Discover Our Place: What's in Your Watershed?

90 minutes

Program Description:

Students will learn to examine exhibit space and artifacts to learn about the Grand River Watershed and some of the special species that call this place home. We will focus on the distinction between native and invasive species as well as the issues facing threatened and endangered species in the region, namely threatened wild rice and lake sturgeon and endangered snuffbox mussels.

What content standards align with this program?

NGSS Disciplinary Core Ideas:
ETS1. Engineering Design
LS1. From Molecules to Organisms: Structures and Processes
LS4.. Unity and Diversity
ESS2. Earth's Systems
ESS3. Earth and Human Activity

NGSS Science & Engineering Practices
Asking Questions and Defining Problems
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information.

Museum Program Strand:

Empower individuals to use observations and inquiry to understand arguments and design creative solutions.

This program is aligned with the following Museum Learner Outcomes:

Holders of Foundational Knowledge	Masters of Fundamental Literacies	Creative Thinkers and Doers	Generous Collaborators for Tough Problems	Learners For Life	
X	X				

What will students know and be able to do after completing this program?

-Describe a watershed and the interconnections of species in that area, including how native and invasive species interact and impact each other.
-Understand the possible reasons that species become threatened and how human actions play a role.
-Closely observe exhibits to analyze risks organisms face in their environments.
-Think critically to propose solutions to mitigate the risks against threatened and endangered species.

What questions will students answer?

-What organisms live in our watershed that we need to help protect?
-What is a watershed?
-What is a habitat?

-What is the difference between native and invasive species?
-How do certain species become threatened or endangered? Further, how might we help protect them?
-What is already being done to restore populations of threatened and endangered species?

Materials List and Setup:

Great Lakes Watershed map
Grand River Watershed map
Sturgeon scute
Wild rice bag
Wild rice poster
Snuffbox mussel shells
Student handout
Clipboards
Pencils

Program Activities:

1. Introduction: Set expectations and discuss program objectives
2. Instructor leads discussion to draw out student conceptions about program content (i.e. scientific observation, watershed definition, native vs. invasive species, threatened and endangered species)
3. Student inquiry in Wetland habitat: Students imagine they are an organism living in a swamp habitat. They will be prompted to observe and read about potential causes that might lead swamp organisms to become threatened or endangered. They will use observations of the habitat, the text, and their critical thinking skills.
4. Student inquiry in lake habitat: Students will be prompted to look for evidence of damage that might be happening to aquatic lake species.
5. Student inquiry in Grand Fish, Grand River exhibit.
6. Takeaway Message/Wrap up

1. Introduction in habitats
    a. Introduce myself and my role at the museum
    b. Set expectations for the program
        i. Raising hands to answer questions. Program is best when we hear from everyone
        ii. Compromise: I promise to give you plenty of room to explore, if you promise to give me your attention back when I ask for it
    c. Focus of the program: **What organisms live in our watershed that we need to help protect?**
    d. Give instructions to go into the next room, clip a worksheet onto clipboard and take a spot on floor facing the forest habitat display.
2. Fur traders Room
    a. I work with Dr. Ogren at the museum. She is the museum's scientist. **Close your eyes and picture: What do you think a scientist really does? What is their job like?** She is an ecologist
    b. Science as observation and as detective work. Claim, evidence, reasoning.
    c. This program is called "What's in your Watershed?" so **I guess I should start by asking you...what is a watershed? What does it sound like?** *All of the land area that drains to a particular body of water.*
        i. Show map of Michigan watersheds. We are in Great Lakes Watershed: relate to definition--land draining.
        ii. We are in the Lake Michigan sub-basin or sub-watershed of the Great Lakes Basin/Watershed
        iii. **What is the big river that runs by this museum?** *We are in the Grand River watershed.*
            1. Look at map. --Lansing, Grand Haven
        iv. Share metaphor of sharing your bathtub with **871,335** people b/c that's how many live in the watershed!
        v. What are the possible good and bad things about sharing your watershed with so many people?
        vi. Think of if somebody in Lansing who shares your watershed spills a ton of oil on the ground. **What will happen to that oil?** *It'll make it's way to your home!!*
    d. **Who can tell me what a habitat is?** *An area where an organism lives*. MAKE A CONNECTION TO THE INTERCONNECTION OF WATERSHEDS AND THE HABITATS WITHIN!
    e. What is the name of the habitat we are in now? *Forest.* **Would a forest habitat like this be considered part of our watershed?** *Yes! Rainfall would make its way to our Grand River and eventually to Lake Michigan*
    f. There are many different types of species in this habitat. **Who knows what a native species is?** *A species that is natural to the environment or habitat….has been there a very long time.*

g. **Does anybody know what the opposite of a native species might be then?**
    i. Invasive species! *Brought into the area and have taken hold and expanded their range, becoming an issue to native wildlife*
h. Other important terms:
    i. Extinct. **Has anybody seen the movie ice age?** *Wooly mammoth, sabre tooth tiger.*
        1. **Dinosaurs? Anybody seen any dinosaurs walking around lately?**
    ii. Endangered….there's a chance it can go extinct throughout all of its habitats or a significant portion of those.
    iii. Threatened...there is a good chance it can become endangered. Population is low and must be monitored
i. We will talk about three species of concern in our watershed. **How do you think these certain species become threatened or endangered? Further, how might we help protect them?** Be thinking about these questions throughout the program.
j. Send students to the wetland exhibit. **Try to imagine you are an organism living in a swamp habitat. Think about what types of things might lead you to become threatened or endangered! Use observations of the habitat, the text, and your critical thinking skills! When done, come back into this room and we will share our results!**

3. Wetland Habitat
    a. **What habitat are we in?** *Wetland, marsh, swamp*
    b. **How is it different from the forest habitat we were just in?** *Wet, water, different plants, water type organisms*.
    c. **Okay, what organisms did you find that you think depend on healthy water in the watershed the most and why? Remember to use some evidence that made you think this way.**
    d. Direct their attention to plants too! There are different species of turtles and ducks, right? We also have different species of plants that can also be native or invasive.
    e. **Reasons a plant might become endangered?**
        i. Outcompeted by other plants--other plants grow and take up too much of its space
            1. Purple Loosestrife and cattails
            2. My example of how I studied spotted knapweed releasing killing chemicals through roots
        ii. Human overharvesting and more
    f. I will show you an example of a plant that is threatened in Michigan. Remember that that means close to endangered Pass around the wild rice. **Can anyone raise a hand and tell me what this is? Make sure to fill it in on your worksheet!**

i. Show picture of Native Americans harvesting wild rice. Talk about the importance of wild rice for native american food source and cultures.
    1. Talk about their technique for harvesting in canoes with long poles to just swipe the grains off the top.
ii. **Reasons wild rice becomes threatened?** Review, remember wild rice is a plant...The rice we eat is actually the seed of the plant.
    1. Pollution, change in ecosystem temperature, land use, too many houses, boats, invasive species!
    2. Animals destroying it: **Has anybody seen swans on water with pretty orange beaks?**
        a. Mute swan example of invasive animal that is greatly harming wild rice. The native swan (trumpeter swan) eats wild rice but just eats the seeds off the top of the plant. The mute swan rips the whole plant out. Adult mute swans consume large quantities of these plants (about four to eight pounds per swan per day) and often uproot more plants than they actually consume.
            i. Mute swans feed primarily on aquatic plants such as pondweed, coontail, waterweed, wild rice and wild celery.
        b. The first pair of mute swans was introduced from Europe into Michigan in 1919...now Michigan has the highest numbers of mute swans in North American. There are over 15,500 of these invasive swans.

g. How do you think we can help protect the threatened wild rice? *Planting, protect rivers and lakes, reduce pollution, remove invasive species.* Native Americans are working hard to revive the wild rice population.

h. Send them to the lake exhibit---**Look for examples of damage that you think might be happening to aquatic lake species. Think like a detective scientist! Be ready to share what observations or information helped you answer the question.**

4. Lake Habitat
    a. Okay your job was to search to find evidence in this exhibit of damage that is happening to aquatic lake species. **What did you find?** Think like a scientist detective.
        i. Human fishing--hooks and fishing lines! Human pollution--maybe garbage thrown into the lake habitat.
        ii. Zebra mussels and a sea lamprey**….how do you think they cause problems for native species? Use evidence from what is shown in the exhibit.**
            1. Zebra mussels colonize over surfaces and right on native mussels. They change the quality of the water in ways that wipe out the base of aquatic food chains and cause big algae blooms

that disrupt the habitat for other organisms. We bring these over on boats that we don't clean properly b/w bodies of water.
2. Sea lamprey attach to other fish and suck blood and other important body fluids from them. They feed mostly on large Great lakes fish like lake trout, brown trout, lake sturgeon, lake whitefish, ciscoes, burbot, walleye, catfish, Pacific salmonids like Chinook and Coho salmon and rainbow trout/steelhead.

iii. Chemicals

b. I'm sad to tell you that I have an example to share of an endangered species in our watershed. **Do you remember what the definition of an endangered species was?** *The population is close to extinct and we need to work hard to protect it.*
   i. Pass around snuffbox mussel
   ii. This is a freshwater mussel. It's small-to-medium-sized with yellow, green, or brown shells with green rays/blotches/lines. Females are traingular in shape and the males have an ovate shell shape. Male shells are almost 3 inches and females are 1.8 inches. They are found in small to medium creeks with swift currents. Female eggs must attach to gills or fins of specific host fish to complete development.
   iii. Snuffbox mussels are native AND endangered. How many do you think we have left in the Grand River?
      1. Scientists recently did a sampling of snuffbox mussels here and found only 5 individual mussels!
   iv. Why endangered?
      1. Sensitive to pollution and they are sedentary
      2. Need specific host fish to carry its babies in its gills.
      3. Invasive zebra mussel!
      4. Dams disrupt stream flow and change the water temperature
   v. **How to help?** Improve surface lands for the mussels and do your part to reduce pollution.
c. Before leaving the lake exhibit introduce the last 'special species' of the program, lake sturgeon.
d. Send students to sit in the lake sturgeon exhibit facing the fish tank. **As you walk over look at the tall ruler on the wall outside the entryway to the exhibit. That is how big a lake sturgeon adult can grow to be!**

5. Lake Sturgeon Exhibit
   a. Give a couple minute description of lake sturgeon
      i. Sturgeon grow to be 7 feet tall! And can weigh 200 pounds
      ii. Live 150 years
      iii. They are North America's largest fish.
      iv. They have whisker-like tactile organs near their mouth called barbels that help locate prey (bottom-living food like snails, clams, fish eggs)

v. Often called a living fossil, part of fish family that's lived over 135 million years, since dinosaurs existed.
vi. **Where do you think these sturgeon spend most of their lives? Lake or river?**
vii. Live in lake Michigan but they come up to the river in springtime to spawn (**What does spawn mean?**) *Lay eggs*.
viii. H**ow many do you think we have left spawning in Grand River?** *~30-50*

b. As I said, these sturgeon are threatened! This exhibit explains a bit about how important the sturgeon are historically and how they're important to Native Americans. It also describes a bit about how they've been harmed and how people are planning to restore the sturgeon in our watershed.
c. **Scientists do not only rely on direct observation--they also need to be careful researchers and readers. A lot of their experimentation and observation is validated with research. So we will practice that skill in this exhibit today.**
d. Give five minutes to explore and answer questions on the worksheet
e. Come back and face the tank to discuss questions
    i. **Why did their population go down?**
        1. Overharvesting for caviar
        2. Habitat destruction, logging
            a. deforestation= sediment in water causing blockage
            b. Dam=Barriers to migration, fish ladder helps. Can sturgeon use fish ladder? *No, only salmon.*
        3. Pollution, chemicals in water
        4. Invasive species=round gobies eat the eggs, sea lamprey
        5. Intially they were overfished because they damaged fishing gear
    ii. **How were they used historically by native americans?**
        1. Food
        2. Inspiration for artwork
        3. Stories
    iii. **Why do lake sturgeon have bony plates called scutes on their bodies?**
        1. For protection
    iv. **How do you think scientists and the public are trying to help lake sturgeon?**
        1. Streamside rearing, hatcheries
        2. Education and outreach
        3. Don't harvest fish/eggs
        4. stewardship/recovery
f. Pick one of the species we talked about and share something you could do to help protect it

6. Takeaway Message/Wrap Up (Very Variable for time)

a. What are the 3 special threatened/endangered species we discussed in this program?
b. What was your favorite thing we looked at?
c. What was the most interesting/surprising/important thing you learned?