WILD WISE:
READY, SET, DISCOVER

TEACHER GUIDE

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WELCOME TO WILD WISE: READY, SET, DISCOVER!

Wild Wise: Ready, Set, Discover (RSD) includes a number of critical aspects of science, technology, engineering and math (STEM) learning and supports student engagement with the Next Generation Science Standards. By carrying out an extended problem-based learning project — using the tools and methods of scientists — students engaged in RSD strengthen their ability to ask and answer their own questions about the natural world. These skills have a broad application beyond the life sciences, and provide students with powerful tools useful in a wide variety of careers, including STEM fields.

This guide provides an overview and timeline of the RSD program and detailed information about each program element, as well as resources for teaches and student use for each part of the program.

Resources are also available for teachers at our "hidden" RSD website: **www.zoo.org/rsd –** please bookmark this site so you can locate it easily.

PROGRAM OUTCOMES

The Wild Wise: Ready, Set, Discover program, collaboratively developed by Woodland Park Zoo and the Kent School District, empowers students to achieve in science through:

1) Developing a deeper understanding of wildlife roles in ecosystems.
2) Building skills in scientific and engineering practices through problem-based learning.

OUTCOMES FOR STUDENTS

Students who engage in the Wild Wise: Ready, Set, Discover program will demonstrate increased:

— understanding of components of an ecosystem and how they interact.

— appreciation for local habitats and wildlife.

— capability for defining a problem, designing a solution and using evidence to make a claim about the solution.

— understanding of human impacts on ecosystems.

— understanding how communities can use scientific ideas to protect the environment.

OUTCOMES FOR TEACHERS

Teachers who engage with the Wild Wise: Ready, Set, Discover program will demonstrate:

— confidence in using the problem-based learning model effectively.

— increased comfort in taking students outdoors for science learning.

— understanding of human impacts on ecosystems

— the ability to successfully employ cross-curricular integration between RSD, Biodiversity in Rainforests of the Western Hemisphere ELA unit and the FOSS Living Systems Module.

STANDARDS CONNECTIONS

The RSD program and problem-based learning structure engage students in interdisciplinary learning experiences. The list of standards below includes standards that can be supported by student engagement in the RSD program elements (Meet the Problem, Outdoor Exploration, Zoo Exploration and Sharing Solutions) and by integrating RSD with other adopted curriculum modules including FOSS Living Systems and Biodiversity in Rainforests of the Western Hemisphere.

NEXT GENERATION SCIENCE STANDARDS PERFORMANCE EXPECTATIONS

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

3-5-ETS1-1. Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

COMMON CORE STATE STANDARDS - READING

CCSS.ELA-Literacy.RF.5.4.A Read grade-level text with purpose and understanding

CCSS.ELA-Literacy.RI.5.7: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

CCSS.ELA-Literacy.RI.5.9: Integrate information from several texts on the same topic in order to write or speak about the subject knowledgably.

CCSS.ELA-Literacy.RI.10: By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4-5 text complexity band independently and proficiently.

COMMON CORE STATE STANDARDS – WRITING

CCSS.ELA-Literacy.W.5.1: Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

CCSS.ELA-Literacy.W.5.1.A: Introduce a topic or text clearly, state an opinion, and create an organizational structure in which ideas are logically grouped to support the writer's purpose.

CCSS.ELA-Literacy.W.5.1.B: Provide logically ordered reasons that are supported by facts and details.

CCSS.ELA-Literacy.W.5.1.C: Link opinion and reasons using words, phrases, and clauses (e.g. consequently, specifically).

CCSS.ELA-Literacy.W.5.1.D: Provide a concluding statement or section related to the opinion presented.

CCSS.ELA-Literacy.W.5.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

CCSS.ELA-Literacy.W.5.5: With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

CCSS.ELA-Literacy.W.5.7: Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic

CCSS.ELA-Literacy.W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

CCSS.ELA-Literacy.W.5.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.

COMMON CORE STATE STANDARDS - SPEAKING AND LISTENING

CCSS.ELA.Literacy.SL.5.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

CCSS.ELA.Literacy.SL.5.1.A: Come to discussions prepared, having read or studies required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

CCSS.ELA.Literacy.SL.5.1.B: Follow agreed-upon rules for discussions and carry out assigned roles.

CCSS.ELA.Literacy.SL.5.1.C: Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

CCSS.ELA.Literacy.SL.5.1.D: Review the key ideas expressed and draw conclusion in light of information and knowledge gained from the discussions.

CCSS.ELA-Literacy.SL.5.4: Report on a topic or text or present and opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly and an understandable pace.

CCSS.ELA-Literacy.SL.5.5: Include multimedia components (e.g. graphics, sounds) and visual displays in presentation when appropriate to enhance the development of main ideas or themes.

CCSS.ELA-Literacy.SL.5.6: Adapt speech to a variety of contexts and tasks, using formal English when appropriate to task and situation.

COMMON CORE STATE STANDARDS - LANGUAGE

CCSS.ELA-Literacy.L.5.1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

CCSS.ELA-Literacy.L.5.2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

CCSS.ELA-Literacy.L.5.3: Use knowledge of language and its conventions when writing, speaking, reading, or listening.

PROGRAM ELEMENTS

E1: MEET THE PROBLEM

Where: Classroom

Required time: two, 50-minute class sessions.

The classroom teacher launches the unit and introduces students to the problem using a PowerPoint presentation, WPZ Meet the Problem letter, and WPZ introduction video. Through review of these resources, students identify their task and list existing, new, and needed knowledge about amphibians and amphibian conservation in the Know and Need to Know charts.

Building on information learned in session one, students develop problem statements related to the topic of amphibian population declines and conservation in Washington State. Students develop a finalized set of “Need to Knows” that they will learn more about during their upcoming research.

E2: OUTDOOR EXPLORATION

Where: School (indoors and outdoors) or a local park within walking distance of school

The goal of the Outdoor Exploration is for students to increase their familiarity with local habitats and wildlife needs, gather information necessary to solve their problem and gain comfort in natural settings. Activity ideas are included in this guide.

E3: ZOO EXPLORATION

Where: Woodland Park Zoo

A self-guided zoo visit provides an opportunity for students to learn about ecosystems, animal characteristics and practice scientific observation. Activity ideas are included in this guide. King County Schools with 30% or more students qualifying for free- or reduced-rate lunch are eligible to receive free zoo admission and subsidized bus transportation.

E4: PREPARE SHARING SOLUTIONS PROJECTS

Where: Classroom

Required time: Multiple class periods for research, generating solutions, determining best fit solution, reviewing solutions and revising proposal and presentation based on feedback, preparing final projects.

Note: Individual classes and students may need differing amounts of time to complete this element. Preparing for the zoo visit for Sharing Solutions is not necessarily a linear process, and students may go back to do additional research and revisit solutions several times before selecting the best fit solution.

After processing the problem, students have further explored amphibians, field methods and conservation through their own research, Outdoor Exploration and zoo visit. At this point, the focus of the project moves to generating possible solutions, determining a best fit solution supported with evidence and preparing projects to share their solution and PBL process.

E5: SHARING SOLUTIONS

Where: Classroom, library or other school venue

Required time: 50-minute class period

The Sharing Solutions presentations provide students with an opportunity to share their PBL process, proposed solution, and supporting evidence. Students share projects through a combination of an oral presentation and visual means of their choice.

PROGRAM TIMELINE

The timeline below shows the sequence of elements of RSD, illustrating how they integrate to lead to the culmination of the program with the Sharing Solutions element. The timeline below is a suggested outline, but you can adjust as needed.

JANUARY

1. Attend the teacher training: Monday, January 14 (Baker St Helens Room) from 4:30 – 7:30 p.m.
2. Access the RSD program website (www.zoo.org/rsd) and review available materials. Bookmark this link for use throughout the program.
3. After training, submit zoo field trip registration form (**p. 39**) for E3: Zoo Exploration to WPZ.
4. Prepare for E3: Zoo Exploration field trip (Zoo Exploration – **pp. 33-44**).
    - ☐ Complete required Kent School District field trip paperwork.
    - ☐ Schedule buses.
    - ☐ Arrange for chaperones.
    - ☐ Arrange for to-go sack lunches with Nutrition Services and your school cafeteria.
5. Administer student pre-assessment (see **pp. 10-11**).
6. Facilitate E1: Meet The Problem, Sessions 1 and 2 (**pp. 8-20**).

FEBRUARY

7. E2: Outdoor Exploration at your school or a local park (**p. 21-32**).
8. Begin gathering information for student projects (online and/or community research, schoolyard observations)
9. Confirm bus transportation, chaperones and student to-go lunches for E3: Zoo Exploration.

MARCH/APRIL

10. E3: Zoo Exploration (**pp. 33-44**).
11. Continue research and information gathering for student projects.

APRIL

12. Prepare for Sharing Solutions presentations (**pp. 45-54):**
    - ☐ Generate possible solutions.
    - ☐ Determine “Best Fit” solution.
    - ☐ Prepare Claim, Evidence, Reasoning to support proposed solution.
    - ☐ Prepare visual and oral presentations of projects.
    - ☐ Review student projects and allow for student revisions prior to Sharing Solutions.
    - ☐ Invite guests (families, school staff, other classes) to Sharing Solutions.

APRIL/MAY

13. E4: Sharing Solutions presentations (**p. 55**)
14. After Sharing Solutions:
    - ☐ Debrief the problem with students (**p. 55**).
    - ☐ Administer student post-assessments (**p.10-11**).

E1: MEET THE PROBLEM – SESSION 1

Location: Classroom

Timing: 50-minute class period

Sample learning target: Scientists (I) can use a variety of sources to develop an understanding of a topic.

OVERVIEW

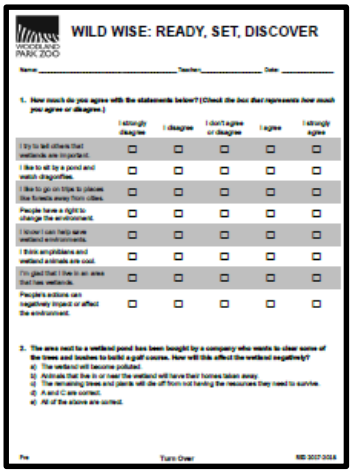
The classroom teacher launches the unit and introduces students to the problem using a PowerPoint presentation, WPZ Meet the Problem letter, and WPZ introduction video. Through review of these resources, students identify their task and list existing, new, and needed knowledge about amphibians and amphibian conservation in the Know and Need to Know charts.

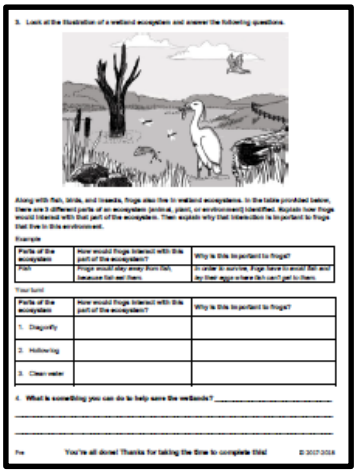
MATERIALS

- ☐ Student assessment, 1 copy per student (**pp. 10-11**)
- ☐ Meet the Problem Introduction PowerPoint (download from www.zoo.org/rsd) & Script (**pp. 12-13**)
- ☐ Meet the Problem Letter, copies for student groups or pairs to review (**p. 14**)
- ☐ Know/Need to Know Graphic organizers, one per pair or group (**p. 17**)
- ☐ Class Know/Need to Know/Need to Do chart with 3 columns, on chart paper
    - This will be posted in the classroom and will be referred back to throughout the RSD program.
- ☐ Meet the Problem Video (available on www.zoo.org/rsd)

  https://www.youtube.com/watch?v=NyOuSH83-2k&feature=youtu.be

ACTIVITY PLAN


WILD WISE: READY, SET, DISCOVER



1) **Administer the student pre-assessment.**

2) **Introduce the unit with the Meet the Problem Introduction PowerPoint, slides 1-3.**

   Share with students about the RSD program and WPZ using the introductory slides of the PowerPoint. The notes section of the slide also includes the script (**pp. 12-13**) to use with each slide.

3) **Introduce the problem with the Meet the Problem Introduction PowerPoint, slides 4-5, and the Meet the Problem Letter.**

Explain that students will be starting an exploration to help solve a problem in their community (see PowerPoint notes for a more detailed script). Review the guiding questions for students to have in mind while reading the Meet the Problem Letter. Distribute copies of the letter for students to review, in partners or small groups and read the letter out loud.

January 7, 2019

Dear Kent School District 5th grade students,

Have you ever seen a frog, toad, or salamander? All of these animals are amphibians found in local parks and wetlands in Kent. However, amphibian populations are shrinking and Washington's native amphibians need your help!

Amphibians, like all living things, depend on their habitat to meet their needs. Wetlands are one important habitat for amphibians, and unfortunately, Washington's wetlands are disappearing. Since the 1780s, Washington State has lost 31% of its wetland area, from 1.35 million acres to 930,000 acres.

Over 1,900 species of frogs, toads, and salamanders, 30% of the world's amphibians, are at risk of extinction. To save the world's amphibians, we need to quickly learn more about their needs. The future of amphibians isn't just in the hands of scientists and government officials; you can help play an important role in saving these animals.

Woodland Park Zoo wants to know how you plan to protect Washington's native amphibians. This year, you will learn about amphibians, wetland habitats and how using scientific ideas can help protect the environment. You will use your knowledge to develop scientific, feasible, affordable and ethical solutions for how people in your community can help native amphibians thrive in Kent. Your ideas can inspire your community to take action in protecting amphibians and wetland habitats. Thank you for your help!

Sincerely,

Woodland Park Zoo

4) **Students identify "Knows" and "Need to Knows" from background knowledge and the Meet the Problem Letter (slides 6-7).**

Student groups review the letter and identify information that they already know, or that they learned from the Meet the Problem Letter. Students record this information in the "Know" column of the graphic organizer.

Students list any information they need to know, or questions they have in the "Need to Know" column of the graphic organizer.

Compile group ideas into a class Know and Need to Know chart.

Know / Need to Know

Know	Need to Know

5) **Review the guiding questions on slide 8 and watch the Meet the Problem video.**

6) **Students revisit their "Knows" and "Need to Knows" list and add anything new they learned or need to learn from watching the video (slides 9-10).**

If students learned something they needed to know in the video, cross that question out in the "Need to Know" and add the information to the "Know" column.

7) **Update the class Know and Need to Know chart to reflect changing ideas and new understanding.**

8) **Conclude the discussion (slide 11) and set context for future work on problem statements that will be developed using today's research and work.**

WILD WISE: READY, SET, DISCOVER

Name: _____ Teacher:_____ Date: _____

1. **How much do you agree with the statements below? (*Check the box that represents how much you agree or disagree.*)**

	I strongly disagree	I disagree	I don't agree or disagree	I agree	I strongly agree
I try to tell others that wetlands are important.	☐	☐	☐	☐	☐
I like to sit by a pond and watch dragonflies.	☐	☐	☐	☐	☐
I like to go on trips to places like forests away from cities.	☐	☐	☐	☐	☐
People have a right to change the environment.	☐	☐	☐	☐	☐
I know I can help save wetland environments.	☐	☐	☐	☐	☐
I think amphibians and wetland animals are cool.	☐	☐	☐	☐	☐
I'm glad that I live in an area that has wetlands.	☐	☐	☐	☐	☐
People's actions can negatively impact the environment.	☐	☐	☐	☐	☐

2. **The area next to a wetland pond has been bought by a company who wants to clear some of the trees and bushes to build a golf course. How will this affect the wetland negatively?**
   a) The wetland will become polluted.
   b) Animals that live in or near the wetland will have their homes taken away.
   c) The remaining trees and plants will die off from not having the resources they need to survive.
   d) A and C are correct.
   e) All of the above are correct.

Pre

Turn Over

3. **Look at the illustration of a wetland ecosystem and answer the following questions.**

Along with fish, birds, and insects, frogs also live in wetland ecosystems. In the table provided below, there are 3 different parts of an ecosystem (animal, plant, or environment) identified. Explain how frogs would interact with that part of the ecosystem. Then explain why that interaction is important to frogs that live in this environment.

Example

Parts of the ecosystem	How would frogs interact with this part of the ecosystem?	Why is this important to frogs?
Fish	*Frogs would stay away from fish, because fish eat them.*	*In order to survive, frogs have to avoid fish and lay their eggs where fish can't get to them.*

Your turn!

Parts of the ecosystem	How would frogs interact with this part of the ecosystem?	Why is this important to frogs?
1. Dragonfly		
2. Hollow log		
3. Clean water		

4. **What is something you can do to help save the wetlands?** _____

_____

_____

Pre **You're all done! Thanks for taking the time to complete this!**

MEET THE PROBLEM POWERPOINT SCRIPT

1. **AWESOME AMPHIBIANS: WHAT'S THE PROBLEM?**

2. **SERIES OF EVENTS**

   Over the next six months, we are going to be researching amphibian health and conservation in Kent. You will be scientists: conducting research, going on field trips, and helping solve an important problem in our community. These are the steps you will go through to learn more about this problem and develop solutions to help local amphibians.

3. **WOODLAND PARK ZOO**

   Why is the zoo asking our classroom for help? Great question! WPZ provided these materials to introduce you to a problem they need your help solving. Washington State is having a hard time finding ways to keep amphibians, such as frogs, toads and salamanders healthy.

   You are about to receive more information on this issue, but I wanted to give you an overview as to why WPZ helps amphibian populations. You may be familiar with the typical zoo experience of going and seeing animals from all around the world with your family or friends. Did you know that zoos do a lot more then keep animals? They breed animals to keep their populations up and prevent them from going extinct. They also work with organizations here and all around the world to help protect the habitats that animals at the zoo came from. From tigers in Malaysia to snow leopard habitat in Mongolia, WPZ helps its international partners preserve habitat and populations of threatened species.

4. **INTRODUCTION TO THE PROBLEM**

   You are about to recieve some important information...

   Today we are going to start an exciting learning adventure that will help us understand amphibians, like frogs, toads and salamanders, and the habitats where they live.

   We will start off with reading a letter that the zoo wrote specially to ask for your help. While reading, pay special attention to the questions asked on this slide.

5. **MEET THE PROBLEM LETTER**

   (Read the letter on the slide out loud to students)

6. **WHAT DO YOU ALREADY KNOW?**

   Now that you have read the letter, let's make a list of what we know and what we need to know or find out. Scientists and engineers start thinking about problems by reviewing available information and thinking about what they already know. Starting with what we know from the letter, can anyone help me fill in these first four questions?

   Now that we have identified some of the basic elements of the problem, let's add other information we already know about this topic.

7. **WHAT DO YOU NEED TO KNOW?**

   Now that we have made a list of things that we know about this issue, let's make a list of things that we still need to find out. This might include questions we have or something mentioned in the letter that we need more information about.

8. **MEET THE PROBLEM VIDEO**

   Great work! We have started to identify what we know and need to know. Woodland Park Zoo has also prepared a video for us with more information. While we watch this video we need to pay special attention to the following (see slide).

9. WHAT DO YOU KNOW NOW?

Now that we have learned more about the problem we have been asked to solve, let's revisit our Knows and Need to Knows.

Can we add more information to the first four questions? Add in anything new you learned from the video.

What other information did you gain while watching the video?

10. WHAT DO YOU NEED TO KNOW?

Let's review the things we still need to learn about.

Have we answered any of our previous Need to Knows?

Can we add any new things we should learn about?

11. DISCUSSION

That concludes your research for the day. Next time, you will create a problem statement that will help guide your research and plan out how you will gather the information you need.

After that, you will present to your peers what you have found thus far.

Thank you for helping Woodland Park Zoo solve this tough problem!

12. WOODLAND PARK ZOO MISSION

13. CLOSING SLIDE

January 7, 2019

Dear Kent School District 5th grade students,

Have you ever seen a frog, toad, or salamander? All of these animals are amphibians found in local parks and wetlands in Kent. However, amphibian populations are shrinking and Washington's native amphibians need your help!

WOODLAND PARK ZOO

Amphibians, like all living things, depend on their habitat to meet their needs. Wetlands are one important habitat for amphibians, and unfortunately, Washington's wetlands are disappearing. Since the 1780s, Washington State has lost 31% of its wetland area, from 1.35 million acres to 938,000 acres.

Over 1,900 species of frogs, toads, and salamanders, 30% of the world's amphibians, are at risk of extinction. To save the world's amphibians, we need to quickly learn more about their needs. The future of amphibians isn't just in the hands of scientists and government officials; you can help play an important role in saving these animals.

Woodland Park Zoo wants to know how you plan to protect Washington's native amphibians. This year, you will learn about amphibians, wetland habitats and how using scientific ideas can help protect the environment. You will use your knowledge to develop scientific, feasible, affordable and ethical solutions for how people in your community can help native amphibians thrive in Kent. Your ideas can inspire your community to take action in protecting amphibians and wetland habitats. Thank you for your help!

Sincerely,

Woodland Park Zoo

601 N. 59th Street, Seattle, WA 98103 | ph 206.548.2500 tty 206.548.2599 fax 206.548.1536 | www.zoo.org

MEET THE PROBLEM:
AMPHIBIAN CONSERVATION VIDEO SCRIPT

INTRODUCTION:

Staff One:

Hi, I'm Tess.

Staff Two:

And I'm Ryan and we're staff members here at Woodland Park Zoo in Seattle, Washington.

Staff One:

Conservation is at the heart of Woodland Park Zoo's mission. Zoos are well placed to provide millions of people each year with the unique opportunity to connect with nature, learn about conservation issues in their own backyard and around the world, and to take action to help protect wildlife. Today we are going to talk to you about an important issue that you can help us with.

Staff Two:

Here at Woodland Park Zoo we have the Amphibian Monitoring citizen science project which aims to identify where amphibians, like frogs, toads, and salamanders, live in the wild. To achieve this, we train groups of citizen scientists to identify the different life stages, including egg masses, of eight different amphibian species. These groups go to wetland areas in Western Washington where they follow a Washington Department of Fisheries and Wildlife-approved protocol to look for amphibians in a way that minimizes their impact on both the animals and their environment. These teams will count and record the numbers of individuals of each species that they find, and upload this information to the department of Fisheries and Wildlife website. There, wildlife biologists can use this information to better understand where these species live and their population numbers.

BACKGROUND/SCIENTIFIC EVIDENCE

Staff One:

Once common and widespread in the wetland habitats of the Puget Sound area, amphibians are in decline with some species in Washington State being endangered. One example of this is the Oregon spotted frog which is now listed as endangered by the Federal government. Today, its habitat type is extremely limited with the frog inhabiting 10% or less of its former range in the Pacific Northwest. The ultimate goal of the Amphibian Monitoring citizen science project is to better understand the amphibians at risk in Washington State.

Washington's wetlands are fast disappearing, and with them our native amphibians. Now, the Oregon spotted frog has become an ambassador for our local wetlands, brought into the national spotlight due to its new federal protection under the Endangered Species Act. Woodland Park Zoo believes the powerful combination of local action with federal protection will help to build a better future for our wetland species under its umbrella.

The future of amphibians isn't just in the hands of conservationists and local government officials—we need you to help bring our native species back!

ISSUE

Staff Two:

Despite our efforts to assist, amphibians in the wild are still under constant threat. Most of this is due to habitat alteration which eliminates the areas where these animals breed and live. Other documented threats include:

- Invasive grasses
- The invasive North American bullfrog
- Habitat contamination
- And introduced game fish, like bass and trout

We're asking you to research the different threats to amphibians and determine what you can do differently to help them survive. Throughout the school year you'll be investigating this issue through a combination of books and other resources, a trip to Woodland Park Zoo and conducting field research! You'll be able to see how staff members like us, use field research to solve real world issues. We'll see you here at the zoo and come and help you on your field research day. We'll also come to your final presentations where hopefully you can inform us on how you propose to create better habitats in your local communities for Washington's amphibians.

WHY CARE?

Staff One:

You may be asking yourself *what's so important about amphibians?* And *why should we care?* Amphibians play a vital role in the health of our ecosystems. Healthy ecosystems provide many services to us and other species. It is also important that we take responsibility for how we have altered our ecosystems and how that has impacted other animals. I feel that as you research our local amphibians, you will better understand their importance. We look forward to coming and hearing why *you* think they are important during your presentations in the spring.

REQUEST: FIND EVIDENCE, CREATE SOLUTION AND PRESENT YOUR FINDINGS.

Staff Two:

We need YOU to assist by finding ways to create better habitats for amphibians in your schoolyard, your backyard and your local community! It'll take the use of multiple resources for you to learn more about the frogs, toads and salamanders that live in your area and it will take conducting real life field research for you to fully understand these animals and the habitats that they live in. You'll need to keep in mind the factors that are negatively impacting these species and finally, you'll need to compile all of the data you collected and, using scientific evidence, design a habitat that can help to save Washington's native amphibians.

Good luck and we look forward to seeing you here at the zoo after you've done your initial research!

Both Staff:

Bye! (Waving)

Know / Need to Know

Know	Need to Know

MEET THE PROBLEM – SESSION 2

Location: Classroom

Timing: 50-minute class period

Sample learning target Scientists and engineers write problem statements with constraints on the solution such as materials, time or cost.

OVERVIEW

Building on information learned in session one, students develop problem statements related to the topic of amphibian population declines and conservation in Washington State. Students develop a finalized set of "Need to Knows" that they will learn more about during their upcoming research.

MATERIALS

- ☐ Know/Need to Know Graphic organizers completed by students in session 1
- ☐ Class Know/Need to Know/Need to do chart – started in session 1
- ☐ Problem Statement graphic organizer, one per pair or group (**p. 20**)

ACTIVITY PLAN

1) Review Knows and Need to Knows generated in session 1.

You may wish to have student groups do this together with their own graphic organizers and then review the whole class Know and Need to Know chart afterwards.

2) Identify the task

The Knows and Need to Knows, based on the WPZ PowerPoint, letter to students and video are the basis for student understanding and engagement with the problem.

Ask students to consider: What are we being asked to do by Woodland Park Zoo? What do I think the task is? Why do I think that?

Have students discuss the problem, task and evidence, referring back to their Knows and Need to Knows for evidence to support their thinking.

Students may benefit from sentence starters:

- The problem we are trying to solve is…
- We are trying to…
- Our task is to…

3) Identify constraining factors

Constrainting factors are elements that will be considered when selecting the best fit solution from among many possible solutions.

Consider having students practice with an example. "A school is opening a new 5th grade classroom and needs to select furniture for students. What might they have to consider? Student answers may include: cost/budget, size appropriate for students (not too small/large), how many can fit in the classroom, space available, what they will be used for and what features would be needed.

Explain that these are examples of constraints. While there are many possible solutions (furniture that could be used), the constraints would be used to help make the best fit solution and eliminate solutions that may not work (e.g. the right size, but too expensive; the right price, but kindergarten-student sized).

Have students brainstorm what factors might constrain their solutions to amphibian problems. Students may need assistance to identify the factors that they may need to take into account when selecting a solution.

4) Combine the task and factors into a problem statement

Students can use the Problem Statement graphic organizer to write problem statements in partnerships or small groups. You may choose to have all students focus on one problem statement as a class, but it is useful to have all students practice and then combine them afterwards.

Recommended format, "How can we (state the task) in such a way that we consider (the factors)?"

You can go back to the desk example if helpful e.g. How can we purchase student furniture for a 5th grade classroom in such a way that we consider the cost, available space and student needs?

5) Based on the problem statement, generate "Need to Dos"

"Need to Dos" are steps the students will need to take as part of the larger task. With the problem and constraints in mind, students are ready to identify initial steps needed to work on solving the problem.This will vary by group but may include items such as "conduct research on local amphibians" or "learn what amphibians need in their habitat to survive".

This brainstorming should be driven by student ideas. This chart should be revisited throughout the unit and added to and updated as students identify additional Knows, Need to Knows, and Need to dos.

6) Conclude session with review of problem statement and looking ahead towards next steps with the "Need to Knows" and "Need to Dos". Celebrate group and class accomplishments and reinforce the connections to the upcoming Outdoor Exploration.

Problem Statement

How can we (state the task here) in such a way that we consider (state the factors, criteria, and constraints here).

How can we

in such a way that we consider:

E2: WILD WISE OUTDOOR EXPLORATION

Location: Schools (in the classroom and outdoors) ***or*** a local park within walking distance of school

Schedule: After E1: Meet the Problem

OVERVIEW

The goal of the Outdoor Exploration is for students to increase their familiarity with local habitats and wildlife needs, gather information necessary to solve their problem and gain comfort in natural settings. Activity ideas are included in this guide.

PREPARE FOR YOUR FIELD TRIP

- ☐ Complete required Kent School District paperwork for field trips (if walking to a site off school grounds).
- ☐ Arrange for chaperones/classroom volunteers. We encourage you to have 4-6 chaperones per class to ensure sufficient coverage for your class and help with small group activities.
- ☐ Prepare students for the Outdoor Exploration:
    - Encourage students and chaperones to dress in layers and wear sturdy shoes that can get wet.

RESOURCES FOR GUIDED PARK EXPLORATIONS INCLUDE:

SHADOW Lake Nature Preserve (http**://**shadowhabitat**.**org**/**education**/)**

Guided field trips on a variety of biological and environmental topics. Contact SHADOW for pricing and availability.

Nature Vision (https://naturevision.org/school-programs/)

In-class and field programs (at local parks) on a variety of science topics, including watersheds and water quality. Some subsidized programs available.

SELF-GUIDED OUTDOOR EXPLORATION

Suggested activities for a self-guided exploration are included on the following pages:

- Outdoor Exploration Introduction
- Habitat Assessment Activity
- Wetland Ecosystems Game
- Water Quality Testing

OUTDOOR EXPLORATION INTRODUCTION

Location: Classroom

Timing: 30 minutes

Guiding questions: What is an amphibian? What is a wetland habitat?

MATERIALS

- ☐ Outdoor Exploration Slides (slides 1-16; available on www.zoo.org/rsd)
- ☐ Whiteboard and dry erase pens or chart paper and markers (to record student ideas)

ACTIVITY PLAN

1. **Set up expectations and review goals for the day using the Outdoor Exploration PowerPoint (slides 1-2).**

   Today, we'll be doing some indoor and outdoor activities to learn more about the local environment and animals and explore some questions as scientists (*slide 2)*.

   Before we begin, let's review some expectations for how we can do our best work as scientists today.

   > *Review your behavior expectations for the indoor and outdoor portions of the day. These might include walking feet, quiet voices, the difference of going outside for science compared to recess, and any other safety guidelines depending on your site.*

2. **Begin reviewing amphibians and connecting to prior knowledge from Meet the Problem activities.**

   Throughout the Ready, Set, Discover program, you are going to be learning about a particular group of animals. Does anyone know which animals we are studying this year?

   Solicit answers from students (amphibians, frogs, toads, newts, salamanders)

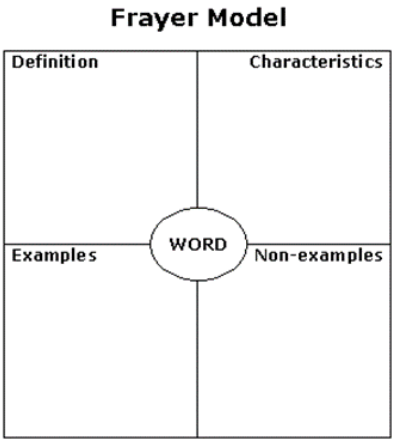
   Exactly! Over the next few months, you will be learning more about amphibians, what they need to survive, and come up with ideas for how you can help amphibians here where you live. Let's start by talking about what makes an amphibian. *(slide 3)*

   Have students turn and talk with their neighbor about what they already know about amphibians.

   Encourage them to think back to the Meet the Problem Letter, PowerPoint, and video.

   Slide 4 has an example of a frog, toad, newt, and salamander that students can observe to help them begin to list amphibian traits.

3. **Have students share out answers and use this to help fill in a Frayer type model. Use student language to get at the significant traits listed below. Fill in and introduce ideas that students do not suggest initially.**



   Amphibians (definition): Cold-blooded vertebrates (without scales) who generally live part of their lives in water and part of their lives on land.

   Amphibian characteristics:

   - *Amphibian – comes from Greek (amphi – double, bios-life), as most amphibians live part of their lives in the water, and part of their lives on land*
   - *Go through metamorphosis and different life cycle stages (e.g, egg, tadpole, frog or egg, nymph, adult)*
     - *Soft eggs (no hard shell like chicken eggs), laid in water or moist places*
     - *Larval stage (e.g. tadpole, nymph) live in water, breathe through gills,*
     - *Adults – most have lungs and live out of the water (though still need water/wet places)*
   - *Need water and a moist environment to survive, even as adults*

- *Ectothermic/Cold-blooded: cannot make their own heat and use their environment to control body temperature (e.g. move to warmer or cooler places, bury themselves)*
- *Sensitive, permeable skin: adult amphibians breathe at least in part through their skin, which can easily absorb chemicals/pollutants from the water and environment.*
- *No scales.*

4. **Have students practice recognizing amphibians using these traits by playing "Amphibian or Not?" (slide 5).**

   Set up a response system for all students e.g. thumbs up = amphibian, thumbs down = not an amphibian.

   Use slides 6-11 and have all students use their signal to share whether they think it is an amphibian or not and provide their evidence (e.g. It is not an amphibian because it has dry, scaly skin and amphibians have smooth, wet skin).

   Each slide will start with the picture, and then add the name of the organisim and whether it is an amphibian or not.

   Your pacing on this may vary depending on your students and how quickly they pick up on this. You may choose to spend more time discussing a few examples, or go over all the examples in detail.

5. **Introduce the seven species of local amphibians that students may focus on for their projects (slide 12).**
6. **Discuss wetland habitats.**

   Have students turn and talk with their neighbor about what they already know about wetlands. (slide 13)

   If students seem uncertain, advace to slide 14 and encourage students to share observations of the wetland pictured. Then share the definition (also on slide 13, but hidden at first).

   Wetland: An area that is filled or soaked with water for all or part of the year,

7. **Review some wetland characeristics (slide 15).**
   - *Plants adapted to wetter places (hydrophytes)*
   - *Animals that live on the land, in the water, or both (like amphibians)*
8. **Have students share out why they think wetlands are important, and conclude the discussion by reviewing three important benefits of wetlands (slide 16)**
   - *Wetlands are home to many plants and animals.*
   - *Wetlands soak up water like sponges and reduce flooding.*
   - *Wetlands clean and filter water.*
9. **Transition to Habitat Assessment Activity.**

HABITAT ASSESSMENT ACTIVITY

Location: Classroom & Outdoor site

Timing: 45-60 minutes

Objective: Students will be able to describe habitat features found in their schoolyard and use evidence to determine if their schoolyard is optimal habitat for the Pacific tree frog.

Guiding question: Can the Pacific tree frog live in our schoolyard?

MATERIALS

- ☐ Outdoor Exploration Slides (slides 17-36; available on www.zoo.org/rsd)
- ☐ Student science notebooks
- ☐ Habitat features Identification cards (optional if doing lesson all outdoors, available on www.zoo.org/rsd
- ☐ Long-toed salamander habitat card (available on www.zoo.org/rsd)
- ☐ Picture of toad in habitat (available on www.zoo.org/rsd)
- ☐ Pacific tree frog habitat card (available on www.zoo.org/rsd)

ACTIVITY PLAN

1. **Introduce the Habitat Assessment Activity (slides 17-18)**

   Today we will be doing a scientific investigation to see what types of animals can make their home your schoolyard. Our investigation will have 3 parts:

   Part 1: Learn about habitats and habitat features.

   Part 2: Learn about the habitat needs of a Pacific Tree Frog

   Part 3: Do a habitat survey in your schoolyard to determine if a Pacific tree frog could live here

2. **Review what makes a habitat and common habitat features.**

   Students turn and talk – what is a habitat? (slide 19)

   Students share responses

   A habitat is an animal's home, the place where it finds food, water, shelter, and space. *(slide 20)*

   Students record this definition in their science notebooks.

   Habitats are made of different parts called habitat features. Examples of habitat features that you can find in your neighborhood are…(*use slides 21-32 if in the classroom, or use printed habitat feature cards if doing lesson outside)*

   Animals use habitat features to meet their needs for food, water, shelter, and space, and reproduction. For example, the long-toed salamander (*show long-toed salamander habitat card*) uses rotting logs for shelter, it finds food, which includes tadpoles, small fish, and aquatic beetles, in rivers; it lays its eggs in wet places ponds, and it finds space by burrowing underground.

3. **Review habitat features with an example.**

   Observe this picture of a toad in its habitat for 1 minute. Draw or describe the answer to these prompts in your journal.

   Students think quietly for 1 minute about the prompt and write/draw the answers to the following questions in their journal.

   - Draw or describe one habitat feature in this photo.
   - Draw or describe how the toad is could use that habitat feature to meet its needs.

Now, turn to the person next to you and share your answers with them. Then we will share our answers aloud.

Student turn and talk and then share answers out with the class.

4. **Prepare for schoolyard habitat assessment for the Pacific tree frog.**

   Today, we will be conducting a scientific investigation to determine if our schoolyard can be habitat for the pacific tree frog (*show Pacific tree frog habitat card*)**.**

   The Pacific tree frog is an amphibian that lives all over Washington in many different locations including in the city of Kent. In fact, the people like the Pacific tree frog so much they made it the official amphibian of Washington State.

   After doing some research, Woodland Park Zoo compiled a list of habitat features that the Pacific tree frog uses to survive and reproduce. We are going to work in small research teams to determine if we have those habitat features in our schoolyard. The process of identifying habitat features that specific animals need is a called a habitat assessment. This is the same process that scientists use when they are working to save species all over the world.

   Let's review what Pacific tree frogs need in their habitat to meet their needs. *Use the habitat needs listed on the card to share with students about what Pacific tree frogs use for food, water, shelter, and space.*

   Before going outside, you may wish to explore a birds-eye view of the schoolyard and discuss habitat features that students see there. You can change the image on slide 35 to be of your site.

   Now, we're going to go outside to look for whether we can find these habitat features in our schoolyard to help us decide if it could be habitat for Pacific tree frogs. *Have students set up a page in their science notebook to take notes of features that they find in each category (food, water, shelter).*

   When you make your observations, record in your journal what the habitat feature is, the location where you found it, and how you think a Pacific tree frog could use that habitat feature for food, water, or shelter.

   General tips for habitat assessment exploration outdoors:

   - Give students 10-15 minutes to find features
   - Define a return sound or signal to gather back together
   - Define a perimeter using visible landmarks
   - Count students off into groups of 4 or 5 students
   - Assign chaperones to each student group if chaperones are available
   - Remind students to write or draw detailed observations in journal
   - If students are having trouble finding insects and other arthropods (food), have them look for signs of these organisms such as chewed leaves or spider webs.
   - If students are having trouble finding water because it is dry, have them try and think of places where they may have seen water before (puddles, depressions in the landscape, ditches) or find places where water could collect on a rainy day.

5. **Return inside and debrief habitat assessment activity.**

   Now that you've made your observations, we'd like a member from each group to share a 1 habitat feature that they found with the rest of the group. When you share, please describe what habitat feature you found, where you found it, and how a Pacific tree frog use it to meet their needs for food, water, shelter, space, or reproduction *(write sentence frame on board and provide example)*

   Sentence frame:

   The habitat feature that I found is _____. The habitat feature is located _____. Pacific tree frogs use this habitat feature for_____.

   Example:

The habitat feature that I found is a log pile. The habitat feature is located near the backdoor of the cafeteria. Pacific tree frogs use this habitat feature for finding shelter.

Have students record their observations in their science notebooks

Thank you for sharing your observations. Some of you may not have seen all of the habitat features that you were looking for but that's okay. When scientist go out into the field and do habitat assessments, they do not always find the features that they are looking for. When that happens, the scientists work with community members, government officials, and engineers to determine how change the landscape to make better habitat for species.

For the Ready, Set, Discover program, you will also develop solutions for improving amphibian habitat. Based in what we've learned about the habitat needs of amphibians today, what are some ideas that you have for improving our schoolyard habitat to make it better amphibian habitat?

Students brainstorm ideas and share solutions for improving amphibian habitat

6. **Transition to next activity – Wetland Ecosystems Game or Water Quality Testing**

WETLAND ECOSYSTEMS GAME

Location: Outdoors or indoor space with room for class to make a large circle with all students

Timing: 30 minutes

Objective: Students will be able to describe one or more connections between wetland ecosystem elements. Students will be able to describe how habitat degradation and pollution negatively impact ecosystems.

Guiding question: How are parts of a wetland ecosystems connected?

MATERIALS

- ☐ Wetland Ecosystems Game Cards (available on www.zoo.org/rsd)
- ☐ Ball of string

ACTIVITY PLAN

1. **Briefly review amphibian biology and wetland ecology as a lead-in to this activity.**
   - Amphibian: cold-blooded vertebrate that doesn't have scales and spends part of their life in water and part of their life on land
   - Wetland: an area of land that is wet either permanently or seasonally. Wetlands have water-loving plants called hydrophytes and wet soils called hydric soils.
2. **Have students consider how amphibians could meet their needs (food, water, shelter, space, or reproduction) in a wetland. Students turn and talk with a partner and then share out ideas.**

   Students may provide answers such as:
   - Amphibians need to keep their skin moist/wet, so they live near water or in wet environments.
   - Many amphibians reproduce in water. They lay eggs in lakes and ponds.
   - Young amphibians (larvae like tadpoles) eat algae, aquatic plants, mosquito larvae, aquatic snails, and aquatic flies.
   - Amphibians drink water through their skin (their drinking patch).
3. **Wrap up conversation, adding in ideas students may have missed. Lead into framing for the game:**

   There are also lots of other plants and animals living with amphibians in wetland ecosystems. All of these plants and animals live in the wetland because that is where they can meet their needs. In a healthy ecosystem, many different species of plants and animals can meet their needs.

   We are going to play a game to learn more about wetland ecosystems and the ways plants and animal use wetland features to meet their needs. During this game, each of you will be a different part of the ecosystem. Some of you will be biotic (living) parts of the ecosystem such as plants and animals. Some of your will be abiotic (nonliving) parts of the ecosystem such as light, water, air, and soil.
4. **Introduce the rules of the game:**
   - Each student will receive an ecosystems component card to hold.
   - Students will form a large circle, with the student who is representing the sun in the center of the circle.
   - The goal will be to connect every component (every student) with a continuous piece of yarn (web of life).
   - The student representing the sun starts the game by passing the yarn to something that is connected to the sun.
   - As each student passes the ball of yarn to another student, they should explain how the two ecosystem elements are connected (e.g. I am a plant and am connected to the sun because I use it to make food). Students can name any connection as long as it is accurate. Address any misconceptions that arise.
5. **Run a short demonstration with a few students to model the steps.**

- In a wetland the cattails (1) which are aquatic plants, use energy from the sun (2) to grow. Pacific tree frogs (3) lay their eggs on cattails. When the eggs hatch, the tadpoles swim around in the water (4) in the marsh.
- Confirm with students that they understand the directions (thumbs up) or need clarification (thumbs down).

6. **Play one round of the game with all students. Debrief the first round: Is there anything surprising or new that you learned during this part of the game? Students share out their responses.**
7. **Introduce the second round of the game.**

   We are going to play a second round with a change. This time, the abiotic components in our ecosystem haven been polluted. How do you think pollution might impact a wetland ecosystem? Make sure to support your claim using evidence.

   Have students share out ideas.
8. **Play a second round with the polluted ecosystem.**

   Have students connect the ecosystem elements as in the first round, and then introduce pollution to different elements (e.g. runoff from cars pollutes the water). Have the student representing the polluted element give a small tug on the string, representing the cascading effects of this pollution on other parts of the ecosystem. Students who felt the tug can raise a hand to show how the effects travel and impact the larger ecosystem.
9. **Debrief the second round: Is there anything surprising or new that you learned during this part of the game? Students share out their responses.**
10. **Conclude the activity.**

    Now we've seen how different parts of a wetland ecosystem are connected and what happens when part of our ecosystem becomes polluted. For your Ready, Set, Discover projects, you will be developing solutions to improve wetland habitats for amphibians in your community.

    To finish this activity, let's brainstorm some ways that our community can improve wetlands to help native Washington amphibians. We'll have some quiet time to think, and then share some of our ideas.

    Have students brainstorm independently and then share out ideas.

WATER QUALITY TESTING

Location: Outdoors, with access to local water (not tap water)

Timing: 30 minutes

Objective: Students will understand the importance of healthy water to amphibians and test a local water sample to investigate the water quality using two or more indicators.

Guiding question: How can we learn if local water is healthy and safe for wildlife?

MATERIALS

- ☐ Water samples or access to body of water
- ☐ Thermometer
- ☐ pH paper/test strips
- ☐ pH reference card
- ☐ Phosphate test supplies (variety of kits are available and aquarium suppliers may also have some)
- ☐ Nitrate test supplies (variety of kits are available)
- ☐ Test tubes or vials with lids (helpful for some water quality tests)

ACTIVITY PLAN

Note: These activities can be done with water samples that you collect from a local body of water and bring to your school to test or at a body of water. If testing at a body of water, ensure that you review safety protocols and expectations with students.

If you collect and transport samples to your school, remember to record the water and air temperature at the time of collection to share with students later.

Depending on the supplies you have available you may run all or some of these tests:

- Air & water temperature
- pH
- Phosphates
- Nitrates

1. **Begin with a discussion about water using the prompts below. Students can begin with a turn and talk to a partner before sharing out ideas.**

   Why is water important?

   - *Every living thing (people, plants, animals) needs water to survive.*
   - *Water is a finite resource (there is a limited amount).*

   Why would having clean water be important for animals?

   - *We don't want to drink or use dirty water, and neither do animals.*
   - *Amphibians have soft, moist skin and need to have water to keep their skin wet so they can breathe. Their skin is sensitive to changes in the water, especially from pollution.*

   How can we tell if water is clean and healthy for people and animals?

   - *Look at the water and area around it for signs of pollution.*

- *Test the water, which will allow you to learn more details about the quality of water that you can't tell just from looking at it.*

2. **Introduce the goals for the activity and water samples.**

   Today we are going to do several tests on a local water sample to see whether it is water that would be clean and healthy for local amphibians such as salamanders, frogs, newts, and toads.

   The water we are testing today came from *(insert description, show pictures or a map)*.

   Help students set up a data table for the water quality tests they will be conducting.

3. **Test 1: Water and Air Temperature**

   - If testing a water sample that was previously collected, share the air temperature and water temperature with students from the time of collection. Discuss why the temperature of the sample now would not accurately reflect the water temperature.
   - If testing at a body of water, have students carefully take the temperature of the water, ensuring that the thermometer is suspended in the water, and not buried in sediment at the bottom of the water.
   - Have students take the temperature of the air.
   - Discuss any observations or ideas that students have about the temperatures.

4. **Test 2: pH**

   - Go over what pH is with students:
     - pH stands for parts hydrogen and is one factor we consider in water health
     - pH is measured on a scale from 0-14
     - pH less than 7 is acidic (think of lemon juice)
     - pH of 7 is neutral, neither acidic or basic
     - pH greater than 7 is basic (many cleaners such as ammonia are basic)
   - Have students consider the relationship between amphibians and the pH levels of water: With what you know about amphibians, what kind of pH levels do you think they would need for water to be safe and healthy for them? *Have students share ideas. Reinforce the idea that the permeable skin of amphibians makes them sensitive to changes in the water (such as more acidic or basic pH). Levels of pH that are too high or too low will impact other aquatic life as well.*
   - Have student groups use pH paper or pH strips to test the pH level of the water by dipping one end of the paper in, counting to five, and then removing it from the water. Then, students can compare the color of their strip to the provided reference guide that comes with the pH paper. Student groups can discuss and come to a consensus about their results. Once all groups have a pH, have each group share out their results to come to a class consensus *(this is an excellent opportunity to reinforce the importance of taking multiple samples as scientists)*.
   - Students record the pH results in their science notebook.

5. **Test 3: Phosphates**

   - Introduce what phosphates are:
     - Phosphate is a nutrient needed for plant and animal growth
     - Phosphates are needed by plants and animals to make energy (from sunlight or food)
   - Share why scientists test for phosphates in the water
     - Phosphates are needed for plant growth and low levels of phosphates will be found in healthy and unpolluted water.
     - High levels of phosphates in the water can cause accelerated eutrophication:

        - Weeds and algae grow rapidly (*students may have seen a pond or body of water covered with algae)*
        - With higher numbers of weeds and algae, less sunlight can get to aquatic plants and they die off.
        - Bacteria and decomposers use up oxygen in the water and low levels of oxygen make it difficult for living things to survive (can't breathe)
- Have students consider the relationship between amphibians and the phosphate levels in the water: With what you know about amphibians, what kind of phosphate levels do you think they would need for water to be safe and healthy for them? *Have students share ideas. Reinforce the idea that high levels of phosphate ultimately lead to reduced levels of oxygen, which means amphibians can't breathe.*
- Have students test for the phosphates, following the procedure of your testing materials.
- Student groups can discuss and come to a consensus about their results (phosphate levels at ppm). Once all groups have a phosphate level, have each group share out their results to come to a class consensus *(this is an excellent opportunity to reinforce the importance of taking multiple samples as scientists)*.
- Students record the phosphate results in their science notebook.
- If the phosphate concentration is higher, discuss some of the possible human-caused sources:
    - Human and animal waste
    - Fertilizer runoff from gardens and farms
    - Laundry detergent
    - Industrial waste

6. **Test 4: Nitrates**

- Introduce what nitrates are:
    - Plants (including algae) need nitrogen to grown and nitrates are one form of nitrogen that plants can take up through their roots.
    - All living things (plants and animals) need nitrates to build protein.
- Share why scientists test for nitrates in the water
    - Normal/low levels of nitrates do not adversely impact aquatic life.
    - High levels of nitrates cause eutrophication.
    - High levels of nitrates in the water can cause accelerated eutrophication:
        - Weeds and algae grow rapidly (*students may have seen a pond or body of water covered with algae)*
        - With higher numbers of weeds and algae, less sunlight can get to aquatic plants and they die off.
        - Bacteria and decomposers use up oxygen in the water and low levels of oxygen make it difficult for living things to survive (can't breathe)
- Have students consider the relationship between amphibians and the nitrate levels in the water: With what you know about amphibians, what kind of nitrate levels do you think they would need for water to be safe and healthy for them? *Have students share ideas. Reinforce the idea that high levels of nitrates can ultimately lead to eutrophication and reduced levels of oxygen, which means amphibians can't breathe.*
- Have students test for the nitrates, following the procedure of your testing materials.

- Student groups can discuss and come to a consensus about their results (nitrate levels at ppm). Once all groups have a nitrate level, have each group share out their results to come to a class consensus *(this is an excellent opportunity to reinforce the importance of taking multiple samples as scientists)*.
- Students record the nitrate results in their science notebook.
- If the nitrate concentration is higher, discuss some of the possible human-caused sources:
    - Wastewater from sewage
    - Fertilizer runoff from gardens and farms
    - Laundry detergent
    - Industrial pollution

7. **Debrief water quality testing results and synthesize results for an overall idea about the water quality for amphibians.**

   This is a key synthesis element of the activity and it is important to leave sufficient time for student discussion to bring together all of the different water quality indicators that students were able to observe. If needed, the debrief could happen at a later time to ensure that there is sufficient time.

   Review results of testing as needed. *You may wish to create a combined chart of the class results for reference.*

   Questions for student discussion:

   - Based on the results of your water quality test, what do you think about the overall health of this water?
   - Do you think this water is/would be healthy for local amphibians? Why or why not? *Students should work to support this claim with specific evidence from their water quality testing results (I think this water is health because…. or I think this water is not healthy because…). Students can discuss this in small groups before sharing out ideas.*
   - Do you have any ideas about how to help keep/make this water healthy for local wildlife including amphibians? Why would that idea help?

E3: ZOO EXPLORATION

Location: Woodland Park Zoo

Schedule: After Outdoor Exploration

OVERVIEW

A self-guided zoo visit provides an opportunity for students to learn about ecosystems, animal characteristics and practice scientific observation. Activity ideas are included in this guide. King County Schools with 30% or more students qualifying for free- or reduced-rate lunch are eligible to receive free zoo admission and subsidized bus transportation.

PREPARE FOR YOUR FIELD TRIP

- ☐ Register for zoo visit (**p. 39** or writeable PDF available at www.zoo.org/fieldtrips under "Step 3: Submit Your Registration"
- ☐ Review Zoo Visit FAQ (**p. 40-42**).
- ☐ Complete required Kent School District paperwork for field trips.
- ☐ Schedule buses for zoo field trip.
    - Teachers are responsible for scheduling buses and requesting late pick-up.
- ☐ Students will need sack lunches for the trip. Arrange for to-go sack lunches with Nutrition Services and your school cafeteria.
- ☐ Arrange for chaperones and prepare "Zoo Visit Chaperone Sheets" (**p. 43**) and school group maps (**p. 44**) for each group.
- ☐ Prepare students for field trip by discussing the day and reviewing behavior expectations.
    - Use the WPZ Education Intro video (https://www.youtube.com/watch?v=LQYUahzKZIs) to help prepare students.
    - Review zoo rules:
        - Stay with adult chaperone and your group at all times.
        - Stay on designated paths, viewing areas and grassy areas.
        - Do not throw food or objects into the exhibits.
        - Do not tap on glass or otherwise stress the animals.
        - Be quiet near exhibits.
        - Use recycling, compost and waste containers throughout the zoo.
        - No frisbees, balls, balloons or pets are allowed on the zoo grounds.
- ☐ Plan for on-grounds activities. Suggested activities available (**p. 34-38**).
    - Tropical Rain Forest Tour (amphibian-focused)
    - Temperate Wetlands Tour and Exploration

TROPICAL RAIN FOREST TOUR

Guiding Question: How are different amphibians uniquely adapted to meet their needs in the different layers of a tropical rain forest?

Before entering the exhibit, review what students know/remember about amphibian needs from the Outdoor Exploration at their school. As needed, help reinforce key ideas:

- **Habitat:** The place where an animal finds the food, water, shelter, and space that it needs to survive.
- **Adaptation:** Adaptations help plants and animals survive in their habitat; adaptations can be anatomical, behavioral, or physiological.

[Start in Jaguar Cove – outside the Tropical Rain Forest Building]

During our tour of the Tropical Rain Forest Exhibit, we will be exploring several topics. First, we will practice using our naturalist skills including using our 5 senses (touch, taste, smell, hearing, seeing) to compare and contrast our temperate forest ecosystem with the tropical rain forest ecosystem.

Second, we will learn about the different layers of a rain forest including the forest floor, the understory, the forest floor, the forest canopy, and the emergent layer.

Third, we will learn about how different types of amphibians, including frogs, toads, and salamanders are uniquely adapted to live in different layers of the rain forest.

We are now going to transport ourselves into a tropical rain forest ecosystem. Using our five senses, we are going to compare and contrast the rain forest ecosystem with the temperate rain forest ecosystem that we live in. Can someone remind me of what our 5 senses are?

Take responses from students

That's right, our five senses are taste, touch, small, sight, and hearing. Right now, take 30 seconds to make quiet observations about the environment outside of the Tropical Rain Forest Exhibit.

Wait 30 seconds

[Go into Tropical Rain Forest vestibule]

Now, that we're inside, take 30 seconds to make quiet observations about the environment inside of the Tropical Rain Forest Exhibit.

Wait 30 seconds

With a quiet hand, please share me one difference that you notice between the inside exhibit and the outside of the exhibit.

Take responses from students

That's right, there are many differences between the inside of the exhibit, which represents a tropical rain forest ecosystem, and the outside of the exhibit, which is our temperate rain forest ecosystem.

The tropical rain forest is more humid than the temperate rain forest. That means that the air is more wet. Having greater humidity means that it rains more often, even more often that it does in Seattle!

The tropical rain forest is also warmer. On average, the tropical rain forest is 64º F or higher.

Because the tropical rain forest is warmer and wetter than the temperate rain forest, it has a lot of biodiversity. That means that a lot of different type of plants and animals can make find a habitat, or home, in the tropical rain forest.

Hold up forest layer visual have students write in notebooks.

The Tropical Rain Forest exhibit was designed to feel like we are walking through different layers of the forest. The four layers of the forest are called the forest floor, the understory, the canopy, and the emergent layer. The plants and animals of the rain forest have special adaptations that allow them to live in different layers of the forests. As we go through the exhibit, we'll learn about some of the adaptations that amphibians have for living in the different forest layers.

[Enter the exhibit]

The beginning of this exhibit is designed to feel like the forest floor. Some characteristics of the forest floor is that is soft, warm, wet, and dark. Scientist, why do you think it is dark on the forest floor?

Take responses from students

That's right, the trees in the emergent layer and canopy block the sun from reaching the forest floor, making the forest floor dark.

There are many amphibians use the forest floor as their habitat, including the Leaf Litter frog. On the forest floor, the leaf litter frog meets its needs for (refer to card)

Hold up visual for forest floor. Have students write in journal.

The leaf litter frog has a special adaptation that helps it survive in its habitat on the forest floor. Can anyone guess what that adaptation is by looking at this picture?

Take answers from students

Excellent ideas. This frog is camouflaged to look like a dead leaf.

Walk over carpet and stop at wood, before you reach the poison dart frogs

We are leaving the forest floor and are going into the forest understory. The understory has more light and is drier than the forest floor. Because it gets more sun and has less water, different types of amphibians use the understory as their habitat.

Hold up visual for understory. Have students write in journal.

One type of amphibian that uses the understory as its habitat is the climbing salamander. In the understory, the climbing salamander meets its needs for (refer to card)

The climbing salamander has a special adaptation that helps it to survive in its habitat in the forest understory. It is camouflaged to be light on its belly and dark on its back. Can anyone guess why it has this type of coloration?

Take answers from students

Great ideas scientists! When an animal is light on its belly, predators that hunt from the ground think that the animal is sunlight and predators that hunt from above think that the animal is a shadow.

There's another very special amphibian in that lives in the forest understory that we have in this exhibit. However, it does not have camouflage. Try to find the amphibian. When you do, make a guess as to why it is not camouflaged.

Stop at poison dart frogs and have students make observations

Does anyone know what this animal is?

Take answers from students

Great ideas! It is a poison dart frog. Does anyone know why this poison dart frog is not camouflaged?

Take answers from students

The poison dart frog has bright colors to let every predator in the forest know that it has poisonous toxins in its skin.

[Stop at canopy]

Hold up canopy visual, have students write in journal

We are leaving the forest understory and are going into the canopy. The forest canopy has more light than the forest floor and the forest understory. It also has the greatest biodiversity- it has more plants and animals living there than any other part of the forest. The red-eyed tree frog uses the forest canopy to meet its needs for (refer to card)

The red-eyed tree frog has a special adaptation for living in the forest canopy, can anyone guess what it is?

Take answers from students

That's right! The red-eyed tree frog is bright green to hide in the leaves. It also has sticky cups on its feet that it uses to climb high up in the canopy.

The next place we're going to go represents the emergent layer of the forest. In the emergent layer, it is the hottest and the sunniest. It also has many predators that amphibians avoid like hawks, bats, and snakes. Therefore, no amphibians live in the emergent layer. However, there are lots of birds! As we walk through the aviary, take a few minutes to make silent observations about the birds in the aviary.

Give expectations for the aviary- be silent, don't play with the wood curtain, it may rain!

[Walk into aviary and make observations]

Circulate among students

[Leave the aviary to debrief outside of the dome]

Great job scientists, turn to the person next to you and share 3 things that you learned about or observed in the Tropical Rain Forest Exhibit.

Students talk

Thanks for all those wonderful ideas!

TEMPERATE WETLANDS TOUR & EXPLORATION (15 MINS)

Guiding Question: Could amphibians meet their needs in the Temperate Wetland exhibit?

Before entering the exhibit (near cranes), review what students know/remember about wetlands from the Outdoor Exploration at their school. As needed, help reinforce key ideas:

- **Wetland:** an area that is filled or soaked with water for all or part of the year.
- Includes marshes, swamps, bogs, fens
- Wetlands are home to many plants and animals (including amphibians). Over 200 species in Washington call our wetlands home!
- Wetlands are important because they are habitat for many species, clean and filter water, and reduce flooding by soaking up and holding water.

We will be entering our temperate wetlands exhibit, which is similar to many wetlands we have here in Washington state. In this exhibit, there are free-roaming birds so there are a few things to remember:

- We will enter through two doors, please only open one door at a time so birds do not escape.
- Please stay on the path and use walking feet.
- Give the animals space and do not chase them.

OPENING SENSORY ACTIVITY

After entering the wetland, have students gather together for a quick observation activity.

Welcome to the temperate wetland! This exhibit resembles wetlands that you might see right here in Washington state! To start our time here, let's practice using our observation skills. Close your eyes and we'll spend one quiet minute seeing what we notice.

Students close eyes and spend one moment standing still, listening and observing.

After one minute, have students open their eyes and look around at what they notice.

Have students share their observations with a partner.

PACIFIC TREE FROG EXHIBIT ASSESSMENT

Excellent work! Thanks for sharing those observations. Many of you noticed some of the different species of birds here. There are many different species of wetland birds, and this exhibit has been designed to meet their needs.

Do you remember what the four basic needs that animals need to find in their environment?

Take answers from students. Prompt as needed to get the four basic needs: food, water, shelter, space

That's right. Whether its animals in their habitat, or animals here at the zoo, all animals need to have food, water, shelter, and space. Here in the temperate wetlands, keepers make sure that every species of bird has what it needs.

When we did our Outdoor Exploration, we learned about the Pacific tree frog (*hold up Pacific tree frog poster*) and what it needs in its habitat to survive. Can anyone remember what the Pacific tree frog needs in its habitat for food?

Students share answers. Repeat with water, shelter, and space. If students do not seem to remember, encourage them to look back at their notes from the habitat assessment and/or review the four basic needs and how the tree frog meets them with the poster.

Your challenge today, is to conduct a habitat assessment of the temperate wetlands exhibit to see if it could provide suitable habitat for the Pacific tree frog. Just like at your schoolyard, we will be looking for things that could provide Pacific Tree Frogs with the food, water, shelter and space they need.

Let's set up our notebooks to record our observations.

Have students create a table across two pages to record their observations for each of the basic needs.

Food	**Shelter**
Water	**Space**

Review expectations for activity:

- Remain on the path
- Walking feet
- Give animals space
- Observe with eyes and ears only.
- Remain in the temperate wetlands (do not exit either door)

Release students to look for Pacific tree frog habitat needs in the temperate wetlands with their chaperone groups. Circulate among groups to help provide guidance and encouragement.

Gather students back together. *Have groups share out what they found in each of the habitat need categories.*

Have small groups discuss their overall thoughts on the suitability of the habitat for amphibians. Remind students that they may be left with unanswered questions (e.g. due to the season) and to have them think about what other information they could gather to help answer those questions.

Great job on your observations and teamwork scientists!

WOODLAND PARK ZOO

Educational Visit Registration Form

Registration Procedures

1. Fill out the registration form. Telephone registrations are not accepted. Questions? 206.548.2424 x2 or schools@zoo.org.
2. Get your application in early! Three weeks' advance notice is required for booking your zoo visit.

1st choice	2nd choice	3rd choice
Day of Week M T W TH F SA SU	Day of Week M T W TH F SA SU	Day of Week M T W TH F SA SU
Date / /	Date / /	Date / /

Please fill in:
Number of Students: _____ Number of Adult Chaperones: _____ Number of Classes: _____ Grade Level: _____

Chaperones must stay with their students at all times (regardless of student age; chaperones must be over 21 years of age). Required ratio is 1 chaperone for every 6 students.

Please provide a brief statement about how your zoo visit supports your school/program's learning goals:

_____

_____

_____

_____

Learning Experiences at Woodland Park Zoo
No preregistration required for programs. Space is available on a first-come, first-served basis.

- **Ambassador Animal Program 10:30 a.m. (15 minute program)** *www.zoo.org/file/AAProgramforschools.pdf*
  The Nature of Growing Up: October 4 – November 16, 2018, Thursdays and Fridays
  Small Creatures, Big Tales: March 1 – April 30, 2019, Tuesdays, Thursdays and Fridays
- **Daily Programs and Activities**: *www.zoo.org/today*.
- **Educator Resources and Downloadable Zoo Visit Activities:** *www.zoo.org/education/teacher-resources*.

School Name	School Phone ( )
Contact Teacher	Email
☐ Public ☐ Private ☐ Homeschool	
District	County
School Address	
City State	Zip

Please read and sign this form. Applications cannot be accepted without both signatures. By signing below, I agree to hold our school to Woodland Park Zoo's rules of conduct:

Teacher Signature
Date
Principal Name
Principal Signature
Date

WOODLAND PARK ZOO

Mail this form to:
Woodland Park Zoo
5500 Phinney Ave. N.
Seattle, WA 98103
or fax 206.547.3553
or scan and email to:
schools@zoo.org
Telephone registrations are not accepted.

Updated Sep 2018

ZOO VISIT FAQ

ADMISSIONS AND ENTRY

How many chaperones do I need?

The zoo requires one adult (21 years or older) chaperone for every six students, regardless of age. Chaperones must stay with students during the entire zoo visit, and must supervise the group's conduct at all times.

My students are older. Do I still need to have one chaperone for every six students?

Yes. Chaperones are an important part of field trip learning and all groups through preK-12th grade must have a minimum of one adult chaperone for every six students.

Where should we arrive and enter?

Please enter through the South Entrance located off 50th and Fremont Avenue.

What will I need at the admissions gate?

- Your confirmation letter (attached to your confirmation email)
- The total number of students in your group
- The total number of adults (including teachers and one-on-one aides)
- Payment: cash, check, credit card or Purchase Order. Payment must be made in one transaction to receive the education rate.

What is the cost for each student and adult?

There are two different rates available to education groups with reservations, depending on the time of year. Rates listed below are per person, ***including students, adults and educators***.

September 1 – March 31: $6.75

April 1 – August 31: $9.50

Why do I need two count totals (students and adults) if they are all the same price?

These two counts help us ensure that you have a minimum of one adult chaperone for every six students. The total of adults is also needed to ensure that every adult receives a chaperone sticker (their proof of payment and ticket into the zoo).

What if some of my students and/or chaperones have zoo memberships?

Make a copy of each membership card, and note on the copy how many family members for each membership are in your group (e.g. 1 child, or 1 child, 1 adult if both the student and named adult on the membership are on the field trip). Memberships are good for the immediate family members only. We cannot accept Microsoft Prime Cards, Entertainment Coupons, the Seattle Public Library Pass Program, or Discover tickets for discounted school group admission.

Can I use guest passes?

If families are willing to give you their guest passes, you can use them to help with admission payment. Present the zoo guest passes to the cashier with your payment.

Will we get zoo maps when we arrive?

No. In order to keep school group admission costs down and reduce resource use, we do not provide maps to school groups upon arrival. Please print the needed number of copies of our school group map (attached to your confirmation email) and provide them to your chaperones. For paperless map options, we recommend that you and your chaperones take a photo with a smartphone of the large sign of our zoo map near the entry upon arrival, and/or download our Woodland Park Zoo app to help you navigate and interact with the zoo during your visit.

PARKING

Where can chaperones park?

The closest parking lot to the South Entrance is the Hippo parking lot, which is entered from 50th and Fremont. However, on busy days this lot may fill up and additional parking can be found in the Flamingo parking lot, entered from 50th and Phinney. After parking, chaperones can walk through the War Memorial Park to meet your group at the South Entrance.

Where can busses park?

Limited bus parking is available in the Hippo parking lot near the South Entrance for $18.00 + tax and free bus parking is available in the Lower Woodland parking lot. Please note that we cannot guarantee bus parking availability in the Hippo parking lot. If we are unable to accommodate your bus in this lot, we will direct your bus driver to the nearby Lower Woodland parking lot where they can park for free.

How much is parking? How do we pay for parking

Car parking (anything that fits in a standard parking spot) is $6.00 + tax and bus and other oversized vehicle parking is $22.08 ($18.00 + tax). If chaperones drive, they can pay for their parking at kiosks in the lot, or you can include parking fees with your admission payment by telling the cashier the stall number(s).

LUNCHES & SNACKS

Are there lockers to store our lunches?

We do not have lockers or lunch storage space available. You are welcome to bring your own lunches and eat them in any public eating area, but your students and chaperones will need to carry the lunches.

Where can we eat our lunch and/or snack?

There are a variety of indoor and outdoor places where groups can eat snack and/or lunch, indicated on the school groups map. Covered options include the Rainforest Food Pavilion, Peacock Plaza (near rhinos) and the North Picnic Shelter.

ON-GROUNDS ACTIVITIES

Can we visit Zoomazium?

Zoomazium is a nature play space for families with children ages 8 and under. Chaperones are required to have no more than three children with them, and must supervise them closely to ensure their safety. There are also Outdoor Nature Play Spaces available in Family Farm, the Habitat Discovery Loop and near Banyan Wilds.

What is Quarters for Conservation?

Quarters for Conservation is a way for you to choose which or our conservation partners you want to support. Your token represents 25 cents of your admission fee. Request tokens for each member of your group from the Guest Services locations near the South and West entrances of the zoo.

What programs are available on-grounds?

Throughout the year, there are different activities and programs occurring on-grounds for you and your students to attend during your visit. To see the full schedule of programs, please visit: https://www.zoo.org/today. Check program boards near the entrance when you arrive for the most up-to-date information on programs available that day.

Do you have resources I can use to connect our field trip to classoom curriculum?

Yes. We have a variety of resources including self-guided tours, inquiry-based activities and scavenger hunts available here: https://www.zoo.org/resources.

CHAPERONE INFORMATION

Thank you for being a chaperone for our field trip! Your first priority is the student group that you are with – these students need your full attention. You are responsible for their safety and for ensuring that they have an enjoyable, engaging learning experience. To this end, we **strongly recommend that you not bring younger siblings** along on your field trip, and that you refrain from using your cell phone during your zoo visit. **It is required that you stay with your group at all times.**

Your students are:

1. _____ 2. _____

3. _____ 4. _____

5. _____ 6. _____

Please review with your students before you arrive at the zoo:

Animal Viewing tips:

- Be patient, look all around the exhibit (up, down, by bushes, etc.)
- Use quiet voices. Loud noises sometimes make the animals nervous.
- If an animal is not visible, it may be temporarily inside or sleeping. Check back a little later during your visit.

Zoo Do's – and a Few Don't's!:

- DO have a great time!
- DO understand that animals need rest and privacy – just like humans. All animals have access to off-exhibit areas and may not always be visible. Check back later.
- DO help us keep the zoo clean by placing all litter in trash receptacles and recycling.
- DO stay on visitor pathways. Watch children at railings and fences! Zoo animals are wild animals, not pets. Their exhibits are designed to protect both you and our animals.
- DON'T feed the animals! Zoo animals are fed a carefully balanced diet.
- DON'T bring radios, skateboards, balls, balloons, Frisbees, scooters, or skates for your safety and the well-being of the animals.

Lunch and Departure Information:

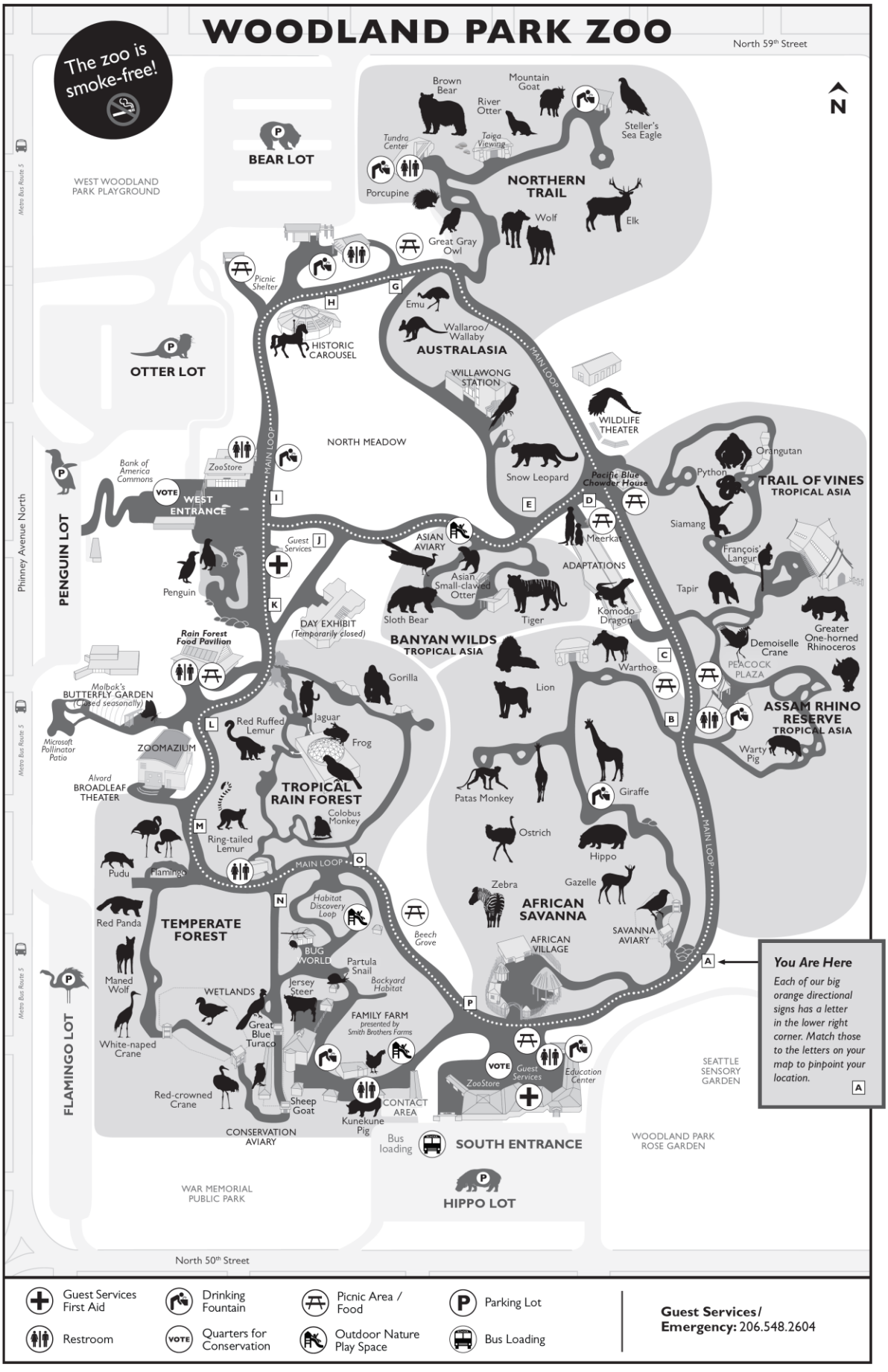
Lunch Location = Departure Location =

Lunch Time = Departure Time =

Zoo Visit Tips:

- Programs are frequently offered at various places at the zoo. Check the kiosk as you enter the zoo to see if there are some programs you and your students want to attend.
- **Zoomazium** is a nature play space for families with children ages 8 and under. Chaperones are required to have **no more than three children** with each adult in that building and must supervise them closely to ensure their safety. Other Outdoor Nature Play Spaces are available in Family Farm, the Habitat Discovery Loop and near Banyan Wilds.
- **Quarters for Conservation** is a way for you to choose which of our conservation partners you want to support. At either Guest Services location, you are welcome to request one free voting token per person in your group. These can be used at the voting kiosks located at the West and South Entrances of the zoo.
- **First Aid** and **Lost & Found** are located at Guest Services (206.548.2604) by the South and West Entrances. If you have questions or need assistance, please do not hesitate to ask zoo staff.

5500 Phinney Ave N, Seattle, WA 98103 | ph 206.548.2555 fax 206.547.3553 | www.zoo.org/education


WOODLAND PARK ZOO
The zoo is smoke-free!
North 59th Street
N
BEAR LOT
WEST WOODLAND PARK PLAYGROUND
Brown Bear
Mountain Goat
River Otter
Steller's Sea Eagle
Tundra Center
Taiga Viewing
Porcupine
NORTHERN TRAIL
Wolf
Elk
Great Gray Owl
Picnic Shelter
Emu
Wallaroo/ Wallaby
AUSTRALASIA
HISTORIC CAROUSEL
OTTER LOT
WILLAWONG STATION
MAIN LOOP
WILDLIFE THEATER
NORTH MEADOW
Bank of America Commons
ZooStore
VOTE
WEST ENTRANCE
Snow Leopard
Pacific Blue Chowder House
Orangutan
Python
TRAIL OF VINES TROPICAL ASIA
Siamang
Meerkat
ASIAN AVIARY
Guest Services
ADAPTATIONS
François' Langur
Asian Small-clawed Otter
Tapir
Penguin
PENGUIN LOT
Sloth Bear
Tiger
Komodo Dragon
Greater One-horned Rhinoceros
Rain Forest Food Pavilion
DAY EXHIBIT (Temporarily closed)
BANYAN WILDS TROPICAL ASIA
Demoiselle Crane
Warthog
PEACOCK PLAZA
Gorilla
Lion
Malbak's BUTTERFLY GARDEN (Closed seasonally)
Red Ruffed Lemur
Jaguar
Frog
ASSAM RHINO RESERVE TROPICAL ASIA
Warty Pig
Microsoft Pollinator Patio
ZOOMAZIUM
Alvord BROADLEAF THEATER
TROPICAL RAIN FOREST
Colobus Monkey
Patas Monkey
Giraffe
Ring-tailed Lemur
Ostrich
Hippo
Pudu
Flamingo
MAIN LOOP
Zebra
Gazelle
Habitat Discovery Loop
AFRICAN SAVANNA
Red Panda
TEMPERATE FOREST
Beech Grove
SAVANNA AVIARY
AFRICAN VILLAGE
BUG WORLD
Partula Snail
Backyard Habitat
Maned Wolf
Jersey Steer
WETLANDS
FAMILY FARM presented by Smith Brothers Farms
Great Blue Turaco
White-naped Crane
FLAMINGO LOT
Red-crowned Crane
Sheep
Goat
Kunekune Pig
CONTACT AREA
Guest Services
Education Center
ZooStore
SEATTLE SENSORY GARDEN
CONSERVATION AVIARY
Bus loading
SOUTH ENTRANCE
WOODLAND PARK ROSE GARDEN
WAR MEMORIAL PUBLIC PARK
HIPPO LOT
North 50th Street
Phinney Avenue North
Metro Bus Route 5
You Are Here
Each of our big orange directional signs has a letter in the lower right corner. Match those to the letters on your map to pinpoint your location.
A
Guest Services First Aid
Drinking Fountain
Picnic Area / Food
Parking Lot
Restroom
Quarters for Conservation
Outdoor Nature Play Space
Bus Loading
Guest Services/ Emergency: 206.548.2604

E4: PREPARE SHARING SOLUTIONS PROJECTS

Location: Classroom

Schedule: After zoo visit, prior to Sharing Solutions project presentations

Timing: Multiple class periods for research, generating solutions, determining best fit solution, reviewing solutions and revising proposal and presentation based on feedback and preparing final projects.

Note: Individual classes and students may need differing amounts of time to complete the steps. The outline below is intended to provide a sense of the overall process, rather than a detailed lesson plan for each section. Preparing for Sharing Solutions presentations is not necessarily a linear process and students may go back to do additional research and revisit solutions several times before selecting the best fit solution.

OVERVIEW

After processing the problem, students have further explored amphibians, field methods and conservation through their own research, Outdoor Exploration and zoo visit. At this point, the focus of the project moves to generating possible solutions, determining a best fit solution supported with evidence and preparing projects to share their solution and PBL process.

FORMING STUDENT GROUPS

It is up to each teacher to determine the size and total number of student groups. We recommend groups of 2-5 students, but you can determine what structure will best meet your needs for this project.

GENERATING SOLUTIONS & DETERMINING BEST FIT SOLUTIONS

Research

- Students conduct additional research as needed about local amphibians and wetlands (habitat, needs, challenges, possible conservation solutions etc.). A graphic organizer for students to track their sources and record notes is included on **p. 48.** A list of some research resources can be found on **p. 58**.

Generate possible solutions

- Student groups should brainstorm possible solutions, aiming to have two or more solutions per group. Solutions should take the constraints and factors generated by the class during “Meet the Problem” into consideration. A graphic organizer for students is included on **p. 49**.
- These solutions should include reasonable suggestions for helping amphibians survive and thrive in their community. Encourage students to focus on actions that they could do themselves.
- Generating solutions may require students to do additional research to identify or learn more about possible solutions. See the RSD teacher website and suggested resources in this guide.

Choose Best Fit Solution

- Student groups should consider the possible solutions they generated and determine which solution is the “best fit” solution. A graphic organizer for students is included on **p. 50**.
- Remind students to return to the problem statement, as well as the constraining factors to help them make an informed decision. Students may use the “Considering Possible Solutions” graphic organizer to help organize and clarify their thinking about the pros and cons of their potential solutions.
- These group discussions can provide a rich opportunity for student discussion and engagement with CCSS ELA Speaking and Listening standards.
- Providing students with sentence starters or stems for discourse may help ensure these discussions are productive and focused.

Develop a Claim-Evidence-Reasoning statement for their Best Fit Solution

- Student groups explain their choice of best fit solution using a Claim-Evidence-Reasoning structure. A graphic organizer is included on **p. 51** for students to use.
- Encourage students to include reasons that address the constraints identified during the "Meet the Problem" sessions.

SHARING SOLUTIONS PRESENTATION PREPARATION

Student groups should prepare both visual and oral presentations of their solutions and PBL journey to share with the class. Plan on having each group having 10 minutes to share their solution - this includes 5 minutes of presentation and 5 minutes of questions about their project.

Format suggestions for Sharing Solutions (will take approximately 50 minutes of class time). Select the format that will work best for your students and for the total number of groups you have in the class.

- Groups present their solutions one at a time in front of the rest of the class
- Student groups are stationed around the room with their presentation materials, and take turns rotating to hear from other groups

Student Project Format:

The format of the final project is an opportunity for students to students to leverage their strengths and showcase their talents. KSD has provided a number of project format options for students to share their solutions in a fun, age-appropriate way. Student projects should aim to include the above components, but can be supplemented by student presentations and explanations as needed to include all components.

Encourage students to select a format they are excited about from the list below:

Advertisement: Create an advertising campaign to promote your proposed solution.

Booklet: Create an informational booklet outlining your PBL process.

Brochure: Create an informational bi-fold or tri-fold informational brochure.

Collage: Create a collage or collection of images related to yoru topic. Images can be hand-drawn, printed, and/or clipped from a magazine of newspaper.

Comic strips or books: Create an illustrated comic strip or book representing events in the PBL.

Flowcharts: Create a flowchart analyzing and representing events in the PBL.

Newscasts: Deliver important information about your PBL in a news program format.

Poems and raps: Write a poem or rap about your PBL.

Scrapbook: Create a scrapbook covering events and information from the PBL.

Skit: Create a short skit covering events and information from the PBL.

Storyboard: Create a storyboard to summarize evnets and information from the PBL.

To support students in preparing high-quality presentations, provide students with the student-friendly presentation checklist (**p. 52**). It is based on a rubric that can be used to review student projects. This (**pp. 53-54**) is not intended for use by students in preparation or self-assessment of their projects.

Student presentations should include the following components (see Student Presentation Checklist p. 52):

- **Clear statement of problem:** Presentations should include students' problem statement about amphibian conservation in Washington State. A suggestion for the format of the problem statement is "How can we (state task) in such a way that we consider (state factors)?"
- **Information gathering:** Data collection should be appropriate and complete, using information from multiple credible sources. This may include include information from the Outdoor Exploration and Zoo Exploration.
- **Determining solutions:** Students should share multiple solutions that they considered, including the solution they determined was the best-fit solution.
- **Evidence for choosing the Best Fit Solution:** Students explain their choice of best fit solution and the evidence supporting their choice. The solution should include reasonable suggestions for helping amphibians survive and thrive in their community.
- **Viability of solution:** Student solutions should demonstrate consideration of factors such as feasability, ethical considerations and accuracy of the information presented.

Information gathering

Data collection should be appropriate and complete, using information from multiple credible sources.

Information	Source

Determining Solutions

Student groups should share multiple solutions they have considered. Afterwards, the group must decide on a "best fit" solution.

Team member's name	Their solution

Considering Possible Solutions

Problem statement:_____

_____

_____

Our constratining factors are….	Solution 1 _____ _____ _____ _____	Solution 2 _____ _____ _____ _____	Solution 3 _____ _____ _____ _____
Factor 1:_____ _____			
Factor 2:_____ _____			
Factor 3:_____ _____			
Factor 4:_____ _____			
Pros – What are strengths or benefits of this solution? 			
Cons – What are challenges or problems with this solution? 			

Evidence for Choosing the Best Fit Solution

Student explains why they chose a solution and provides evidence for the choice. The solution should include reasonable suggestions for creating better habitat for amphibians in schoolyards, backyards and/or community.

Claim (solution):

Evidence and Reasoning

Evidence and Reasoning

Evidence and Reasoning

READY, SET, DISCOVER

SHARING SOLUTIONS

Student presentation checklist

CONTENT

- ☐ We shared our problem statement about amphibians in Washington.
- ☐ Our problem statement included **two or more** factors or constraints.
- ☐ We shared two connections between amphibians and other ecosystem parts (plants, animals or the environment) that help amphibians survive.
- ☐ We shared **two or more** possible solutions we considered to solve this problem.
- ☐ Our best fit solution included a way that we could help Washington amphibians.
- ☐ We explained why this solution would work the best using evidence from our research Outdoor Exploration and Zoo Exploration.
- ☐ We explain if our project would be easy or hard to do and how it might help or harm people and wildlife.
- ☐ We shared the **3 or more** sources where we got our information (such as names of books or websites)

DELIVERY

- ☐ We presented our ideas in order, so they were clear to the listener.
- ☐ We provided evidence to support our ideas.
- ☐ We shared responsibility for the presentation, so every group member got to talk about part of the project.

WILD WISE: READY, SET, DISCOVER

SHARING SOLUTIONS

Presentation Rubric

Date: **Interviewer:** **Teacher/School:** **Group:**

Problem Statement:

Prompts	2 - Meets Expectations	1 - Approaching Expectations	0 - Below Expectations	Total
Clear statement of problem				
• What problem did you focus on for your project? • What factors (e.g. benefit for wildlife, cost) did you consider?	❒ Problem statement clearly identifies an issue relevant to both local amphibians and local ecosystems.	❒ Problem statement identifies an issue relevant to **either** a local amphibian or the local ecosystem.	❒ Problem statement not included **or** problem statement identifies an issue that is not relevant to either a local amphibian or a local ecosystem.	
	❒ Included **two or more** factors/constraints.	❒ Included **one** factor/constraint.	❒ Factors or constraints not included.	
	❒ Demonstrated an understanding of: ❒ **2** connections between amphibians and other ecosystem components (plants, animals, environment) that help the amphibians survive. ❒ Human impacts on the ecosystem	❒ Demonstrated limited understanding of **either**: ❒ **2** connections between amphibians and other ecosystem components (plants, animals, environment) that help the amphibians survive. ❒ Human impacts on the ecosystem	❒ Understanding of ecosystem connections not addressed	
Information gathering				
• What resources did you use for your research? • Why did you select those resources? How did you know they were high quality resources?	❒ Presented information derived from **3 or more credible sources.** ❒ 1 ❒ 2 ❒ 3 ❒ 4	❒ Presented information derived from 1-2 sources **or** included a source that is not credible.	❒ Outside sources for information were not used.	
Determining solutions				
• Did you consider any other solutions?	❒ Generated **two or more** possible solutions to meet the criteria and constraints of the problem. ❒ 1 ❒ 2	❒ Generated **one possible** solution to meet the criteria and constraints of the problem.	❒ Solutions not included.	

Prompts	2 - Meets Expectations	1 - Approaching Expectations	0 - Below Expectations	
Evidence for choosing best fit solution				
• Did you consider any other solutions? How did you determine this was the best one? • How will your proposed solution benefit local amphibians?	❒ Included one or more general suggestions for habitat improvement **with clear explanation** of the benefit for the focal species.	❒ Included general suggestion**s** for habitat improvement **without clear explanation** of the benefit for the focal species.	❒ No suggestions for habitat improvement included.	
	❒ Supported their choice of solution through a combination of evidence from all **3** of these: ❒ their research ❒ Outdoor and Zoo Explorations ❒ prior knowledge	❒ Supported their choice of solution through a combination of evidence from 1-2 of these: ❒ their research ❒ Outdoor and Zoo Explorations ❒ prior knowledge	❒ Evidence for choice of solution absent.	
Viability of Solution				
• Is your solution something that you could do? How did you consider how easy or hard it would be? • Does your proposed solution help or harm wildlife or people? • Is your proposed solution supported by your research?	❒ Project shows consideration of **two** of these factors in developing their solution: ❒ feasibility ❒ ethical considerations ❒ accuracy of information	❒ Project shows consideration of **one** of these factors in developing their solution: ❒ feasibility ❒ ethical considerations ❒ accuracy of information	❒ Did not explain how these factors were considered in development of the solution.	
Scientific Communication & Collaboration				
• How did you divide up the work between team members? • How did you decide who did each part of the project?	❒ Shared responsibility for completion of the project with **all** team members.	❒ Shared responsibility for completion of the project with **some** team members.	❒ Responsibility was not shared equally (one or two team members completed most of the work).	
	❒ Communicated effectively as scientists: ○ ideas with supporting evidence ○ logical order to presentation ○ ideas support problem statement	❒ Communicated somewhat effectively as scientists: ○ ideas with some supporting evidence ○ order of presentation was sometimes confusing ○ ideas somewhat support the problem statement	❒ Did not communicate effectively as scientists: ○ ideas were unclear ○ order of presentation was confusing ○ ideas did not support the problem statement	
Total Points	**Final Score Key: [0 – 9] Below Expectations [10 - 15] Approaching Expectations [16 – 20] Meets Expectations**			

E4: SHARING SOLUTIONS PRESENTATIONS

Location: Classroom (or other school space)

Timing: 50-minute class period

Sample learning target: Scientists and engineers share their work and use reasoning to communicate persuasively about their ideas.

OVERVIEW

The Sharing Solutions presentations provide students with an opportunity to share their PBL process, proposed solution, and supporting evidence. Students share projects through a combination of an oral presentation and visual means of their choice.

PRESENTATION DAY SUGGESTIONS

- Consider inviting guests, such as family members, other school staff, and/or other classes to hear student presentations.
- Before guests arrive, determine student presentation order (if presenting to the whole class) or where groups will be stationed, so groups can prepare.
- Provide listeners (including students) with sentence starters or possible questions they might ask of student groups.

DEBRIEF THE PROBLEM

Location: Classroom

Timing: 30-minute class period

Sample learning target: At the end of a project, I reflect on how the project went, what I learned, and skills I have gained.

OVERVIEW

Following the Sharing Solutions presentations, this debrief session allows students to reflect on what they have learned through RSD and going through the PBL process. This is an opportunity to help students make explicit connections from this experience to what they are learning and celebrate personal and group accomplishments.

REFLECTION QUESTIONS

1. Describe your response to the problem when you first learned about it. What were you thinking and feeling?
2. What were some of the most interesting discoveries you made during this project (about the project, yourself, etc.)?
3. What was your biggest success during this project? What did you do to be successful?
4. What part did you enjoy the most? What about that part did you enjoy?
5. What was your most challenging moment? How did you handle the challenge?
6. How did you and your partner/group work together? How did you deal with disagreements?
7. What can you do now that you didn't think you could do before?
8. What questions do you have now?

NOTES

- You may choose to have students journal individually on suggested topics and/or other reflective questions you create prior to small group and/or whole class discussion.
- Encourage students to begin with these topics, but not be limited by them. They may have other reflections or learning and should be encouraged to bring their new thinking to the discussion.

READY, SET, DISCOVER KITS

OVERVIEW

The Ready, Set, Discover kits were developed to help support your students' learning and provide tools for outdoor explorations. The tools selected are examples of scientific tools that can be used to increase observation skills and familiarity with data collection. The kits can be used in your schoolyard or when visiting a local park.

Below is a list of the contents, as well as some suggestions for how materials may be used. This is by no means a complete list. The hope is that students not only learn traditional uses of these tools, but employ them in new and creative ways much like professional scientists. Science is an ever-evolving field filled with ingenuity and we encourage you to foster this mindset with your students.

READY, SET, DISCOVER KIT CONTENTS

Field Guides

- Trees and Shrubs of Washington
- Insects of the Pacific Northwest
- Rocks and Minerals
- Birds of Washington State **or** Birds of the Puget Sound
- Urban Wildlife
- Scats and Tracks of the Pacific Coast
- "Quick-Guide" Local Rocks of North America
- "Quick Guide" Local Tracks of North America
- Amphibian reference book

Optical Equipment

- Private Eye magnifying loupes (labeled in cases)
- Bushnell (8 x 21) binocular in case
- Triumph Eagle Optics (8 x 25) binocular in case

Photography Equipment

- Digital camera (including SD card and case)
- 4 AA rechargeable batteries and charger
- SD card reader **or** download cord

Measuring Equipment

- Calipers
- Measuring tape

Other Materials Included

- The Private Eye activity packet
- Forest in a Box
- Plant press
- Woodland Park Zoo backpack

USING FIELD MATERIALS

Field guides: The field guides included in the kit are resources that will be useful in identifying different biotic and abiotic elements of ecosystems, such as wetlands.

Loupe magnifying lenses and binoculars: The loupes (magnifying lenses) and binoculars can be used to develop observation skills at a micro and macro level. These perspectives on the world help young scientists realize that there are many organisms and objects that play a role in an ecosystem that we do not always see. Students can identify, list and draw what they see to better understand the world around them. We have included a loupe activity sheet to show one way to use these tools.

Calipers: Calipers are amazing measurement tools that allow you to take both internal (top measurement jaws) and external (bottom measurement jaws) of an object. Students can use these to measure natural objects they find in their schoolyard or backyard.

Forest in Box: The collection of plant (flora) and animal (fauna) specimens were selected to help students become more familiar with their local forest ecosystems. By learning about the smaller organisms around us and the roles they play, we develop increased respect and can help protect them. Students can also learn how these flora and fauna are important to native amphibians, thus bringing them closer to solving the problem they have decided to try and address.

Plant press: Plant presses are great tools for collecting small samples of dead and down plants for further investigation and identification. The presses that are included in the kit are able to press small and large items. Pressings can be used during research presentations or, after use for this project, used for art displays that tell the story of Washington wetlands and our native amphibians.

FURTHER RESOURCES FOR FIELD INVESTIGATIONS

Pacific Education Institute (PEI)

https://pacificeducationinstitute.org/work/#guides

PEI offers several guides for educators on field investigations and science learning outdoors. Activities in guides such as the *Field Investigations with NGSS*, *Schoolyard Biodiversity Investigation Educator Guide*, and *Fostering Outdoor Observation Skills* contain activity guides and suggestions for outdoor investigations that could be used along with the RSD kit.

Beetles – Science and Teaching for Field Instructors

http://beetlesproject.org/ (see "For Classroom Teachers" tab)

BEETLES (Better Environmental Education, Teaching, Learning & Expertise Sharing) is devoted to creating:

- versatile environmental education professional learning materials;
- student activities for use in the field;
- a collaborative, resource-sharing network of environmental educators; and
- additional resources for field instructors, leaders, and classroom teachers.

All BEETLES resources are based on current research and understandings about how people learn, and tested by dozens of programs in diverse settings all over the country (and beyond!). Although BEETLES materials have been designed for residential outdoor science schools, they've been snatched up and used successfully in a wide variety of outdoor science education settings.

STUDENT RESOURCES

Amphibians and Reptiles of Washington (Burke Museum)
http://www.burkemuseum.org/blog/curated/amphibians-reptiles-washington

Short blog posts written in a fact page style about amphibians and reptiles found in Washington state. Information includes classification, what they look like, where they live, breeding, cool biology facts and threats. Advanced scientific vocabulary is used on some individual species pages.

Do you know how an amphibian grows?/Sabes como crece un anfibio?
English: https://www.aza.org/assets/2332/do_you_know_how_amphibians_grow_english.pdf
Español: https://www.aza.org/assets/2332/sabes_como_crece_un_anfibio_espanol.pdf

Cut and paste activity sheet showing the stages of frog life cycles.

Amphibian Facts Wheel
English: https://www.aza.org/assets/2332/ranarueda_english_version.jpg
Español: https://www.aza.org/assets/2332/sabes_como_crece_un_anfibio_espanol.pdf

Fact wheel that can be assembled and has eight question and answer facts about amphibians.

Ways to Help Frogs (Association of Zoos and Aquariums)
https://www.aza.org/assets/2332/top_8_ways_to_help_frogs.pdf

From the materials produced by the Association of Zoos and Aquariums Year of the Frog in 2008, this one-page handout shares eight actions to help frogs.

Amphibians (National Geographic)
http://kids.nationalgeographic.com/animals/hubs/amphibians/

A collection of National Geographic resources including videos and fact sheets on amphibians around the globe. Includes a fact sheet and short video (1:44) on American bullfrogs.

Amphibians: Facts (Idaho Public Television)
http://idahoptv.org/sciencetrek/topics/amphibians/facts.cfm

Website with general information about amphibians including adaptations, diet, and threats. Species information focuses on species in Idaho.

Animal numbers are shrinking, but kids can help (Washington Post, 2014)
https://www.washingtonpost.com/lifestyle/kidspost/earths-animal-populations-are-shrinking-fast--but-kids-can-take-action-to-help/2014/10/13/061ecb90-4d65-11e4-8c24-487e92bc997b_story.html?utm_term=.966b7f8170f5

A KidsPost article on global wildlife declines emphasizing the importance of citizen science and kids taking action to protect the environment.

Pond Ecosystem Simulation (Explore Learning – Gizmos)
https://www.explorelearning.com/index.cfm?method=cResource.dspDetail&resourceID=664

Explore the effect of dissolved oxygen on fish. Build on the field experience of testing for dissolved oxygen.

TEACHER RESOURCES

All About Amphibians (Burke Museum)
http://www.burkemuseum.org/blog/curated/all-about-amphibians
Short articles on general amphibian topics including general information about frogs and salamanders, where amphibians live, and threats to amphibians.

Amphibians (Encyclopedia of Life)
http://eol.org/info/amphibians
Background information for educators about amphibians and similarities and differences with reptiles.

Amphibian Ark
http://www.amphibianark.org/
Variety of amphibian resources including conservation information and educational resources

AmphibiaWeb
http://amphibiaweb.org/
Database of amphibian species information and educational resources

- Video about amphibians with a catchy song! (7,000 Kinds of Amphibians)
  http://amphibiaweb.org/about/singasong.html

Global Amphibian Bioblitz (iNaturalist)
www.inaturalist.org/projects/global-amphibian-bioblitz
Contribute your photos of amphibians along with the dates and locations where you observed them from anywhere in the world:

Reptiles & Amphibians Teacher Packet (Woodland Park Zoo)
Introduction

Background

Glossary and Resources

Activities

Conservation Links

Washington Department of Fish and Wildlife:
Backyard Wildlife Sanctuary Program: Detailed information on creating ponds and maintaining birdbaths:
http://wdfw.wa.gov/living/backyard
Living with Wildlife (section on frogs under Reptiles and Amphibians): http://wdfw.wa.gov/living/species/
Report wildlife observations http://wdfw.wa.gov/viewing/observations/sgcn/

Washington Herp Atlas (WA Natural Heritage Program, WA Dept. of Fish & Wildlife, U.S.D.I Bureau of Land Management)
http://www1.dnr.wa.gov/nhp/refdesk/herp
Species fact sheets on Washington's amphibians (and reptiles!)

GLOSSARY

Vocabulary with an asterisk is also key vocabulary for the FOSS Living Systems module.

Abiotic: something that was never alive, such as water or rocks.

*** Adaptation:** a structure, feature, or behavior that helps an organism survive and/or reproduce

Amphibian: cold-blooded vertebrates that live part of their lives in water and part on land

Biotic: something that is or was alive.

*** Carnivore:** an animal that eats other animals

Camouflage: the natural coloring or patterning of an animal that allows it to blend in with its surroundings

Conservation: the management of natural resources, including wildlife and habitats, to sustain resources for the future. Preservation, protection and wise use can all be a part of conservation practices.

*** Ecosystem:** a community of organisms interacting with each other and with the nonliving (abiotic) environment.

Ectothermic (cold-blooded): animals that use heat from their environment and behavior to control their body temperature

Endangered: a species or population that is in danger of extinction if no actions are taken to protect the species.

*** Food chain:** a description of feeding relationships between organisms in an environment

*** Food web:** a diagram showing the feeding relationships between organisms in an ecosystem. Arrows show the flow of matter and energy from one organism to another.

Habitat: place where an animal lives.

*** Herbivore:** an animal that eats plants.

Introduced species: an organism that has been transported to and established a population outside of its native range.

Invasive species: an introduced species that rapidly populates and expands its range in an area and causes or is likely to cause harm to the economy, environment, or human health.

Native species: species that originated or occur naturally in a certain area; species that have not been moved from one area to another by humans.

*** Nutrient:** a chemical in food that helps keep an organism alive and active.

*** Oxygen:** a waste gas produced by plants during photosynthesis. Oxygen is used by all plants and animals during cellular respiration.

Permeable: allowing liquids or gasses to pass through it

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

Prey: an animal that is eaten by other animals.

Vertebrate: an animal with a backbone

Warm-blooded (endothermic): animals that produce their own body heat, independently of outside temperature

Watershed: a basin-like landform defined by high points and ridgelines where water drains off into a body of water.

Wetland: an area of low-lying land with shallow water or soggy soil for at least part of the year.