and Writing for Literacy in Science as well as The Nature of Science.

As noted in the previous paragraph, grades 6 through 8 and high school content courses will include Reading and Writing for Literacy in Science. It is important to note that these Process Standards emerged with the adoption of the Common Core State Standards in the area of Reading and Writing for Literacy in Science. The Literacy Standards establish that instruction in reading, writing, speaking, listening, and language is a shared responsibility. The Literacy Standards are predicated on teachers in the content areas using their unique disciplinary expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the literacy standards are meant to complement rather than supplant content standards in the disciplines.

Part of the motivation behind the disciplinary approach to literacy promulgated by the Literacy Standards is extensive research establishing the need for college- and career-ready students to be proficient in reading complex informational text independently in a variety of content areas. Most of the required reading in college and workforce training programs is informational in structure and challenging in content. Postsecondary education programs typically provide students with both a higher volume of such reading than is generally required in K-12 schools and comparatively little scaffolding.

The Literacy Standards make clear that significant reading of informational texts should also take place outside ELA classrooms in order for students to be ready for college and careers. Future assessments will apply the sum of all the reading students do in a grade, not just their reading in the ELA context. The Literacy Standards demand that a great deal of reading should occur in all disciplines.

The Literacy Standards also cultivate the development of three mutually reinforcing writing capacities: writing to persuade, to explain, and to convey real or imagined experience. College and career readiness requires that writing focus significantly on writing to argue and to inform or explain.

The Literacy Standards use grade level bands to present the standards. Teachers teaching at the beginning of the grade band may need to provide scaffolding for students to be successful, where teachers teaching at the end of the grade band should expect students to demonstrate the standards independently.

Content Standards

In grades 1 through 8, the Content Standards are organized in four distinct areas: 1) physical science; 2) earth science; 3) life science; and 4) science, technology and engineering. Kindergarten has only the first three areas: physical, earth and life science. In each of these areas there is at least one core standard, which serves as the big idea at that grade level for that content area. For the high school science courses, the content standards are organized around the core ideas in each particular course, which are represented by the core standard. The core standard is not meant to stand alone or be used as an individual standard, but instead is meant to help teachers organize their instruction around the ―big ideas‖ in that content area and for grades K-8, at that particular grade level. Beneath each core standard are indicators which serve as the more detailed expectations within each of the content areas.

Finally, in the development of these revised science standards, careful attention was paid to how ideas are articulated across the grade levels so that content and skills that students will need to succeed in a particular sub-discipline are introduced in an appropriate manner in the early elementary grades and then progressed as students move towards high school.

Grade 2

Students in second grade study changes in physical properties of materials and the affect of force on the motion of an object. They investigate patterns in the weather, in the position of the sun and the moon in the sky during the day and in the shape of the moon over the course of about a month. Students study the life cycles of plants and animals and compare the different body plans. Students investigate simple tools and how they can be used to meet human needs. Within this study students employ the key principles of the nature of science and the design process.

Process Standards

The Nature of Science

Students gain scientific knowledge by observing the natural and constructed world, performing and evaluating investigations and communicating their findings. The following principles should guide student work and be integrated into the curriculum along with the content standards on a daily basis.

- Use a scientific notebook to record predictions, questions and observations about data with pictures, numbers or in words.
- Conduct investigations that may happen over time as a class, in small groups, or independently.
- Generate questions and make observations about natural processes.
- Make predictions based on observations.
- Discuss observations with peers and be able to support your conclusion with evidence. Make and use simple equipment and tools to gather data and extend the senses. Recognize a fair test.

The Design Process

As citizens of the constructed world, students will participate in the design process. Students will learn to use materials and tools safely and employ the basic principles of the engineering design process in order to find solutions to problems.

- Identify a need or problem to be solved.
- Document the design throughout the entire design process.
- Brainstorm potential solutions.
- Select a solution to the need or problem.
- Select the materials to develop a solution.
- Create the solution.
- Evaluate and test how well the solution meets the goal.
- Communicate the solution with drawings or prototypes. Communicate how to improve the solution.

Content Standards

Standard 1: Physical Science

Core Standard:

Observe and describe that the properties of materials can change, but not all materials respond in the same way to the same action. (2.1.1, 2.1.1, 2.1.3)

Core Standard:

Observe and describe the motion of an object and how it changes when a force is applied to it. (2.1.4, 2.1.5, 2.1.6, 2.1.7)

2.1.1. Observe, describe and measure ways in which the properties of a sample of water (including volume) change or stay the same as the water is heated and cooled and then transformed into different states.

2.1.2. Predict the result of combining solids and liquids in pairs. Mix; observe, gather, record and discuss evidence of whether the result may have different properties than the original materials.

2.1.3. Predict and experiment with methods (e.g. sieving, evaporation) to separate solids and liquids based on their physical properties.

2.1.4 Observe, sketch, demonstrate and compare how objects can move in different ways (e.g., straight, zig-zag, back-and-forth, rolling, fast and slow).

2.1.5 Describe the position or motion of an object relative to a point of reference (e.g., background, another object).

2.1.6 Observe, demonstrate, sketch and compare how applied force (i.e., push or pull) changes the motion of objects.

2.1.7 Investigate the motion of objects when they are acted upon at a distance by forces like gravity and magnetism.

Standard 2: Earth Science

Core Standard:

Day to day and over the seasons, observe, measure, record and recognize patterns and ask questions about features of weather. (2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6)

Core Standard:

Investigate how the position of the sun and moon and the shape of the moon change in observable patterns. (2.2.7, 2.2.8, 2.2.9)

2.2.1 Construct and use tools to observe and measure weather phenomena like precipitation, changes in temperature, wind speed and direction.

2.2.2 Experience and describe wind as the motion of the air.

2.2.3 Chart or graph weather observations such as cloud cover, cloud type and type of precipitation on a daily basis over a period of weeks.

2.2.4 Ask questions about charted observations and graphed data. Identify the day-to-day patterns and cycles of weather. Understand seasonal time scales in terms of temperature and amounts of rainfall and snowfall.

2.2.5 Ask questions and design class investigations on the effect of the sun heating the surface of the earth.

2.2.6 Learn about, report on and practice severe weather safety procedures.

2.2.7 Investigate how the sun appears to move through the sky during the day by observing and drawing the length and direction of shadows.

2.2.8 Investigate how the moon appears to move through the sky during the day by observing and drawing its location at different times.

2.2.9 Investigate how the shape of the moon changes from day to day in a repeating cycle that lasts about a month.

Standard 3: Life Science

Core Standard:

Observe, ask questions about and describe how organisms change their forms and behaviors during their life cycles.

2.3.1 Observe closely over a period of time and then record in pictures and words the changes in plants and animals throughout their life cycles-including details of their body plan, structure and timing of growth, reproduction and death.

2.3.2 Compare and contrast details of body plans and structures within the life cycles of plants and animals.

Standard 4: Science, Engineering and Technology

Core Standard:

Describe how technologies have been developed to meet human needs.

2.4.1 Identify parts of the human body that can be used as tools—like hands for grasping and teeth for cutting and chewing.

2.4.2 Identify technologies developed by humans to meet human needs. Investigate the limitations of technologies and how they have improved quality of life.

2.4.3 Identify a need and design a simple tool to meet that need.

Appendix B – Grade 3 Academic Standards

Introduction to Indiana's Academic Standards for Science – 2010

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Finally, in the development of these revised science standards, careful attention was paid to how ideas are articulated across the grade levels so that content and skills that students will need to succeed in a particular sub-discipline are introduced in an appropriate manner in the early elementary grades and then progressed as students move towards high school.

Grade 3

Students in third grade study sound and light and recognize them as forms of energy. They investigate rocks and minerals and develop an understanding of how natural materials can meet the needs of plants and animals. Students study plant growth and development. Students investigate the uses and types of simple machines and study ways to solve real world problems. Within this study students employ the key principles of the nature of science and the design process.

Process Standards

The Nature of Science

Students gain scientific knowledge by observing the natural and constructed world, performing and evaluating investigations, and communicating their findings. The following principles should guide student work and be integrated into the curriculum along with the content standards on a daily basis.

- Make predictions and formulate testable questions.
- Design a fair test.
- Plan and carry out investigations—often over a period of several lessons—as a class, in small groups or independently.
- Perform investigations using appropriate tools and technologies that will extend the senses.
- Use measurement skills and apply appropriate units when collecting data.
- Test predictions with multiple trials.
- Keep accurate records in a notebook during investigations and communicate findings to others using graphs, charts, maps and models through oral and written reports.
- Identify simple patterns in data and propose explanations to account for the patterns. Compare the results of an investigation with the prediction.

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The Design Process

As citizens of the constructed world, students will participate in the design process. Students will learn to use materials and tools safely and employ the basic principles of the engineering design process in order to find solutions to problems.

- Identify a need or problem to be solved.
- Brainstorm potential solutions.
- Document the design throughout the entire design process.
- Select a solution to the need or problem.
- Select the most appropriate materials to develop a solution that will meet the need.
- Create the solution through a prototype.
- Test and evaluate how well the solution meets the goal.
- Evaluate and test the design using measurement.
- Present evidence by using mathematical representations (e.g., graphs, data tables).
- Communicate the solution (including evidence) using mathematical representations (graphs, data tables), drawings or prototypes.
- Communicate how to improve the solution.

Content Standards

Standard 1: Physical Science

Core Standard:

Observe and describe how sound is produced by vibrations. (3.1.1, 3.1.2, 3.1.3)

Core Standard:
Observe and describe how light travels from point to point. (3.1.4, 3.1.5, 3.1.6)

3.1.1 Generate sounds using different materials, objects and techniques. Record the sounds and then discuss and share the results.

3.1.2 Investigate how the loudness and pitch of sound changes when the rate of vibrations changes.

3.1.3 Investigate and recognize that sound moves through solids, liquids and gases (e.g., air).

3.1.4 Investigate how light travels through the air and tends to maintain its direction until it interacts with some other object or material.

3.1.5 Observe and describe how light is absorbed, changes its direction, is reflected back and passes through objects. Observe and describe that a shadow results when light cannot pass through an object.

3.1.6 Describe evidence to support the idea that light and sound are forms of energy.

Standard 2: Earth Science

Core Standard:
Observe, describe and identify rocks and minerals by their specific properties. (3.2.1, 3.2.2, 3.2.3, 3.2.4)

Core Standard:
Observe and describe how natural materials meet the needs of plants and animals (including humans). (3.2.5, 3.2.6)

3.2.1 Examine the physical properties of rock samples and sort them into categories based on size using simple tools such as sieves.

3.2.2 Observe the detailed characteristics of rocks and minerals. Identify rocks as being composed of different combinations of minerals.

3.2.3 Classify and identify minerals by their physical properties of hardness, color, luster and streak.

3.2.4 Identify fossils and describe how they provide evidence about the plants and animals that lived long ago and the nature of their environment at that time.

3.2.5 Describe natural materials and give examples of how they sustain the lives of plants and animals.

3.2.6 Describe how the properties of earth materials make them useful to humans in different ways. Describe ways that humans have altered these resources to meet their needs for survival.

Standard 3: Life Science

Core Standard:
Observe, describe and ask questions about plant growth and development.

3.3.1 Identify the common structures of a plant including its roots, stems, leaves, flowers, fruits and seeds. Describe their functions.

3.3.2 Investigate plant growth over time, take measurements in SI units, record the data and display the data in graphs. Examine factors that might influence plant growth.

Standard 4: Science, Engineering and Technology

Core Standard:
Define a real world problem and list criteria for a successful solution.

3.4.1 Choose and use the appropriate tools to estimate and measure length, mass and temperature in SI units.

3.4.2 Define the uses and types of simple machines and utilize simple machines in the solution to a —real world‖ problem.

Appendix C – North American Amphibian Monitoring Program - Data Sheet

USGS

North American Amphibian Monitoring Program
Frog call survey instructions and datasheet

Name and Contact Information Please complete contact information below to notify us of any changes.			
Name :			
Street Address:			
City, State, Zip Code:			
Phone:		**Email:**	

Instructions:
Please be sure to complete the entire datasheet.

Each datasheet represents one person's frog call observations. If you have an assistant, he/she can assist with the environmental data (e.g. air temp, count cars, etc.) but not with what frogs are heard.

Visit stops in 1-10 order. If unforeseen circumstances require you to skip a stop, write that on the datasheet.

At the start and finish of each survey record the time, wind, and sky conditions (see codes to the right).

At each stop listen for 5 minutes, then record the amphibian calling index for each species heard. Report only the species you are confident that you heard. If a species varies in calling intensity over the listening period, report the highest calling index level you heard.

At each stop, also report the environmental data requested: start time, air temperature, noise conditions, moonlight, and number of cars that passed while listening.

There are two kinds of noise disturbance questions:

- Was noise a factor? This is asking if background noise impacted your ability to hear. If yes, check the box.
- "Did you take a time out?" If an unexpected noise disturbance happens (such as a train) that lasts a minute or more, you may interrupt the 5 minute listening period to ignore the sudden disturbance. Finish up the listening time after the disturbance has passed. Do not include this type of noise in the "was noise a factor" question.

Window 1: Feb 21 – Mar 31 (Temp 42° and above)
Window 2: Apr 15 – May 15 (Temp 50° and above)
Window 3: June 1 – June 30 (Temp 55° and above)

Index and Code Definitions

Amphibian Calling Index

1	Individuals can be counted; there is space between calls
2	Calls of individuals can be distinguished but there is some overlapping of calls
3	Full chorus, calls are constant, continuous and overlapping

Sky codes

0	Few clouds
1	Partly cloudy (scattered) or variable sky)
2	Cloudy or overcast
4	Fog or smoke
5	Drizzle or light rain (not affecting hearing ability)
7	Snow
8	Showers (is affecting hearing ability) do not conduct survey

Wind Codes

0	Calm (<1mph) smoke rises vertically
1	Light Air (1-3 mph) smoke drifts, weather vane inactive
2	Light Breeze (4-7 mph) leaves rustle, can feel wind on face
3	Gentle Breeze (8-12 mph) leaves and twigs move around, small flag extends
4*	Moderate Breeze (13-18 mph) moves thin branches, raises loose papers * Do not conduct survey, unless in Great Plains states
5**	Fresh Breeze (19 mph or greater) small trees begin to sway **Do not conduct survey –ALL REGIONS

Please send all data sheets to:

Sarabeth Klueh
Dept. of Natural Resources
5596 East SR 46
Bloomington, IN 47401

Comments:

Please complete information below		Data collected at start and finish of survey														
Observer Name:		For wind & sky codes see page 1	Start							Finish						
Route Number:		Time (military)														
Route Name:		Wind	0	1	2	3	4	5		0	1	2	3	4	5	
Survey Date (mm/dd/yyyy):		Sky	0	1	2	4	5	7	8	0	1	2	4	5	7	8
Window Number:		Days since last rainfall:														

Data collected at each stop	Stop Number									
	1	2	3	4	5	6	7	8	9	10
Start Time (military):										
Air Temperature: Select Scale: °C °F										
Was noise a factor? (check if yes)										
Did you take a timeout? (check if yes)										
Species List	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Eastern Spadefoot										
American Toad										
Fowler's Toad										
Northern Cricket Frog										
Green Treefrog										
Eastern Gray Treefrog										
Unknown Gray Treefrog										
Cope's Gray Treefrog										
Spring Peeper										
Boreal/Western Chorus Frog Complex										
American Bullfrog										
Green Frog										
Wood Frog										
Northern Leopard Frog										
Southern Leopard Frog										
Plains Leopard Frog										
Pickeral Frog										
Crawfish Frog										
Moon or moonlight visible? Y, N										
Check if snow cover (optional)										
Number of cars that passed:										

If you have any additional notes, please write them in the box provided on the front of this sheet. Thank you for your participation!

Appendix D - Field Notebook

Name: ____________________

Weather: ____________________

Conditions: ____________________

____

	1	2	3	4	5
American Toad					
Chorus Frog					
Gray Treefrog					
S. Leopard Frog					
Spring Peeper					

Key	
1	Clear, spaced frog calls
2	Calls can be heard with some overlap
3	Full chorus, constant overlapping calls

Plant Characteristics (Height, color, appearance, etc.):

____

____

____

____

____

____

____

Appendix E – Learning Assessment

Lifecycle Knowledge:

1	2	3	4	5

Habitat Knowledge:

1	2	3	4	5

Amphibian Threats:

1	2	3	4	5

Additional comments:

Appendix G – Presentation

Has Anyone Been to a Wetland?

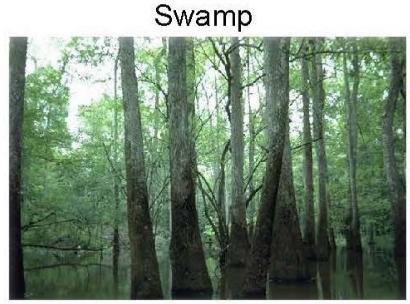
What is Wetland?

- Piece of ground covered with water, in some way, almost all year around
- Marshes, Swamps, Potholes, Bogs, Fens

Marsh

Home to non-woody plants

Swamp



Wetland with trees

Potholes

"Potholes" formed by large pieces of ice

Bogs

Acidic, with a lot of plant matter

Fens

Cover hills and flatlands

How Wetlands Can Be Lost

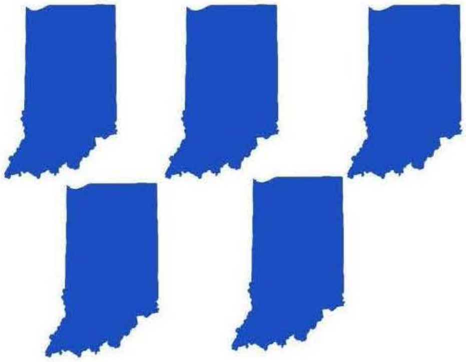
Water is removed for farming

Area is used for buildings

Some of the resources used for business

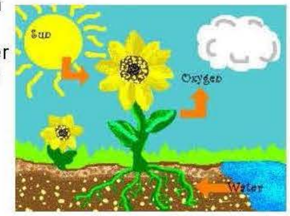
Wetlands have been lost…

Estimated area of loss in the US

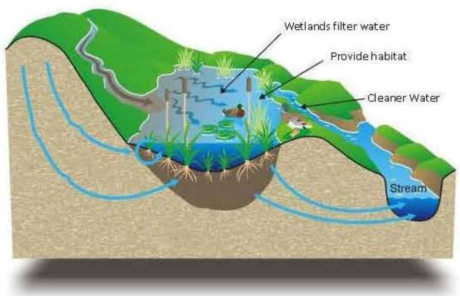


Why should we care?

- Wetlands are very productive ecosystems
  - Turns sunlight into food
  - Filters bad substances from water and carbon from the air
- Produce the oxygen we breathe!
- Slow down rainwater and reduce flooding like giant sponges



Other Wetland Functions



Swamp milkweed + monarch

Wet prairie species: Cardinal flower and swamp wild iris

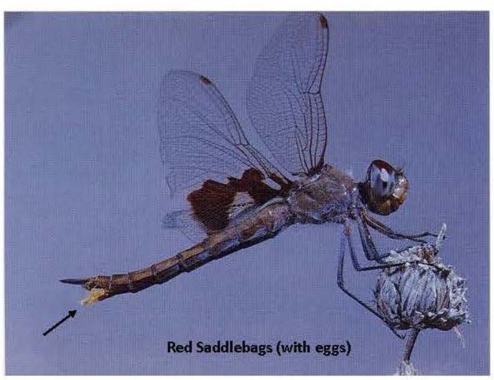
Pink lady's slipper

In swamps (wet woods)

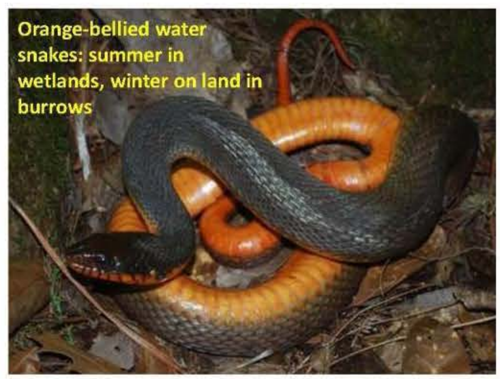
Many species like red-winged blackbirds make their homes in wetlands

Baby jacanas

Bittern



Eastern
pondhawk
male (blue)
Female (green)



Impacts on Wetlands

- Humans destroy wetlands when they convert land for houses, businesses and agriculture
- There are also natural threats to wetlands such as hurricanes and tornadoes

Examples

- Logging
- Air and water pollution
- Mining
- Construction

Effects of Agriculture

- Draining for tilling fields
- Runoff of nutrients, chemicals, and soil erosion

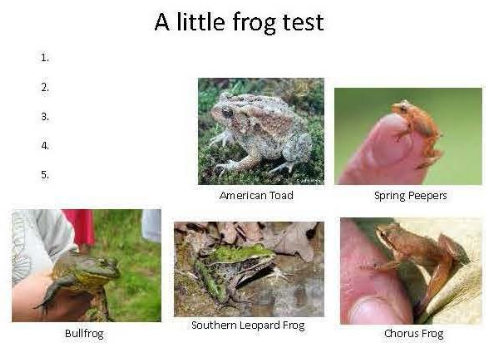
<u>The World's Smallest frog</u>

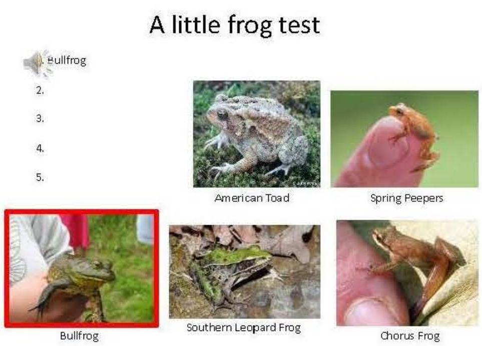
Eleutherodactylus iberia

Brazilian flea frog
Brachycephalus didactylus


The World's Largest frog
Goliath frog
(Conraua goliath)


The most poisonous frog
Golden terribilis
(Dendrobates terribilis)


A little frog test
1.
2.
3.
4.
5.
American Toad
Spring Peepers
Bullfrog
Southern Leopard Frog
Chorus Frog


A little frog test
Bullfrog
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American Toad
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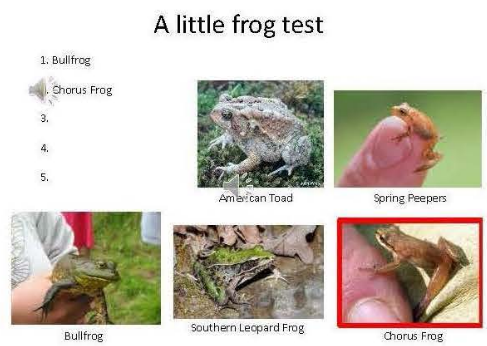
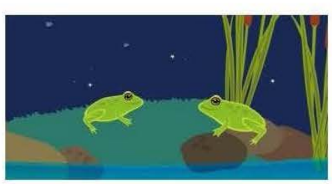

A little frog test
1. Bullfrog
Chorus Frog
3.
4.
5.
American Toad
Spring Peepers
Bullfrog
Southern Leopard Frog
Chorus Frog


A little frog test
1. Bullfrog
2. Chorus Frog
Southern Leopard Frog
4.
5.
American Toad
Spring Peepers
Bullfrog
Southern Leopard Frog
Chorus Frog

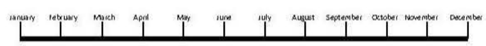

A little frog test
1. Bullfrog
2. Chorus Frog
3. Southern Leopard Frog
Spring Peepers
5.
American Toad
Spring Peepers
Bullfrog
Southern Leopard Frog
Chorus Frog


A little frog test
1. Bullfrog
2. Chorus Frog
3. Southern Leopard Frog
4. Spring Peepers
American Toad
American Toad
Spring Peepers
Bullfrog
Southern Leopard Frog
Chorus Frog

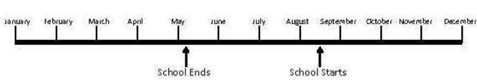


© Mike Tyler

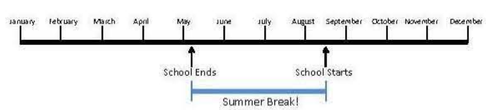
When can you hear them?



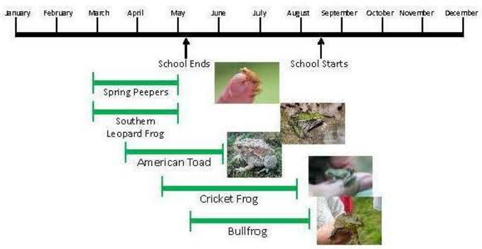
When can you hear them?



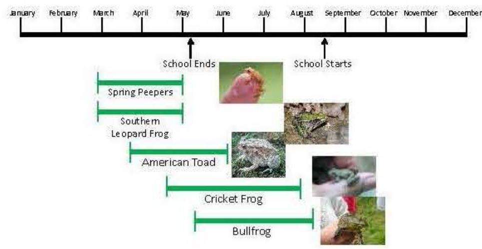
When can you hear them?



When can you hear them?



When can you hear them?



Did you know amphibians are disappearing?

What?! Really?

- 2,000 amphibian species are threatened.
- 200 species have gone extinct since 1979.
- That's one species every two months!

Causes

Many things have contributed to fewer frogs:

- Habitat loss
- Pollution
- Global Warming
- Diseases
- Introduced species

Habitat Loss

- Wetlands are getting smaller and smaller
- The areas between them are getting larger
- Roads are also a problem

Climate Change

Droughts are hard on frogs- they have no place to live!

Monitoring

In order to know if frogs are declining, how can we count them?

Sampling Methods

- Call surveys
- Pond surveys
- Egg Counting
- Radio telemetry
- PIT tags

Calling Surveys

- What we will do!
- Go to ponds and listen for the sounds of different frog calling
- Record what frogs are heard

Wetland Surveys

Go to the ponds and look for eggs and tadpoles

Record where they are found

Look at the quality of the wetlands

Tracking Adults

With adult frogs, we can use a radio

What can YOU do?

- There are many things you can do to help save frogs!

- Be environmentally friendly
- Don't pollute
- Learn to study amphibians

Winter

The eggs are attached to plants

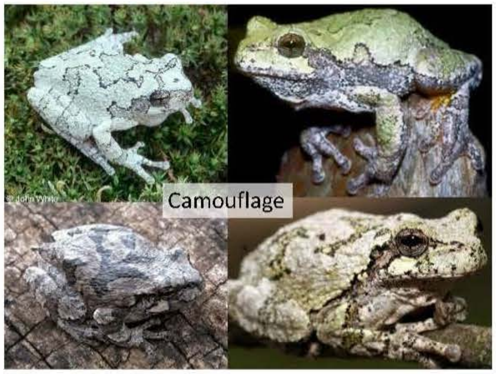
1,000 to 2,000 eggs broken up into smaller sections

Tadpoles

Tail changes color and shape in response to predators: bigger & red when predators present, allowing escape

Gray Treefrogs can have an array of colors

Large toe pads for climbing


Camouflage

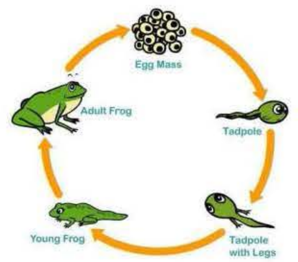
Appendix H – Spring Peeper Small-Group Presentation

Have you ever seen a Spring Peeper?

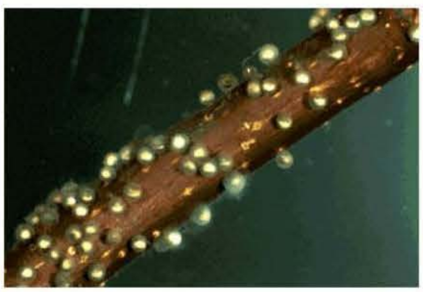
Spring Peeper
(*Pseudacris crucifer*)

This frog is very small

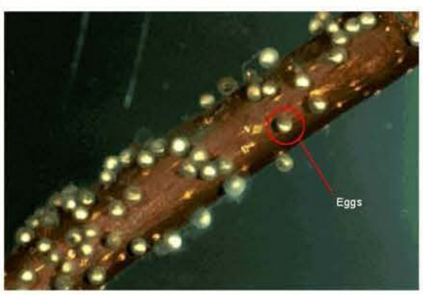
Lifecycle



What do you think is in the picture?



Have you ever seen frog eggs?



Have you ever seen tadpoles?

Metamorphosis

Appendix I – American Toad Small-Group Presentation