RIVERS ARE ALIVE

Educator's Program Guide

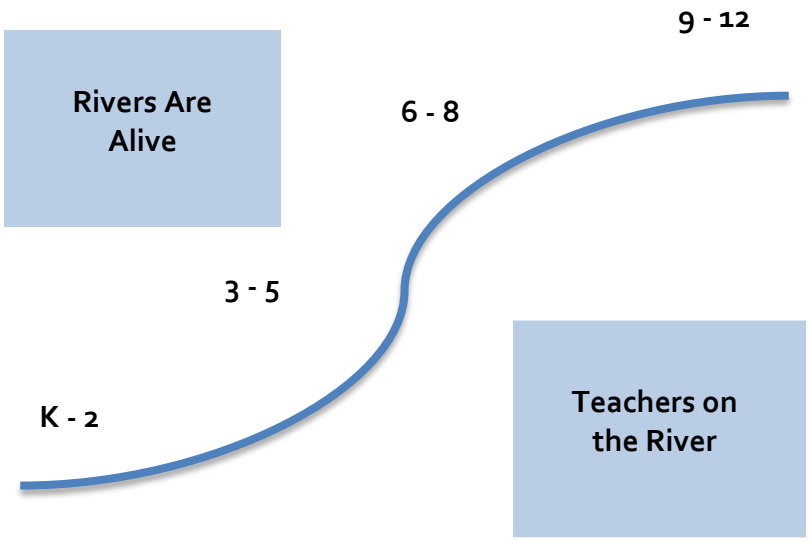
The St. Croix National Scenic Riverway is a complex system of interconnected habitats that support many forms of plant and animal life. The river is affected by human activities.

NATIONAL PARK SERVICE

St. Croix River ASSOCIATION

TABLE OF CONTENTS

Rivers Are Alive is a **K-12 environmental education program** offered in partnership by the St. Croix National Scenic Riverway, a unit of the National Park Service and the St. Croix River Association. Our **whole school model** connects students and teachers at all levels in a **learning progression** that offers engaging, **standards aligned,** student centered science and social studies activities. We believe in the benefits of **reconnecting with students at each grade level** to provide a holistic approach to watershed education throughout their career so that **Rivers are always alive** and present in their learning. We also believe in **empowering educators** to be river and watershed experts through valuable **on-river workshops and training**.



The BIG IDEAS behind Rivers Are Alive

- There is a National Park in our backyard called the St. Croix National Scenic Riverway.
- A National Park is land that is so important and special that it is protected by our Federal government.
- Rivers are the heart of a watershed and we all live in a watershed and are connected by them.
- Many people care for rivers as part of their career.
- Rivers sustain a variety of life as they drain, interact with, and change the landscape they run through.
- Humans have and do influence rivers.
- We can all care for the rivers in our communities and the watershed we live in.

Rivers Are Alive Objectives and Outcomes

Throughout their school career, students will:

- Explore how their communities are connected to rivers;
- Identify and explain their connection to these rivers;
- Define what a watershed is and discover their place in the watershed;
- Comprehend and explain the importance of protecting rivers;
- Describe the richness and diversity of animal life under the surface of the rivers;
- Discuss the variety of adaptations that aquatic animals have that help them to survive in a river environment;
- Become scientists, do science and share ways that scientists study the rivers;
- Explore the terrestrial resources of the national park and demonstrate how forests contribute to water quality;
- Discover and describe how people have changed the rivers and how the rivers have impacted local culture;
- Learn about and list threats to the river and understand the implications of these threats; and
- Participate in service and stewardship projects.

LETTER FROM SUPERINTENDANT

LETTER FROM SCRA EXECUTIVE DIRECTOR

St. Croix River
ASSOCIATION

BECOME A JUNIOR RANGER

PROGRAM TYPE : ECOLOGY

Grade Level : 3 – 5 Site : Classroom or Visitor Centers

ESSENTIAL UNDERSTANDING

You don't have to wait to grow up to be a Park Ranger; the National Park Service Jr. Ranger program welcomes all young stewards to participate and protect our wild places.

BIG IDEAS

- National Parks are scenic or historically important areas of countryside protected by the federal government for the enjoyment of the general public or the preservation of wildlife.
- The National Park Service manages and protects the Riverway for future generations to enjoy.
- Park Rangers have the important job of educating the public about our National Monuments and Parks in order to inspire people to care for and protect these special places;
- A Jr. Park Ranger is a program by the National Park Service to inspire young people to become stewards of all of our wild places, including National Parks.

LEARNING TARGETS (Students will be able to…)

- Describe what a National Park is;
- State in their own words the role of the National Park Service and a Park Ranger; and
- Give one example of how they will carry out the role of a Jr. Ranger in their own community.

ACADEMIC CONTENT STANDARDS

MN Science Standards

3.1.1.1.1, 3.1.1.2.1, 3.1.3.2.1, 3.4.1.1.1, 3.4.1.1.2 , 5.4.1.1.1 , 5.4.2.1.1

MN Social Studies Standards

3.1.1.1.1, 3.1.4.6, 3.3.1.1.1, 3.4.1.1.1, 3.4.2.5.1

WI Science Standards*

C.4.1, F.4.4

WI Social Studies Standards*

A.4.4, A.4.7, B.4.7

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- White board, dry erase markers and eraser
- Jr. Ranger booklets (one for each student)
- Lifejackets of various sizes
- Jr Ranger badges
- Jr Ranger certificates

BIG NEW WORDS

- Steward
- Riverway
- Jr Ranger
- Responsibility
- Lifejacket

ADAPTATIONS; for younger, older, ELL, and special needs students

- Younger students – If there are teachers who want to do this activity for students in grades K-2, communicate to the teachers what is involved and that students will need assistance with completing the booklets.
- Older students – There may be teachers who want their 6th or 7th graders to become Jr. Rangers; that's just fine. You might throw in some additional challenges for them.
- ELL – Send teachers booklets ahead of time so ELL students have some additional time to work through the booklet activities

CLASS PREP

- Request a list of all the students that are becoming Jr. Rangers from the
- Teacher/s ahead of time.
- Prior to going to their classroom or the students coming to the Visitor Center, complete an award certificate for each student.
- Kids can sit and listen for about the time that correlates to their age (i.e. a 1st grader who is 7 can actively listen for about 7 minutes- this caps at 12 minutes even for adult learners). Be sure to be concise in your explanation of concepts, since students will be so excited to be in a new environment with things to explore. Let their curiosity drive the lessons as much as possible (while also bringing it back to the essential understanding, big ideas and learning targets).

SAFETY STUFF

- There are no major safety concerns for this activity

10 MINUTES TO TEACHING

- Be sure you have enough booklets and pencils for each student
- Ask the teacher for the completed certificates
- Sign all of the certificates
- Count out enough badges for each student

INVITATION (10 min; 17 extra min needed for VC Video)

1. Gather the students outside the Visitor Center, greet and welcome them, and introduce yourself.
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. Walk and Talk: Have the students walk and talk with a partner to the VC movie room about the following questions:
   a. What is a National Park?
   b. Have you ever visited a National Park, such as Yellowstone or the Grand Canyon? If so, which one/s?
   c. What do you think it means to be a National Park?
4. Allow a few students to share what they heard their partner share and discuss their responses.
5. Ask the students what National Park they think is the closest to where they live?
6. Did they know they are actually in a National Park right now (If at one of the Visitor Centers)? Did you know there is a National Park in your backyard (if at a school)? Yep, just like Yellowstone and Yosemite.
7. Show students a map of the St. Croix National Scenic Riverway to show them how big it is and how many communities border it.
8. Share how the SACN came to be designated a unit of the national park system and its significance as a National Wild and Scenic Riverway or if they are at the Visitor Center, you could show them the film.

CONCEPT INVENTION (10 min)

1. Remember that one thing we are learning about today is what Park Rangers do; think about some questions you might have for a Park Ranger.
2. Park Rangers take care of our National Parks. How do you think they do this?
3. Park Rangers where uniforms so they are easily identified by park visitors.
   a. If a Park Ranger is giving the program, they will be in uniform.
   b. If a Park Ranger is present, this is the perfect time for them to greet the students and speak with them about their job.
   c. If a Park Ranger is not present, show student a ranger hat, ranger badge and image of a Park Ranger.
4. Allow students to ask the Park Ranger some questions.
5. Introduce the Jr. Ranger program, explaining that many National Parks have these programs.
6. Point out what a big deal and responsibility it is to be a Jr. Ranger and how important it is to the Park.

EXPLORATION (20 min)

1. Hand out Jr. Ranger booklets to each students, along with a pencil.
2. Explain the process – they will complete ten activities total (Jr. Ranger booklet activities, Nature Explorer's Bingo, the Visitor Center Movie, and any other classes each count toward the ten activities), participate in the lifejacket activity, take a pledge to protect the Riverway, then they will be given a certificate and badge.
3. Give students 15 – 20 minutes to complete the Jr. Ranger booklet activities. They may work with a buddy or in small groups (no more than four students per group).
4. Lay some lifejackets of different sizes on the ground and ask for two volunteers. Explain to the volunteers that they need to find a lifejacket that fits and put it on properly.
5. Once they have the life jacket on, go through how to know if a lifejacket fits properly.
    a. Lifejackets are often called Personal Floatation Devices or PFD's.
    b. Lifejackets list what size/weight they fit on the inside.
    c. Once the lifejacket is put on you should not be able to lift the lifejacket to the ears; if you can it is not tight enough or it is too big.
    d. The life jacket should be comfortable.
    e. Remind everyone of the law (under 13 must wear lifejackets) and explain the lifesaving importance of lifejackets.
    f. Allow everyone to practice putting on a PFD.

APPLICATION (15 min)

1. Create an atmosphere of a ceremony when you are ready to designate the students as Jr. Rangers.
2. Review the booklet answers with them and have fun with it. Engage all students to increase participation.
3. When it is time for the pledge, have them put their hand over their hearts and take the pledge. Remind them how important the role of a Jr. Ranger is for the Riverway.
4. As a Junior Ranger, I _____, promise to protect and preserve the plants, animals, and history of the St. Croix National Scenic Riverway and to keep the air, water, and land clean. I will share what I have learned about National Parks with others and will continue to explore these national treasures.
5. Announce each individual student and have them come to the front of the class, hand them a certificate, badge shake their hand, and thank them for becoming a Jr Ranger.

REFLECTION (5 - 10 min)

Have the student's think, pair, share or journal on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF → As a newly appointed Jr. Park Ranger, what is the first thing you are going to do on the job?
- WORLD → What is the role of the National Park Service and a Park Ranger?
- OTHERS → How would you describe what a National Park is to someone unfamiliar with National Parks?
- THOUGHTS → What are you still wondering about?

CANOE CAMPING RACES

PROGRAM TYPE : HISTORY / CULTURAL

Grade Level : 3 – 5 Site : Namekago Visitor Center

ESSENTIAL UNDERSTANDING

Canoes have long been used for transportation on river highways throughout the Great Lake states.

BIG IDEAS

- Minnesota and Wisconsin have a long history of canoe culture because of the many lakes and rivers.
- Before the invention of trains and cars, canoes were used for hunting, fishing, travel and commerce on the river highways of the Great Lake States.
- Ojibwe people originally crafted birch bark canoes for their use, and for use by fur traders in the 1800's.
- The fur trade existed because of the popularity of the beaver hat in Europe.
- The Voyageurs were primarily French and British fur traders who would trade useful goods for beaver and other fur pelts with the Ojibwe people and other native tribes.

LEARNING TARGETS (Students will be able to…)

- Demonstrate familiarity with the parts of canoe and canoe paddle;
- Summarize the significance of the canoe in Minnesota and Wisconsin history;
- Describe the Ojibwe people's role in canoe and fur trade history; and
- Explain who the Voyageurs were and their role in the fur trade.

ACADEMIC CONTENT STANDARDS

MN Science Standards

3.1.1.1.1, 3.1.3.2.1,

MN Social Studies Standards

2.4.1.2.1, 2.4.2.4.1, 3.4.1.1.1, 3.4.2.3.1, 3.4.2.5.1, 5.3.4.10.1, 6.3.4.10.1, 6.4.4.16.1

WI Science Standards*

C.4.1

WI Social Studies Standards*

A.4.4, A.4.7, B.4.1, B.4.7, B.4.9

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- 4 canoes
- Paddles (Enough for each person)
- PFD's (Enough for each person)
- 4 Duluth packs (with a sleeping pad, tent, sleeping bag inside)
- Voyageur costume (toque, sash, shirt)
- Fur trade artifacts and images
- map of St. Croix river
- White board, dry erase markers and eraser

BIG SCIENCE WORDS

- Canoe (bow, stern, thwarts, hull)
- Paddle (blade, shaft, T-grip)
- Personal Flotation Device
- Duluth Pack
- Sleeping bag and pad
- Tent
- Voyageurs
- Ojibwe

ADAPTATIONS: for younger, older, ELL, and special needs students

- Younger students can practice holding paddles and paddling through air, and putting on their own PFD.
- Special needs students can participate up to their ability or interest. A child in wheelchair can carry a Duluth Pack in their lap to finish line.
- Teacher can list lesson plan on grade level website ahead of time to inform other teachers (ELL).
- Older students can be taught how to lift the canoe to portage on shoulders.

CLASS PREP

- List all pre-class materials to prepare and any set-up that needs to take place.
- Kids can sit and listen for about the time that correlates to their age (i.e. a 1st grader who is 7 can actively listen for about 7 minutes- this caps at 12 minutes even for adult learners). Be sure to be concise in your explanation of concepts, since students will be so excited to be in a new environment with things to explore. Let their curiosity drive the lessons as much as possible (while also bringing it back to the essential understanding, big ideas and learning targets).
- Teachers can use materials that they can gather on their own or contact the St. Croix River Association or the St. Croix National Scenic Riverway for material support. (See Background Information at the end.)

SAFETY STUFF

- It might be difficult for small children to carry a canoe. They can partner with stronger children. Be aware and monitor tent poles that could poke children. Have children set up tents ten feet away from each other. Trips and falls might be possible during a race.

10 MINUTES TO TEACHING

1. Find a spot where four canoes can be lined up and raced across a grassy area (i.e. the spot by the quarters in Trego).
2. Set the canoes up in a line.
3. Next to each canoe put a Duluth Pack stuffed with a sleeping bag, sleeping pad and the tent. Put two paddles and two PFD's in each canoe.
4. About ten yards away stretch out a rope to indicate the "finish line".
5. Make sure there are four adults ready and aware of instructions.

INVITATION (5 min)

1. Greet the group and introduce yourself.
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. Turn and Talk: Turn and talk to the person next to you about the following questions.
4. Have you been in a canoe or kayak? If not, would you want to? What do you think it would be like?
5. Allow a few students to share what they heard their partner share.

CONCEPT INVENTION (20 min)

1. (Minnesota / Wisconsin – depending on where you are) is home to thousands of lakes and many scenic rivers, which has resulted in a deep and rich canoeing culture.
2. Today, we primarily use canoes for recreation, so we are going to pretend that we are preparing to go on a canoe camping trip along the wild and scenic St. Croix River.
3. What would we need to bring?
4. Allow students to share some ideas and then introduce the key pieces of gear needed for our journey.
5. Introduce a canoe and the various parts of a canoe and their purpose (bow, stern, gunnels, thwarts, hull).
6. Introduce a paddle and show them the parts of a paddle (blade, shaft, T-grip) and demonstrate a basic paddle stroke.
7. Introduce a Duluth Pack and describe how it is used, how it is stored in the canoe and how it is carried.
8. Introduce the Duluth Pack; the tent, sleeping pad, sleeping bag and PFD (Personal Floatation Device or Life Jacket – the piece of gear that keeps us afloat if our canoe tips over).
9. Some of the gear you just learned about was used a few centuries ago as part of the fur trade.
10. Between 1600 – 1800, the highways were rivers; cars and trains were not yet invented. Introduce the idea that throughout human history, rivers have served as highways.
11. Introduce and explain who the Dakota, Ojibwe, the Voyageurs are, and their role in the Fur Trade. Explain how birch bark canoes were used as part of the fur trade. Define the word "portage".
12. Pass around fur trade artifacts, such as beaver pelts, a top hat, and images from the fur trade.
13. Introduce the Voyageur costume the purpose of each; the toque, sashes, and drop-sleeve shirt.

Exploration (25 – 45 min)

1. We are not only going on a canoe camping trip, we are going on a Voyageur style camping trip, which is a greater challenge!
2. Break students up into four groups; make sure each group has an adult.
3. Hand out an instruction sheet to the adult (see end of this document) and go over the rules for the Great Canoe Camping Race.
4. Each team must:
    a. Dress a team member up like a Voyageur
    b. Name at least two parts of the canoe and their purpose.
    c. Put on a PFD, sit in the canoe and do ten paddle strokes in unison (count out loud).
    d. Carry the gear (Duluth Pack with sleeping bag, sleeping pad; tent; paddles; and pfd's) across the finish line
    e. Portage (define the word portage) the canoe across the finish line
    f. Get inside
5. Let the Great Canoe Camping Race begin!
6. After the race, congratulate each team and allow each team to share what the experience was like. What was challenging? What was fun? What surprised them? What strategy would they use if they could do it again?

APPLICATION (5 min)

- Older students can be taught how to lift the canoe to portage on shoulders.
- Explain to students how the voyageurs would often travel many miles in one day across the Great Lakes or other large lakes in Minnesota or Wisconsin. In order to make better time and establish efficiency in the canoes, they would sing, which would help them to paddle together in unison.
- Teach the students a fur trade song, such as Alouette, and then allow each team to practice paddling in together in the canoes while singing.

REFLECTION (5 min)

Have the student's think, pair, share or journal on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF → What would have been challenging about working as a Voyageur?
- WORLD → What did you learn about the canoe and its significance in Minnesota/Wisconsin history?
- OTHERS → What was the role of Native Americans and Voyageurs during the fur trade?
- THOUGHTS → What are you still wondering about?

BACKGROUND INFORMATION

It is important to have some background knowledge of the Ojibwe people and the fur trade before teaching this class. Here are some recommended websites for learning more.

- Grand Portage National Monument - https://www.nps.gov/grpo/index.htm
- Minnesota Historical Society - http://www.mnhs.org/
- Wisconsin Historical Society - https://www.wisconsinhistory.org/
- Fort Folle Avoine - http://www.theforts.org/
- Northwest Fur Post - http://sites.mnhs.org/historic-sites/north-west-company-fur-post

DISCOVERY HIKE

PROGRAM TYPE : ECOLOGY

Grade Level : K - 5 Site : Any outside site with trails

ESSENTIAL UNDERSTANDING

We don't think much about how we use our five senses in daily life, but if we were an animal we would be acutely aware of how much we rely on our senses for survival.

BIG IDEAS

- We have five senses that we use repeatedly on a daily basis; sight, smell, taste, touch, and hearing
- Using our senses in nature can open our eyes to new experiences and give us a sense of how animals live and survive
- Animals rely on their senses to help them survive life in the wild

LEARNING TARGETS (Students will be able to…)

- List all five senses and give examples of how we use these senses in to make observations in nature;
- Give two examples of how two different animals rely on their senses for survival.

ACADEMIC CONTENT STANDARDS

MN Science Standards
0.1.1.2.1, 0.4.1.1.1, 0.4.1.1.3, 0.4.2.1.1, 1.1.1.1.1, 1.1.1.1.2, 1.1.3.1.1, 1.4.2.1.2, 2.1.1.2.1, 3.1.1.1.1, 3.1.1.2, 3.1.1.2.4, 3.1.3.2.1, 3.4.3.2.2, 5.1.1.1.3, 5.4.1.1.1, 5.4.2.1.1

Wisconsin Science Standards*
C.4.1, C.4.8, F.4.1, F.4.4

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- 2 paper or cloth bags of rocks of different sizes and textures
- Unnatural Trail Game - 20 unnatural objects
- Nature Explorers Bingo - Bingo sheets, pencils and clipboards
- Stalking Game - Blindfold
- Trail snack
- Pre-set deer shed – deer antlers
- White board, dry erase markers and eraser

BIG SCIENCE WORDS

- Unnatural
- Peripheral vision
- Photosynthesis
- Camouflage
- Predator
- Prey
- Habitat
- Ecosystem

ADAPTATIONS for younger, older, ELL, and special needs students

- For students with mobility issues, you need to make sure you will have a level trail
- Older students: The activities in this lesson plan are best for elementary students

CLASS PREP

- Scout the trail you will be using ahead of time, as well as the area for animal signs that you can either show the group or strategically guide them to discover
- Set up a pre-set deer shed along the trail for learners to discover
- Set up un-natural objects (toys) for un-natural trail game. Do this about one hour ahead of time. Objects should be in plain sight but can be behind them as they walk ahead. High on branches, down behind stumps, trunks, next to logs, in holes, etc.
- Put copies of Nature Explorer's Bingo and pencils on clipboard
- Kids can sit and listen for about the time that correlates to their age (i.e. a 1st grader who is 7 can actively listen for about 7 minutes- this caps at 12 minutes even for adult learners). Be sure to be concise in your explanation of concepts, since students will be so excited to participate. Let their curiosity drive the lessons as much as possible (while also bringing it back to the essential understanding, big ideas and learning targets).

SAFETY STUFF

- Learners will potentially be walking off-trail and on un-even surfaces; scout ahead of time for hazards and communicate clear boundaries to students for each activity.
- Students may ask about tasting and touching things in nature and for the most part they can touch anything; just scout for poison ivy ahead of time. Explain that you will have something for them to taste.

10 MINUTES TO TEACHING

- Make sure activity materials are ready to go and that you are prepared to keep track of time for each activity; this is a class with several activities that can go longer than you might expect.

INVITATION (15 min)

1. Seat the group in a circle on the ground
2. Intro: Greet and welcome students and introduce yourself
3. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
4. Today, we are going to become nature detectives. Before we do that, let's test out our observation skills with this fun sensory challenge.
    a. **Activity: One with the Rocks**
        i. Shut your eyes
        ii. Pick a rock out of the bag
        iii. Feel it carefully
        iv. Put it back and shake the bag
        v. Open your eyes, but without looking in the bag try to find your same rock
        vi. Can you find it in the bag with all the others?
        vii. Allow each student to test their skills (to save time; have two bags of rocks and send a bag around the circle in each direction)
        viii. What was that experience like? What did you notice about your observation abilities?
        ix. Allow a few students to share their experience out loud
5. **Turn and talk to the person next to you about what skills are required to be a good detective.**
    a. Right on! We need to put on our investigative goggles to better notice clues that will give us more information about what we are seeing in nature.
    b. Yes, we need to turn down the volume of our voices and turn on our keen sense of hearing so that we can better hear sounds that clue us into the life and activity of this ecosystem.
    c. We will get to touch some things, but I will let you know when it is okay to do so. When detectives investigate a crime scene they either do not touch evidence or they are very careful about handling evidence so they do not destroy clues to what happened.
    d. Do you smell that? Don't forget about using your sense of smell, which can also lead to important discoveries about what is growing and what is happening in this here.
    e. Do you have your thinking caps on? Detectives in books and movies and wear fun hats, don't they? Let's make sure we have our investigative hats in order to wonder and piece together the clues we discover today in order to make sense of what we are experiencing.

EXPLORATION (15 min)

Begin the Discovery Hike with the following observation activities that activate students' innate sense of discovery.

1. **The Un-Natural Trail**: need two adult volunteers: one @ beginning, one @ the end. Set up trail out of sight of those waiting before students arrive on-site.

    a. Give magnifying glasses to the adult at the end of the trail for students to use once they complete the un-natural trail activity while they are waiting for other to finish.
    b. Goal of the activity: How many unnatural objects can you observe and remember in a designated 30' stretch?
        i. What detective skills will need to rely on to successfully determine what belongs here and what does not?

c. One at a time send students down the trail. Space them out so they don't see the person ahead of them (because they point)

d. Use your investigative goggles to see how many "unnatural" objects (items that don't belong in nature) you notice along this trail. Don't tell anyone! Whisper how many "unnatural" objects you notice in my ear at the end.

e. 1st volunteer: Send one child at a time: "silently look all around while walking to where you are standing just out of sight." As one person finishes, another person starts.

f. Stand at end of the Un-Natural Trail. Ask each child how many unnatural objects they observed and send on to the 2nd volunteer, who will be waiting with magnifying glasses.

g. Wrap up: "raise your hand if you saw 3… 4… 5… 6… 7…"

h. Tell them how many there are: (20).

i. Why don't we see them?

   I. We need to make sure we are using our peripheral vision, something owls excel at doing.

   II. Owl Eyes: wiggle fingers with arms wide to show peripheral vision

   III. If you see something raise your hand

   IV. Look up. Look down. Look all around.

j. Have all the students line up in a single file on the trail and look again. Point when you see an object you did not notice the first time.

k. Once all of the unnatural objects are observed, have each student collect objects from the trail.

2. **I-Spy Activity**:

   a. Individual exploration with magnifying glasses

   b. Concept Invention (20 – 30 min)

CONCEPT INVENTION (20-30 min)

USE ANY COMBINATION OF THESE SENSORY ACTIVITIES

1. **Sensory Activities** "How many senses do we have?"

   a. Yes, we have five senses! We have already warmed up our sense of sight and touch, so let's test out some of our other senses starting with hearing.

   b. I'm thinking of an animal with big horns and a white tail and this animal has excellent hearing.

   c. Right! A white-tailed deer. Let's try practicing listening like a white-tailed deer.

      i. Cup your hands behind ears to improve hearing. Compare "on" and "off".

      ii. When do deer need to use their hearing?

      iii. Now, let's play a game to put deer ear hearing into practice.

2. **Stalking Game - blindfold**

   a. Create a large circle.

   b. Select one student to be the deer in the middle of the circle wearing a blindfold.

   c. Object: One at a time, you will select someone in the circle to be the hunting wolf. The wolf should silently sneak up and pick up a fawn (represented by a pinecone or a rock) in front of the blindfolded person in the middle.

   d. Everyone needs to be quiet for the deer to hear.

   e. If the deer hears a wolf and points at the wolf, they are out and need to sit down in the circle.

   f. Allow a few students to be the deer.

g. What was the experience like for both the deer and the wolves?

3. **Scent Trail**
    a. Wolves are an example of a Minnesota and Wisconsin mammal with a great sense of smell. Wolves' sense of smell is estimated to be 100 times stronger than that of humans.
    b. How do wolves and other mammals use their sense of smell?
    c. Our sense of smell might not be as strong as many of the animals living in these woods, but let's see how many scents we can pick up.
    d. Instruct learners to smell, but not touch various items they find along the trail.
    e. What does different tree bark and evergreen leaves smell like? Are there any wildflowers along this trail to smell? What else can they smell?
    f. They should keep count of the number of scents they are able to track and be ready to describe what the various aromas remind them of.
    g. Give the group boundaries for the activity, as well as five – ten minutes for scent tracking and then call them back together to debrief.
4. **Nature's Buffet**
    a. Living organisms need to eat, including plants! Plants are unique because they make food for themselves through photosynthesis (review with learners).
    b. Using all of our senses, let's see what we can find in nature's buffet.
    c. Can we see any signs of predation or browse by herbivores? (Point out deer browse)
    d. Can we hear any animals on the move today who might be hunting or potential prey?
    e. Do we smell anything that might attract an animal?
    f. After our exploration, we will enjoy a tasty snack!
    g. Give the group boundaries for the activity, as well as five – ten minutes for exploration and then call them back together for their snack which they can enjoy while you ask them what they observed.
    h. What sense are we enjoying now? TASTE!

APPLICATION (15 - 30 min or however much time you have left)

FINISH UP WITH ONE OR BOTH OF THESE ACTIVITIES

1. **Camouflage**
    a. Camouflage is a classic environmental education game and a student favorite.
    b. Did you see any animals? Are they here? So why can't we see them? (They're camouflaged!)
    c. You are going to try to camouflage yourselves from the owl (you). Tell the students when you yell camouflage and count to ten should go no more than ten steps from the trail and try to hide.
    d. Yell Camouflage!
    e. Turn from the group and slowly and loudly count to ten while they hide within ten steps of the trail
    f. Ready or not, I'm turning around
    g. How many kids can you spot while standing in one spot?
    h. Bring everyone back together to review their strategies and play another round.
2. **Nature Explorers Bingo**
    a. Nature Explorer's Bingo allows them to put all of their sensory skills to the test
    b. How many observations can they make within the time you give them by using all of their senses?
    c. Make it a fun and friendly competition!
    d. Allow students to work with a buddy or in small groups.

e. Hand out copies on clip boards with pencils.
f. Allow them some time to look around and check off items.
g. Review and discuss what they discovered.
h. Think, pair, share: What are examples of the living (biotic) and nonliving (abiotic) members of this forest ecosystem (community) that you discovered?
i. Why are both the living and nonliving members important?

REFLECTION (5 -10 min)

Have the student respond to these reflective questions using the Reflection Page:

MY RIVER CONNECTIONS TO…

- SELF → How did you use your senses today to make observations in nature?
- WORLD → What did your senses lead you to observe today that you maybe would not have noticed?
- OTHERS → What are two examples of how two different animals might use their senses for survival?
- THOUGHTS → What are you still wondering about?

HABITART

PROGRAM TYPE : AQUATIC

Grade Level : K - 5 Site : Classroom or Visitor Centers

ESSENTIAL LEARNING

Just like we have a home that provides shelter, space, food and water, there are tiny creatures who make their home in a stream or river; this habitat provides everything they need to survive.

BIG IDEAS

- A habitat is a home for a community of animals that provides everything needed for survival, including air, food, shelter, space, and water.
- A river or stream can be an ideal habitat for even the tiniest creatures.
- Macroinvertebrates are aquatic organisms without a backbone that we can see with our naked eye.
- We can help to keep habitat clean and healthy.

LEARNING TARGETS (Students will be able to…)

- Draw what habitat looks like for the tiny creatures who live in a river or stream;
- Compare the similarities and differences between our home and stream habitat;
- Observe and describe 2 – 3 interesting characteristics about macroinvertebrates;
- Provide an example of how we can help to keep stream and river habitat healthy.

ACADEMIC CONTENT STANDARDS

MN Science Standards
0.1.1.2.1, 2.1.1.2.1, 3.1.1.1.1, 3.1.1.2.1, 3.1.1.2.1, 3.1.1.2.4, 3.1.3.2.1, 3.1.3.4.1, 3.4.1.1.1, 3.4.1.1.2, 3.4.3.2.2, 5.1.1.1.3, 5.4.1.1.1, 5.4.2.1.1

MN Art Standards*
0.2.1.5.1, 0.3.1.5.1, 0.4.1.5.1, 4.1.1.5.1, 4.1.3.5.2 4.2.1.5.1WI Science Standards
C.4.1, C.4.2, C.4.8, F.4.1, F.4.4

WI Art Standards*
C.4.5, C.4.6, C.4.10, D.4.3, G.4.1, G.4.2, G.4.4, H.4.1, H.4.3, K.4.3

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- Blank paper (11x14)
- Markers, colored pencils or crayons
- White board, dry erase markers and eraser
- Digital cameras (SCRA)
- If gathering invertebrates, nets, tubs and location suitable for gathering invertebrates is needed.
- Tub or tubs of water for invertebrates
- Water windows for viewing
- Plastic jars
- Small magnifying containers
- Animal identification cards
- Invertebrates
- Aerators

BIG SCIENCE WORDS

- Microinvertebrates
- Habitats

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger: Let's make a picture of the animals. What do you see? What does the animal/s look like?
- Older: List the 4 things that make up habitat: space, food, water, shelter
- ELL: Inform ELL teacher of this activity ahead of this class and ask teacher or aide to review vocabulary and instructions
- Special needs: Based on needs and if assistant is available, offer any activity that can be performed i.e. viewing animals, painting, feeling water, hearing directions
- this art activity on the class website so others (ELL, special needs staff) can prep before class

CLASS PREP

This class can be a post-mucking activity.

- Review all pre-class materials to prepare and any set-up that needs to take place.
- Set up observation stations, just as you would for the mucking activity with bug boxes, digital cameras, and other tools for observing with the exception of the ID Guides. Initially, ID guides are not used to help build the mystery as to what these creatures are. ID guides can be brought out during the application section of the lesson plan.
- Kids can sit and listen for about the time that correlates to their age (i.e. a 1st grader who is 7 can actively listen for about 7 minutes- this caps at 12 minutes even for adult learners). Be sure to be concise in your explanation of concepts, since students will be so excited to participate. Let their curiosity drive the lessons as much as possible (while also bringing it back to the essential understanding, big ideas and learning targets).

SET UP

- Best times to gather invertebrates is May-Sept. 30. To get the most out of viewing invertebrates also see these companion lessons: Let's Go Mucking On Site; Let's Go Mucking (In River Experience), Let's Go Mucking (Off River Experience)
- If trained, anyone can find invertebrates if they know what to do. Call the RAA staff to learn how to gather invertebrates or to schedule for invertebrate and materials delivery for the lesson/s.
- RAA staff contact info: Jaime Souza, jaimes@scramail.com, 715-483-3300

- In order for students to study the animal, they need to see it for several minutes. The morning of or the night before RAA staff or a trained teacher would gather invertebrates and water into plastic tubs (20" x12"x 12") with aerators. 5--6 students per tub is good for viewing.

SAFETY STUFF

- RAA staff are knowledgeable about where and how to gather invertebrates safely. If teachers are trained they are aware of the safety concerns when near water. The art activity does not have inherent risks to safety.

10 MINUTES TO TEACHING

- RAA staff or teacher will need 10-15 time to bring in materials to class and set up.
- Desks need to be positioned to support 5-6 students viewing over 5-6 tubs of water with invertebrates.
- Clipboards, paper and markers
- Write these three observational strategies on whiteboard:
    a. I notice…
    b. I wonder…
    c. What does it remind me of?

INVITATION (TIME: 5 MIN)

1. Introduce yourself to the students.
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. Can anyone tell me if they know about a river nearby?
4. Turn and Talk: Turn and talk to the person next to you about a river or stream experience you have had in the past (i.e. in a boat, near the water, seen a fish or frog etc).
5. Ask 2-3 students to share out loud what they heard their neighbor share with them.

EXPLORATION (Time: 30 min)

1. Today, we are going to study some very small creatures that live in streams and rivers nearby. You will be given some time to make observations about these creatures, and then you will draw them in their habitat.
2. What is the definition of habitat? Right! A habitat is a home that provides an organism with everything they need to survive, such as food, shelter, space and water.
3. When we make observations, here are some good scientific strategies to use (point to strategies on whiteboard):
    a. I notice…
    b. I wonder…
    c. What does it remind me of?
4. Break students up into groups of 4 to 5.
5. Each group location will have a tub of invertebrates, a set of markers, and a set of colored pencils. You may want to put some of the more interesting invertebrates into the small magnifying glass jars beforehand, or have the students do this.

6. Inform the students that they have 15 minutes to observe the tiny creatures in the tubs with samples of the living and nonliving parts of their habitat, such as algae, plants, rocks, water and oxygen (quiz the group to see if they can actually identify these important habitat components).
7. They may use the bug boxes, containers, digital cameras and magnifiers to improve their observations.
8. After observation the students will select one or two of the creatures as inspiration for Habitat Art or Habit-Art.
    a. Many artists spend time in nature observing to inspire their artwork.
    b. Nature art can be used to give meaning to what we can observe in the natural world.
    c. They should create a piece of art that reflects the shape, movement, size and physical structures of the creatures in their aquatic habitat.
    d. Remind them to draw the details of the creature as accurately as possible and the various components of habitat.
    e. They have 15 minutes to complete their drawings.
    f. Once completed the student will write their name on the sheet and think about what they might want to share about their artwork with the rest of the class.

CONCEPT INVENTION (Time: 10 min)

1. Allow students to share their drawings and discuss the habitat they drew in more detail.
2. As each student is sharing, point out the visual art techniques used to create their habit-art, such as color, lines, textures, values, shapes and space. Point out to students that the techniques we use help to bring the artwork to life and help others to better understand the structure, life and habitat of these creatures.
3. Point out examples of air, food, shelter, space and water in their drawings.
4. **Think, pair, share:** What makes habitat healthy? What if air, food, shelter, space or water was missing from the river habitat?
5. Compare human habitat and the habitat of these stream creatures. How are they similar and how are they different?

APPLICATION (Time: 10 min)

1. Now, have the students analyze the body parts of the stream creatures they drew.
2. What did you notice that was cool, odd or funny about the creatures you observed?
3. What are you wondering about these creatures?
4. Did these creatures remind you of anything?
5. Consider writing the answers to these last three questions on a white board.
6. What body parts did your animal have in your drawing?
7. How is the animal's body part similar to other animals?
8. Are there any of these creatures that are similar or might be related based on our observations and drawings of their physical appearance? **Compare and contrast the creatures.**
9. How do you think the various body parts, the shape, and size of each of these creatures helps them to survive in their habitat?
10. I am now going to use a big science word to tell you what this group of creatures is called.
11. Say the word macroinvertebrate and have the students repeat the word after you.
12. Write the word macroinvertebrate on the white board and break the word in two, and have students assist with defining the word.

a. **Macro** – visible with the naked eye
b. **Invertebrate** – Without a backbone

13. Have the students feel their own backbones and then ask them what animals in a river or stream have a backbone?

REFLECTION (Time: 5 min)

Have the student's **think, pair, share or journal** on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF → What are two observations you made about a macroinvertebrate today?
- WORLD → How can we keep stream and river habitat healthy for the organisms who live there?
- OTHERS → What are two observations you made about a classmate's habit-art today?
- THOUGHTS → What are you still wondering about?

HANDS ON HISTORY - THE STORY OF THE ST. CROIX

PROGRAM TYPE : AQUATIC

Grade Level : 2 - 8 Site : Classroom or Outdoors

ESSENTIAL UNDERSTANDING

Special places, such as the St. Croix National Scenic Riverway, have been shaped over time by the animals, plants and people that have made their home here, as well as the natural and human caused events that have occurred throughout its history.

BIG IDEAS

- The St. Croix National Scenic Riverway is deserving of its Wild and Scenic designation as it meets the criteria for outstanding scenic, recreational, geologic, fish and wildlife, historical, and cultural values.
- The St. Croix River was born of fire and ice; volcanic activity, ancient seas and glaciers formed the land.
- The Riverway is home to a variety of animals, including fur bearing mammals, bald eagles and mussels.
- Human history shaped the St. Croix Riverway, influenced by the Dakota and Ojibwe people, the fur trade and the lumber era.

LEARNING TARGETS (Students will be able to…)

- Describe in their own words how the St. Croix River Valley was formed; and
- Summarize the significance of mussels in the story of the St. Croix;
- Give two examples of how humans have used the river.

ACADEMIC CONTENT STANDARDS

MN Science Standards

2.1.1.2.1, 3.1.1.1.1, 3.1.1.2.1, 3.1.3.2.1, 3.4.3.2.2, 4.4.2.4.1, 5.4.1.1.1, 5.4.2.1.1, 5.4.2.1.2, 5.4.4.1.1

MN Social Studies Standards

2.2.4.5.2 2.3.1.1.3, 2.3.4.9.1, 2.4.1.2.1, 2.4.2.4.1, 2.4.2.4.2, 3.1.1.1.1, 3.2.4.5.1, 3.3.1.1.1, 3.3.3.8.1, 3.4.1.1.1, 3.4.1.1.2, 3.4.1.2.1, 3.4.2.5.1, 4.3.4.9.1, 5.2.1.1.1, 5.3.4.10.1, 5.4.1.1.1, 5.4.1.2.1, 5.4.2.3.1, 6.3.4.10.1, 6.4.4.16.1

Wisconsin Science Standards*

C.4.1, E.8.5, E.8.6, F.8.2

Wisconsin Social Studies Standards*

A.4.4, A.4.7, A.4.8, B.4.1, B.4.2, B.4.7, B.4.8, B.4.9, A.8.6, B.8.12

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- SACN & Watershed Maps
- Duluth Pack
- Geology props – basalt, conglomerate, sandstone and glacier image
- Mussel Shell
- Sturgeon stuffed animal attached to an image of a real sturgeon
- Flannel Shirt, logging era images, and lumber company brands
- Maple syrup, plastic spoons, birch bark and wild rice
- Small canoe or kayak paddle
- Voyageur image
- Timeline rope with laminated dates and events
- White board, dry erase markers and eraser

BIG HISTORY WORDS

- Duluth Pack
- National Park Service
- Basalt
- Conglomerate
- Sandstone
- Mussel
- Dakota
- Ojibwe
- Fur Trader
- Voyageur
- Lumberjack
- Era
- Congress
- Wild & Scenic Rivers Act

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger students – Less talk and more questions and helping them piece together the story of the St. Croix
- Older – Challenge their vocabulary and consider creating more of a debate out of the Application activity
- ELL – Visual aids will be very useful in helping ELL students to understand the historical information

CLASS PREP

- Load a Duluth pack with river related items, make sure to put them in the order you want to show them to the students.

- Spend some time researching some background information so you are comfortable talking about history of the St. Croix and can answer student questions

- Set up stations prior to leading the program and determine how many students will be at each station and what the rotation will be.

SAFETY STUFF

- There are no safety concerns for this class

10 MINUTES TO TEACHING

- Spread out the timeline and make sure you have additional timeline cards in order

INVITATION (10 MIN)

Special Places

1. Welcome students and introduce yourself.
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. We have all experienced special places in our community, in our travels, and even in our own backyard.
    a. What is a place that is special to you?
    b. What makes it special?
    c. Who do you enjoy this special place with?
    d. What do you experience at your special place?
    e. How do you feel when you are in your special place?
4. Turn and talk to the person or people next to you or draw or write in your journal about these questions.
5. Allow learners to share their responses out loud.
6. Did they know they were in a special place right now (if at one of the Visitor Centers or a river landing)?
7. Show them the St. Croix and Namekagon rivers on a map and how the St. Croix River became the boundary between Minnesota and Wisconsin. **Think, pair, share:** Why might that be significant?
8. The St. Croix Riverway is special for so many reasons and today we are going to learn why it's special.

EXPLORATION (30 MIN)

Explain to the students that you have set up hands-on history exploration stations that will give them clues to what makes the St. Croix Riverway so special.

1. Geology Props – The St. Croix River Valley are a story of fire and ice.
    a. Ancient lava flows made of basalt (lava cooled quickly at the surface) are the foundation for some of the towering cliffs along the St. Croix (pass basalt around)
    b. More than 500 million years ago a massive sea covered the St. Croix River Valley leaving behind signs of life in fossils and erosion. Ocean waves sped up the erosion process and broke loose chunks of the basalt we just passed around and covered it with sand. Another type of rock called conglomerate was formed, which is rocks embedded in fine particles of sand. (Pass around conglomerate).
    c. The sea also deposited layer after layer of sand, which formed more towering sandstone cliffs over the St. Croix. (Pass around Sandstone)

    d. Then, 100,000 year the sea retreats and the last ice age occurs. Who has seen the movie Ice Age?
    e. This was a time when the summers did not warm up enough for the snow and ice to melt and more and more snow and ice piled on top of each other.
    f. Eventually, there was enough pressure that caused the ice to move and slide and once a massive sheet of ice starts moving it's hard to stop it. This movement caused major erosion and formed the river valleys we see today in Minnesota and Wisconsin, including the St. Croix River Valley (pass around laminated glacier images).
2. Mussel Shell – The Riverway is home to approximately 40 species of mussels, one of the most premier mussel populations in the world! Mussels can be a sign of clean water and a healthy river.
    a. Before telling students what the shell is, let them guess!
    b. Share some of the funny names for mussels and how they spread their eggs with their very own lure.
3. Sturgeon stuffed animal – Namekagon means "place of the sturgeon" and many sturgeon are seen in the lower Namekagon River. These fish have been around since the dinosaurs, and they look like an ancient fish. They can reach lengths of over five feet in the Namekagon and six feet in the St. Croix.
    a. First ask students if they have ever seen a dinosaur? No? Well, this guy has been around since the age of dinosaurs!
    b. Give students the opportunity to guess what kind of fish it is.
4. Maple syrup, birch bark and wild rice – Native Americans, including both the Ojibwe and Dakota tribes have lived along the river long for centuries and before Europeans came to America. They used birch bark to make shelters for homes and canoes to travel the river just like it was a highway. They knew which plants would give them food and medicine. They understood how to collect sap from maple trees to make maple sugar and syrup. They collected wild rice or manoomin from the St. Croix and Namekagon Rivers for food. The St. Croix River is still a special place to them today; collecting wild rice is still an important tradition they carry out each summer. Allow the students to taste the maple syrup and smell the wild rice.
    a. When talking about the Ojibwe and Dakota, it is important to make sure you are talking about them as both a people of the past, present, and future.
    b. There may be students who are Ojibwe and Dakota in your group, so just be aware of your words.
5. Beaver Pelt – We understand that in daily life we use money to purchase the things we need? Remember those animal pelts we just looked at? What if I told you that there was a time in Minnesota and Wisconsin history (several centuries ago, beginning in the mid to late 1600's), where pelts were valuable and were essentially used as currency or money to "purchase" or trade for goods? European fur traders called Voyageurs came over and traded with the Ojibwe, Dakota and other tribes so they could send beaver pelts back to Europe for hats and other clothing. The Ojibwe and Dakota people would hunt and trap for animals and trade the pelts for goods and materials that they had never seen or used before, such as iron pots for cooking, guns and gun powder for hunting, and cloth for making clothing. Voyageurs were very tough, they spent lots of time canoeing and portaging their canoes and gears (moving from one body of water to another). In fact, they often carried 180 pounds on their backs when they portaged.
    a. In the mid 1800's the fur trade came to an end as fashion trends in Europe changed.
    b. Discuss both the positive and negative outcomes of the fur trade with older students.
    c. It would also be great to have an image of fur traders for a visual.
6. Flannel Shirt and lumber company brands – A couple centuries ago, in the 1800s, the logging era began as European settlers noticed the huge white pines along the Namekagon and St. Croix rivers. This natural resource seemed endless and could be used to make homes, farms and towns. Lumberjacks, or loggers spent their winters in the woods cutting down trees and more trees, and once spring came they would push the logs in the river and send them down stream.

a. They cut down pines, because they were tall, straight and could float, unlike some of the hardwood deciduous trees.
b. **Think, pair, share:** What do you think eventually happened?
c. Eventually, the natural resource ran out and the logging era came to an end in the mid 1800's.
d. We have second and third growth white pines along the Namekagon and St. Croix Rivers, but they are not the giant pines of the past. **Have students close their eyes and imagine giant trees.**
    i. **Think, pair share:** What could have been done differently during the lumber era to not exhaust this natural resource?
    ii. Logging is still done to this day because we have a need for lumber products for homes, furniture and buildings. Logging practices have changed dramatically and for the most part there are practices, such as re-seeding and not clear cutting to better manage timber stands.
e. It would be great to have a lumber era image, as well. Especially the picture of the log jam in the Dallas.

CONCEPT INVENTION (10 min)

Building a River Timeline

As you wrap up the hands-on history exploration stations, highlight the major events along the river timeline. Help students to understand the concept of an era; a period of time marked by distinctive character, events.

- 500 million years ago – A massive sea covers much of Minnesota and Wisconsin
- 100,000 years ago – Seas retreat and last ice age occurs; glaciers form over northern Minnesota and Wisconsin
- 10,000 years ago – Glacial Lake Duluth overflows from melting glaciers and begins to cut a deeper and wider valley, including the gouging of the narrow channel through the two Interstate Parks
- 10,000 years ago – Records of human activity in the St. Croix River Valley
- 1600s - First white man comes to river valley-French trappers
- 1670's – Ojibwe people move into St. Croix River Valley
- 1802-1805 - Clear records from fur traders in the St. Croix Valley along with significant competition
- 1837 - Treaty ceding Ojibway lands along St. Croix and Chippewa Rivers to US government
- 1837 - Lumberman rush into the valley in wake of 1837 Treaty.
- 1840-1903 St. Croix River carried 11 billion board feet of logs, largely White Pine.

APPLICATION (15 min)

A River for the Future

1. Now, we are going to travel back in time to 1968; not too long ago, but still a long time before all of you were born.
2. At this time, there was a bill in Congress (the law-making branch of our national government) to create a National Wild and Scenic River System to protect rivers like the St. Croix for future generations, like all of you, to enjoy.
3. We are going to pretend like we are all law-makers who have to vote on this bill to approve the Wild and Scenic Rivers Act that will make the Namekagon and upper part of the St. Croix River one of the first National Wild and Scenic Rivers.
4. In order for a river to qualify to become a Wild & Scenic River it must possess these outstanding and remarkable values (write these on the white board):

    a. Scenic – it has to be beautiful

   b. Recreational – there has to be the opportunity for people to enjoy the river in a variety of ways including fishing, canoeing, kayaking, boating, camping, hiking, etc.
   c. Geologic – Land born of fire and ice especially
   d. Fish & Wildlife – A healthy river is home to an abundance of different species of animals
   e. Historic & Cultural – A unique human history is part of the river's story
5. **Turn and Talk** with your fellow law-makers. Based on what you have learned today about the St. Croix Riverway, does this river meet the outstanding and remarkable values required to be a Wild and Scenic River? Why or Why not?
   a. Give students several minutes to share ideas with each other and then out loud
6. Once everyone has shared, have the students put their heads down and take a vote. Write the vote tally on the board.
7. Most likely, most students will vote unanimously, but if anyone votes no discuss their reasoning.
8. Finish the timeline that leads up to the present day. Emphasize the significance of the 50th Anniversary in 2018 and how the future of the St. Croix is unknown at this time.
   a. Development, invasive species, climate change and human misuse all threaten the future health of the river. What can we do to protect this river for the next 50 years? Think, pair, share!
   b. Allow students time to share with each other and out loud

- September 12, 1968 - House votes 265 to 7 to pass bill creating National Wild and Scenic River System including Upper St. Croix and Namekagon.
- October 25, 1972 - Lower St. Croix added from Taylor's Falls 27 miles downstream, or 25 miles above the confluence with the Mississippi. This was the first addition of new river miles to the federal Wild & Scenic Rivers system.
- June 17, 1976 - Remaining Lower St. Croix added, completing the St. Croix National Scenic Riverway from headwaters to the Mississippi confluence.
- 1987 - Winged Maple Leaf mussels, previously thought extinct, discovered within Riverway.
- 1989 - New species of dragon fly, the St. Croix Snake Tail, was discovered by a Wisconsin DNR researcher.
- 2018 – 50th Anniversary of the Wild and Scenic Rivers Act and the St. Croix National Scenic Riverway
- Next 50 years – That's up to us what kind of future the river has

REFLECTION (5 – 10 min)

Have the student's **think, pair, share or journal** on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF → Describe in your own words how the St. Croix River Valley was formed?
- WORLD → What is unique about the presence of mussels in the St. Croix National Scenic Riverway?
- OTHERS → Give a couple of examples of how humans have used the river throughout its history?
- THOUGHTS → What are you still wondering about?

INGREDIENTS FOR A WILD AND SCENIC RIVER

PROGRAM TYPE : HISTORICAL / CULTURAL

Grade Level : 3 – 8

ESSENTIAL UNDERSTANDING / THEME

Just like you use a list of ingredients to make your favorite recipe, there are a list of ingredients or requirements necessary to create a National Wild and Scenic River.

BIG IDEAS

- We all have a favorite place; a special place where we like to go to have fun, to be quiet, to be with others, to relax, and to be inspired.
- There are wild places, historical places, monumental places that are so special they receive special protections from our federal government so they can be preserved for future generations to enjoy.
- These special places deserving of federal protection might be designated as National Park, National Monument, or a National Wild & Scenic Riverway.

LEARNING TARGETS (Learners will be able to…)

- List at least two qualities of the St. Croix National Scenic Riverway that meet the standards a river must possess to be qualified as a National Wild and Scenic River;
- Summarize the purpose of the National Wild and Scenic Rivers Act;
- Describe in general terms the role of the National Park Service.

ACADEMIC CONTENT STANDARDS

Minnesota Science Standards
3.1.1.1.1, 3.1.1.2.1, 3.1.1.2.3, 3.1.1.2.4, 3.1.3.2, 3.1.3.2.2, 5.1.1.1.3, 5.1.1.2.2, 5.4.2.1.1, 5.4.2.1.2, 5.4.4.1.1, 7.4.2.1.1, 7.4.2.1.3, 7.4.4.1.2, 8.1.3.2.1, 8.3.1.2.2, 8.3.4.1.2
Minnesota Social Studies Standards
3.1.1.1.1, 3.1.4.6.1, 3.3.1.1.1, 3.4.2.5.1, 5.2.1.1.1, 5.4.1.2.1, 6.3.4.10.1, 6.4.1.2.1, 6.4.4.16.1

Wisconsin Science Standards*
A.4.3, C.4.1, C.4.2,C.4.4, C.4.5, C.4.6, C.4.7, C.4.8, F.4.4, B.8.4, C.8.1, C.8.2, C.8.4, C.8.5, C.8.6, C.8.7, C.8.9, C.8.11, E.8.6, F.8.8

Wisconsin Social Studies Standards*
A.4.4, A.4.7, B.4.1, B.4.7, B.4.9, A.8.4, A.8.8, B.8.1

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- Profession name tags
- Top Secret St. Croix Files
- National Park Service Planning Framework
- SACN Foundation document
- White board, dry erase markers and eraser

BIG SCIENCE WORDS

- Observation
- Leave No Trace
- Congress
- Natural
- Cultural
- Free-flowing
- National Park
- National Park Service
- Profession

ADAPTATIONS for younger, older, ELL, and special needs students

- Emphasize use of visual aids and consider making some visual aids in Spanish or another language depending on the ELL audience.
- Partner ELL with a student or adult interpreter (ideally student)
- For older students, continue on with the post-activity for a next level challenge.

CLASS PREP

- Make sure you have all your materials ready to go and review the lesson plan. Scout the area where you will be teaching the lesson.
- Kids can sit and listen for about the time that correlates to their age (i.e. a 1st grader who is 7 can actively listen for about 7 minutes- this caps at 12 minutes even for adult learners). Be sure to be concise in your explanation of concepts, since students will be so excited to participate. Let their curiosity drive the lessons as much as possible (while also bringing it back to the essential understanding, big ideas and learning targets).

SAFETY STUFF

- If you are teaching this lesson on the river, which hopefully you are, be sure to scout out activity boundaries and the terrain. If you are going to allow the students to go off trail look for hazards, such as poison ivy.

10 MINUTES TO TEACHING

- Get to know your group! Review the health history form so that you are aware of allergies, asthma and other concerns.
- Count your kiddos! Know how many learners you will be instructing today.
- Get synced with the schedule! Make sure you know what time your group is arriving and departing and if there are any other logistics to take into consideration.
- Be prepared! Make sure you take care of you! Pack your first aid kit, water bottle and layers.
- Greet the school with a smile! Introduce yourself to the chaperones and teachers and let them know how they can help during the program, and then greet learners with loads of enthusiasm.

INVITATION (5 minutes)

Special Places

1. Greet the students and introduce yourself.
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. We have all experienced special places in our community, in our travels, and even in our own backyard.
    a. What is a place that is special to you?
    b. What makes it special?
    c. Who do you enjoy this special place with?
    d. What do you experience at your special place?
    e. How do you feel when you are in your special place?
4. Turn and talk to the person or people next to you or draw or write in your journal about these questions.
5. Allow learners to share their responses out loud

EXPLORATION (10 – 15 minutes)

Are we in a special place? (Ideally, this would happen on the St. Croix or Namekagon Rivers or one of their tributaries)

1. You are going to have the opportunity to explore this place to determine if it has any special qualities, just like the qualities you shared about your special place.
    a. Instruct learners to sketch, write or take photos of the observations they make during the exploration.
    b. What does it mean to observe?
    c. How can we make good observations?
2. As they are exploring invite them to consider these three observational strategies when they find
    a. I noticed…
    b. I wonder…
    c. It reminds me of…
3. Give them boundaries, but allow them to go off trail.
4. Leave no trace and safety reminders.
5. Have each group of two share their observations with another group of two and answer these questions.
    a. Did your group have any similar observation or aha's?
    b. What did your group collectively notice and wonder?

    c. What questions does your group have about this place?

6. Bring the entire group back together and allow them to share their responses out loud.

CONCEPT INVENTION (10 – 15 MINUTES)

National Wild & Scenic Riverways

1. You could introduce the following information now about the National Wild and Scenic Rivers Act or you could continue to build up the mystery about this special place. Skip to number three to continue building the mystery and then come back to number two after the research activity.
2. The National Wild and Scenic Rivers Act was created by **Congress** (a branch of our federal government that creates laws and policies) in 1968 to preserve certain rivers with outstanding **natural** (nature), **cultural** (the human history), and **recreational** (the activities that allow us to enjoy a place) values in a **free-flowing** (free or mostly free of dams that control the flow of water in a river) condition for the enjoyment of present and future generations.
    a. The Act is notable for preserving the special character of these rivers, while also recognizing the potential for their appropriate use and development.
    b. It encourages river management that promotes involvement from local government, tribes, agencies, organizations and the public to develop goals for river protection.
    c. The Act requires that its immediate environments possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition.
3. Learners will now take on the following roles to determine if this place we are visiting today fulfills the Wild & Scenic designation requirements.
    a. Show students a map of the St. Croix and Namekagon Rivers, which are "being considered for designation as a Wild and Scenic River.
        i. Take a moment to allow students to understand their place in the watershed by finding their community on the map.
    b. Hand out nametags with the following professions (jobs). They can read about what this profession does on their nametag or you can have them research the profession as a pre-activity.
    c. Wildlife Biologist, Anthropologist, Hydrologist, Geologist, Limnologist, Ecologist, Entomologist, Ornithologist, Recreation Specialist, and a Tourism (Aesthetics Specialist).
    d. Your job will be to think like the person in your profession and look at this place through the lens of a scientist or specialist and investigate this place as they might do.
        i. Give learners time for investigation and research (this could happen both on-site and/or at school using computers and books for any time period that you choose).
        ii. Hand out a Top Secret St. Croix Riverway file to each team that gives them some information to get them started.
    e. Provide articles, images and further research that gives them more clues about the Riverway.
    f. Have them also fill the folder with their own research and observations.
4. Provide an opportunity for each team to present their research.
    a. Create a visual display of their research under the Wild and Scenic River Act designation categories: remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural qualities in a free-flowing system.
    b. What information are they lacking or missing to fully determine if this place could be considered for Wild and Scenic Act designation?

i. What other research might be necessary to fully qualify a river as Wild and Scenic?
ii. What would that look like? Who would do it?
iii. Take the time to have a thorough discussion on this topic.
iv. Allow learners to draw conclusions about the St. Croix National Scenic Riverway.

APPLICATION (5 - 30 minutes)

Function of the National Park Service

1. Hopefully, learners come to the consensus that the St. Croix River should be designated as a Wild and Scenic River; that it meets the qualifications.
2. The Wild and Scenic designation qualifies the St. Croix Riverway for protections from development and allows for recreation and enjoyment.
    a. Think, pair, share: What is the St. Croix National Scenic Riverway had never been established?
3. The St. Croix National Scenic Riverway, unlike many other Wild and Scenic Rivers, is managed by the National Park Service; the same government agency that manages National Parks that you might have heard of, such as Yellowstone, Yosemite and Glacier.
    a. That essentially means we have a National Park in our backyard!
    b. Think, pair, share: What is a National Park? What do you know about National Parks? What National Parks have you heard of or visited?
    c. A National Park is a scenic or historically important area of countryside protected by the federal government for the enjoyment of the general public or the preservation of wildlife.
    d. Since 1916, the National Park Service has been entrusted with the care of these parks and with the help of partners and other organizations, safeguards them for the future.
    e. National Park Service Mission - The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

Putting It All Together Activity Options

If your time is limited…

Turn and Talk with the people next to you. What are the "a-ha's" and "take-away's" from this lesson and experience? What do you know now that you did not know before?

If you have a little time…

Create a timeline with your class of the story of the St. Croix River Valley, starting with the geologic events that helped to shape the land. You could also highlight where certain events occurred on a map of the St. Croix Riverway.

If you have more time…

You could do all of the above and / or allow students to work in their teams of professions to create the story of the St. Croix by creating educational posters on their particular topic.

REFLECTION (5 – 10 minutes)

Have the student's think, pair, share or journal on these reflective questions:

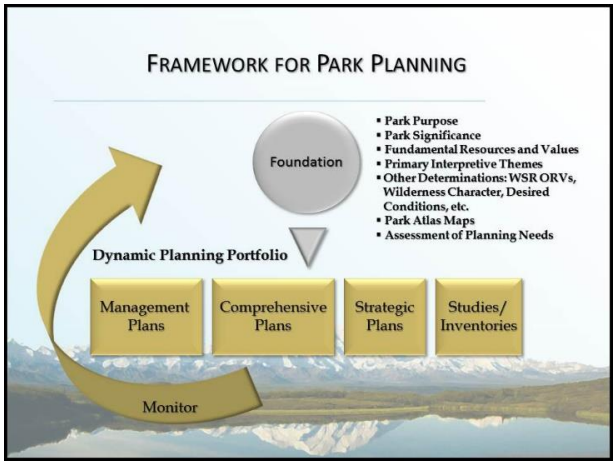
MY CONNECTIONS TO…

- SELF → What are two of the characteristics that qualify the St. Croix and Namekagon Rivers for protection under the Wild & Scenic Rivers Act?
- WORLD → What is purpose of the National Wild and Scenic Rivers Act?
- OTHERS → What is the role of the National Park Service at the St. Croix National Scenic Riverway?
- THOUGHTS → What are you still wondering about?

POST ACTIVITY

Planning for a National Park

1. Each unit of the National Park System is required to have a formal statement of its core mission that provides basic guidance for all planning and management decisions, the park foundation document. A foundation document establishes the basis for all future planning and is the core element of each park's planning portfolio.
2. Using the National Park Service Park Planning Framework, learners will create their own framework for the St. Croix National Scenic Riverway.
3. Working collaboratively in small groups, they will be assigned one of the following areas to research, discuss, and develop.
    a. Park Purpose
    b. Park Significance
    c. Fundamental Resources and Values
    d. Primary Interpretive Themes
    e. Wilderness Character and Recreational Opportunities and Restrictions
    f. Maps and Guides
4. Each group will prepare PowerPoint or Prezi slides which can be combined into one presentation.
5. Each group should present their part of the framework.
6. You could stop there or have the groups come together to create their version of a management plan for the park so they really go through the process of understanding the significance and value of our National Parks which will ultimately give them a greater appreciation for our National Parks and their purpose.



BACKGROUND INFORMATION

Resources:

BEETLES Science & Teaching for Field Instructors - http://beetlesproject.org/

National Park Service Planning - https://parkplanning.nps.gov/planningProgram.cfm

National Park Service Website - - https://www.nps.gov/aboutus/index.htm

National Wild & Scenic Rivers - https://www.rivers.gov/index.php

St. Croix National Scenic Riverway - https://www.nps.gov/sacn/index.htm

St. Croix National Scenic Riverway 50th Anniversary Site - https://nps.maps.arcgis.com/apps/Cascade/index.html?appid=1ecbe95b85ae4f869c8b029c3dade25a

LET'S GO MUCKING

PROGRAM TYPE : ECOLOGY

Grade Level : 3 – 8 **Site : River Landing**

ESSENTIAL UNDERSTANDING

Sometimes it's the smallest creatures in an ecosystem that tell us the most about how healthy it is.

BIG IDEAS

- A habitat is a home for a community of animals that provides everything needed for survival, including air, food, shelter, space, and water.
- Macroinvertebrates are aquatic organisms without a backbone that we can see with our naked eye.
- Macroinvertebrates are bioindicator species; their presence or absence can give us clues about how healthy the aquatic habitat is where they live.

LEARNING TARGETS (Students will be able to…)

- Define what a macroinvertebrate is;
- Observe and sketch two characteristics about their favorite macroinvertebrate;
- Demonstrate an understanding of the Pollution Tolerance Index; and
- Give two examples of ways to help prevent water pollution in our communities

ACADEMIC CONTENT STANDARDS

Minnesota Science Standards

3.1.1.1.1, 3.1.1.2.1, 3.1.1.2.4, 3.1.3.2.1, 3.1.3.4.1, 3.4.1.1.1, 3.4.1.1.2, 3.4.3.2.1, 3.4.3.2.2, 5.1.1.1.3, 5.1.1.2.2, 5.1.3.4.1, 5.3.4.1.3, 5.4.1.1.1, 5.4.2.1.1, 5.4.2.1.2, 5.4.4.1.1, 7.1.1.2.3, 7.4.2.1.1, 7.4.4.1.2, 8.1.1.2.1, 8.1.3.4.2, 8.3.4.1.2

Wisconsin Science Standards*

A.4.1, C.4.1, C.4.2, C.4.4, C.4.5, C.4.6, C.4.7, C.4.8, F.4.1, F.4.2, F.4.3, F.4.4, C.8.1, C.8.3, C.8.4, C.8.6, C.8.7, C.8.9, C.8.10, C.8.11, F.8.2 F.8.8

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- Toolbox with magnifying containers, water windows, and other larger containers
- 30 nets
- Microscopes
- Whiteboard with dry erase marker and eraser
- Watershed map
- 5 white tubs
- 20 Invertebrate Identification sheets

- Invertebrate identification "Life in the River" key
- Set of macroinvertebrate pictures/interesting facts laminated sheets

BIG SCIENCE WORDS

- Muck
- Macroinvertebrate
- Watershed
- Habitat
- National Park
- St. Croix National Scenic Riverway
- Life Cycle
- MetamorphosiS
- Bioindicator specieS
- Pollution Tolerance Index
- White board, dry erase markers and eraser

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger: All students, no matter what age should muck with a buddy, but especially the younger students should follow the buddy system while mucking. Consider doing the mucking lesson plan without the mucking.
- Older: Emphasize identification to determine the pollution tolerance index
- ELL: Show proper mucking technique in the water with all students watching. When identifying, use visual aids and walk through key in small groups, tracing the steps with your finger as you go.
- Special needs: Provide a longer net for a student in a wheelchair and position the wheelchair with the brakes on in a strategic location or have them help put the different types of invertebrates in the magnifying containers and the bigger ones in the bigger containers.

CLASS PREP

- Choose a landing on the St. Croix, Namekagon, or a tributary. Check these locations beforehand to ensure their safety. Examples of good locations include: Phipps Landing, Hayward Landing, Lakeside Road Landing, Riverside Landing, Gordon Dam Landing, County O Landing, Snake River Landing, Lions Park Landing, and Osceola Landing.
- Charge the digital microscopes.
- Once at the location bring the nets, toolbox, identification sheets, and keys to the shore of the river.
- Put a couple of inches of river water in three of the tubs and set them up where students can easily access them from the river.
- Set up the whiteboard where you will give the introduction presentation.
- Make sure to have the watershed map with you at the whiteboard.
- Kids can sit and listen for about the time that correlates to their age (i.e. a 1st grader who is 7 can actively listen for about 7 minutes- this caps at 12 minutes even for adult learners). Be sure to be concise in your explanation of concepts, since students will be so excited to participate. Let their curiosity drive the lessons as much as possible (while also bringing it back to the essential understanding, big ideas and learning targets). Do not over explain!!!

SAFETY STUFF

- Students will be taught to wade up to just below their knees, but will be tempted to wade deeper.
- It is slippery, so they should walk carefully.
- Bugs or bees may be present.
- Instruct students to wade only, use nets gently and for their intended purpose.
- Explain that they are in water. It is very possible that they may fall. So it is important to be careful. If they do fall, there may not be an opportunity to get dry right away.

TEN MINUTES TO TEACHING

- Set up observation stations with tubs, magnifying boxes, and digital microscopes.
- Assess if all the tubs have a sufficient and equal number of animals and some habitat. Add or subtract animals from tubs based on assessment.
- Tubs should be spaced apart so 5-6 students can gather around a tub.
- If a large group and depending on time, break up students into activity groups: (e.g. 1st group about the watershed map, NPS and SACN, habitat meaning; 2nd group viewing and identifying animals; 3rd group playing Web of Life game)
- List BIG science words on a white board

INVITATION (Time: 5 min)

1. Have students sit in a circle, where they can see the whiteboard.
2. Greet the students and introduce yourself.
3. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
4. Share with them that they are in a National Park, just like Yellowstone or the Grand Canyon. Show them where they are located on the St. Croix National Scenic Riverway Map.
5. **Turn and Talk:** Have you ever visited the St. Croix River or another river or creek? What did you see and experience?
6. Today we are going to be taking on the role of a scientist and are going to be researching the health of the river.
7. **Turn and Talk:** what are some examples of living creatures that you might find in the St. Croix River?
8. Today we are going to be scientists researching the health of the St. Croix River by looking at a specific group of living creatures that live in the river.

EXPLORATION (Time: 30 min)

Pre-Activity Discussion

1. In a little bit we are going to get in the water and sample for these little tiny creatures. There are many species of these creatures.
2. I'm going to tell you the scientific name for this group of creatures. I am going to say the name and then I want you all to repeat it after me: *macroinvertebrates*.
3. **Think, pair, and share;** what do you think macroinvertebrate means?
4. Allow the students to share their answer.
5. We can break the word into two parts.
6. The first is macro. Does anyone know what macro means? I'll give you a hint it is the opposite of micro, like microscopic or microscope.
    a. Macro means big enough to be seen with the naked eye
7. A lot of the critters we are going to find are going to be small but we will be able to see them with our eyes.
8. The next part on the word is invertebrate.

9. I want everybody to feel their backbone. An animal with a backbone is called a vertebrate
10. **Turn and talk:** what are some examples of animals with backbones?
11. Now if vertebrate means an animal with a backbone what do you thin invertebrate means?
    a. Exactly an animal without a backbone!
12. The majority of what we are going to find today are going to be insects.

Mucking Activity

1. Bring the students to the shore of the river.
2. Give safety guidelines for the group. Set the boundaries for collection. Station adults at boundaries to monitor.
3. Go over equipment with the group. Each student will get a net. The nets are great at catching macro invertebrates but they are also good at catching rocks and mud. Macroinvertebrates like to hang out by stuff in the water like branches, rocks, and grass along the bank. Bounce your net and scrape it against these different things. There will be tubs of water along the bank to put our macroinvertebrates in. Do your best to get as little muck in the bins as possible, as it makes viewing the macroinvertebrates later more challenging.
4. At first glance it might not look like you caught anything. But look closely and give it a minute. Many of these creatures are pretty small and will only move around when they feel safe. Encourage students to dump their nets in the tubs even if they don't think there is anything in there.
5. Questions about collection?

Observations

1. After the students have finished mucking, get them arranged around the macroinvertebrates, with the same number of people at each tub.
2. Give 5-15 minutes (depending on the length of program) to simply observe what is in the bins without worrying what each macroinvertebrate is called.
3. Show students the observation tools that are available to them:
    a. Spoons – great for picking things up
    b. Magnifying boxes – two different sizes to put macroinvertebrates in.
    c. Larger plastic containers – can be used to place macroinvertebrates in or to collect and separate debris from the bins.
    d. Digital microscopes – distribute evenly throughout observation area. Can either give directions on how to use to large group or small group (with a small group it's easier to demonstrate with an actual specimen)
        i. Turn on with orange power button.
        ii. Place macroinvertebrate in magnifying box without lid and place on stand.
        iii. Move course adjustment knob to move specimen closer to the lens.
        iv. Once close, adjust the focus using the dial on the lens.
        v. Brightness and magnification can be adjusted with levers next to screen.
4. Remind students that we need to handle the macroinvertebrates with care as we will be releasing them. They are aquatic species so they need to remain in the water at all times during observation.
5. As students are observation, they should remember these prompts:
    a. I notice…
    b. I wonder…
    c. It reminds me of…

CONCEPT INVENTION (Time: 10 -15 min)

Identification

1. Depending on the group, you should decide whether to explain the keys to the whole group or to smaller groups.
    a. If there is a large number of students, they are younger, or ELL students, the key explanation will be easier in smaller groups where everyone can see what's happening better.
2. Explain to students that the key uses a series of questions about features that will move them through it until they have identified the species more accurately than just looking at the pictures and deciding which one it most resembles.
    a. Students will be tempted to just point and choose what they are looking at based on appearance, remind them if they are struggling or falsely identify something to use the key and walk through it with them.
3. Demonstrate the key (either to the whole group or small groups) with a specimen. It is best to use a mayfly, dragonfly, or stonefly because those will take you all the way through the key.
    a. Start at the top and answer the question: Shell or no shell?
    b. Follow whichever path is appropriate.
    c. If it has no shell: does it have legs or no legs?
    d. Keep following whatever path it sends you down.
4. Students will be tempted to just point and choose what they are looking at based on appearance, remind them if they are struggling or falsely identify something to use the key and walk through it with them.
5. Students will start to ask questions about some of the macroinvertebrates and their features. Give information to individuals or groups of students who show curiosity. Suggested common themes and facts that will come up:
    a. Questions and facts about the life cycles of dragonflies, mayflies, caddisflies, stoneflies, etc.
        i. Many of these creatures start their life under water, but then undergo a change or metamorphosis where they are no longer dependent on their aquatic habitat. They grow wings and spend their adult lives flying around and catching their food outside the water.
    b. How caddisflies carry their homes with them and the materials they use to make their homes.
    c. Macroinvertebrate adaptations, such as how stonefly nymphs do pushups when they are in low oxygen environments to increase the oxygen around them.
    d. How do mussels reproduce?

APPLICATION (Time: 10 - 15 min)

Pollution Tolerance Index

1. Macroinvertebrates are important for science research because they have the ability to tell us about the health of the water. This makes them a bioindicator species.
2. Introduce students to the pollution tolerance groups on the backs of the keys.
3. Some species are able to tolerate, or put up, pollution whiles others are sensitive, or can't handle, pollution.
4. Depending on the time left in class, you will have to modify how much time is spent on pollution.
5. You can either figure out the quality of the water as a whole class or, if time permits, there are laminated worksheets that can be done in small groups.
6. Have the class identify which species were found and which groups they belong to. Multiple the number in each group by the given factor and add up to get index. The index will tell the water quality.
7. What does our index tell us about the health of the St. Croix River?
8. The St. Croix River is one of the cleanest tributaries to the Mississippi River. It is a very healthy river that supports a lot of life.
9. **Turn and talk:** when we talk about pollution, what are we talking about? What are some examples?

    a. As you do this try to get the students past litter and trash. A lot of times they seem to get hung up on that being the only type of pollution.
10. How does pollution get into the water?
    a. Storm drains – anything on the streets washes away directly into the river.
    b. Run off – rain can wash away things on the earth (pesticides, fertilizers, etc.)
11. **Turn and talk**: If pollution gets into the water way up here on the St. Croix River how does it affect the people, plants, and animals further downstream?
12. **Turn and talk**: What can you do to be a friend of the river, lake, stream, pond or creek in your neighborhood or community?

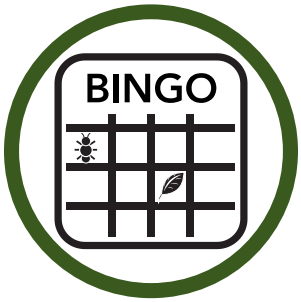
REFLECTION (Time: 5 min)

Have the student's **think, pair, share or journal** on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF → What is a macroinvertebrate? Sketch your favorite macroinvertebrate along with two unique physical features you observed.
- WORLD → What is the Pollution Tolerance Index and how can we use it to know more about the health of the water in our world?
- OTHERS → What are two ways you can help to protect aquatic habitat?
- THOUGHTS → What are you still wondering about?

NATURE EXPLORERS BINGO



PROGRAM TYPE : ECOLOGY

Grade Level : K - 3 **Site : Outside**

ESSENTIAL UNDERSTANDING

Our eyes are not the only tool we can use to make observations of the natural world.

BIG IDEAS

- We can use all five of our senses to experience nature.
- Using our senses allows us to experience nature in different ways.

LEARNING TARGETS (Students will be able to…)

- Demonstrate how they used all of their senses with the exception of taste to make observations in nature;
- Use descriptive language, such as I notice and I wonder, when making observations in nature;

ACADEMIC CONTENT STANDARDS

Minnesota Science Standards
0.1.1.2.1, 0.4.1.1.1, 0.4.1.1.3, 0.4.2.1.1, 1.1.1.1.1, 1.1.1.1.2, 1.1.3.1.1, 1.4.2.1.1, 1.4.2.1.2, 2.1.1.2.1, 2.4.2.1.1, 3.1.1.1.1, 3.1.1.2.1, 3.1.1.2.2, 3.1.1.2.4, 3.1.3.2.1, 3.4.1.1.1, 3.4.1.1.2, 3.4.3.2.2

Wisconsin Science Standards*
C.4.1, F.4.1, F.4.4

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- Nature Explorers Bingo and Reflective Page (printed back to back) copies for each student
- Clipboards for each student
- Colored pencils
- Bingo prizes (optional)
- Image of a white-tailed deer
- White board, dry erase markers and eraser

BIG SCIENCE WORDS

- Biotic
- Abiotic
- Ecosystem

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger: Use the buddy system and check in with them while they are doing the activity.
- Older: This activity is probably not a good fit for students beyond 5th grade.
- ELL: The more visual aids and use of the senses, the more engaged and informed ELL students will be.
- Special Needs: For students with mobility needs, choose an area with level paths and trails.

CLASS PREP

- List all pre-class materials to prepare and any set-up that needs to take place.
- Kids can sit and listen for about the time that correlates to their age (i.e. a 1st grader who is 7 can actively listen for about 7 minutes- this caps at 12 minutes even for adult learners). Be sure to be concise in your explanation of concepts, since students will be so excited to participate. Let their curiosity drive the lessons as much as possible (while also bringing it back to the essential understanding, big ideas and learning targets).

SAFETY STUFF

- Students will be going through the woods so being mindful and having adult supervision is helpful related to safety

MINUTES TO TEACHING

- Have materials ready, handout and colored pencils.

INVITATION (10 min)

1. Sit in a big circle outside on the ground.
2. Welcome the students and introduce yourself.
3. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
4. Next, with their eyes open, but mouths closed, ask them to silently count as many different colors they observe all around them in nature.
5. Allow students to share the colors they observed.
6. Pass an item from nature (your choice) around the circle in one direction for students to smell and pass an item from nature (your choice) around the circle in the other direction for students to touch.
7. Model how to use the following language to describe what they smelled and touched.
    a. I noticed…
    b. I wonder…
    c. It reminds me of…
8. Turn and Talk: Turn and talk to the person/people next to you. What else can we see, smell, touch, hear and taste in nature?
9. Nature is a place we should use all of our senses, so we can experience it to the fullest.

EXPLORATION (20 min)

1. We are going to be Nature Explorers and participate in a fun activity to activate our sense.
2. Explain how Nature Explorers Bingo will work.
3. Give the students boundaries for the exploration.
4. Have them work with a partner.
5. Each person has a clipboard, a copy of the Nature Explorer's BINGO, a colored pencil.
6. Try to find as many objects on the bingo sheet that you can find.
7. If you find the object, mark it with an X.
8. There are blanks on the bingo sheet, if you find something else add that to the blank.
9. When you hear the bell in 10 min, come back to where we started.

CONCEPT INVENTION (5 min)

1. Ask each pair to count how many items they observed during the exploration.
2. How many of the items were new to them; that they observed for the first time?
3. Was there something you found that you didn't know what it was?
4. What were some of the living (biotic) and non-living (abiotic) members of the forest ecosystem (community) that you discovered?
5. How do the biotic and abiotic members of the forest ecosystem interact or depend on each other?
6. Think, pair, share: What if one of them was missing? How would that affect life here?

APPLICATION (10 - 25 min)

Deer Ears

1. Find a place along the trail for students to sit down.
2. Hold up an image of a white-tailed deer with its ears perked. What animal do we have here?
3. What do you observe about this photo?
4. Yes, the deer has its ears perked and is listening. Turn and talk: What do you think it's listening for?
5. Ask the students to close their eyes and for 30 seconds and count as many sounds as they can hear.
6. Allow a few students to share what they heard and how many different sounds they heard.
7. This time, model how to cup your ears to create deer ears and have the students do the same.
8. Prediction: Do you think you will hear more or less sounds with deer ears? How many sounds do you think we will hear?
9. Ask the students to close their eyes and for 30 seconds and count as many sounds as they can hear.
10. How did they do with their prediction?

NATURALIST'S CHOICE ACTIVITY – If there is still time

1. Based on the season, what's blooming, what birds are singing, what tracks are present, or what bugs are buzzing, introduce students to a plant/s or animal/s that you are passionate about.
2. Bring some feathers, track guides, animal pelts or ID guides from the National Park Service Visitor Centers to use as tactile and visual aids.
3. Demonstrate to the students how to use plant ID guides, binoculars or other tools to better observe or study a plant or animal in nature.

4. Consider setting up different hands-on stations for students to rotate through to learn more about birds that are migrating through or North Woods mammals or trees.
5. Do your best to make this a sensory experience for students and if you are facilitating an experience around an animal, take the opportunity to emphasize how animals use their senses to survive in their habitat.

REFLECTION (5 min)

Have the student respond to these reflective questions using the Reflection Page:

MY RIVER CONNECTIONS TO…

- SELF → How did you use your senses today to make observations in nature?
- WORLD → What is something new you observed today that you were unfamiliar with before today's exploration?
- OTHERS → How did you and your partner work together as a team during Nature Explorer's Bingo?
- THOUGHTS → What are you still wondering about?

Out of Place?

PROGRAM TYPE : ECOLOGY

Grade Level : 3 – 8 Site : Outside

ESSENTIAL UNDERSTANDING

Have you ever been the new kid and felt a little out of place? Sometimes in nature, animals and plants are introduced to an ecosystem where they are considered out of place, and they have to figure out a way to thrive and survive. And sometimes, those out of place animals and plants figure out a survival strategy that works too well and they make it hard for the animals and plants that have always lived in that ecosystem to survive.

BIG IDEAS

- A habitat is a home for a community of animals that provides everything needed for survival, including air, food, shelter, space, and water.
- Aquatic Invasive Species (AIS) are non-native plants or animals that invade and take over the habitat of the native species living there.
- AIS are a big problem in many rivers and lakes in Minnesota and Wisconsin, including the St. Croix River.
- There are many efforts happening to prevent the spread of AIS and individuals play an important role in this effort.

LEARNING TARGETS (Students will be able to…)

- Explain the difference between native species and non-native invasive species;
- Predict conditions of the ecosystem when an invasive species multiplies;
- Give one example of an Aquatic Invasive Species (AIS) and the negative impact they have on an ecosystem; and
- Discuss one way to prevent the spread of AIS.

ACADEMIC CONTENT STANDARDS

MN Science Standards
3.1.1.1.1, 3.1.1.2.1, 3.1.1.2.4, 3.1.3.2.1, 3.1.3.2.2, 3.4.3.2.2, 5.4.1.1.1, 5.4.2.1.1, 5.4.2.1.2, 5.4.4.1.1, 7.4.2.1.1, 7.4.2.1.3, 7.4.4.1.2
WI Science Standards*
C.4.1, F.4.1, F.4.4, F.8.2

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- 1 role of any color party/crepe streamer material
- 200 Total Chips of 2 – 3 colors of chips (representing food and dissolved oxygen)
- 4 orange cones to mark off area of play
- Aquatic Species Nametags (For a group of 30 students)
- Small – Medium Native Fish
- 10 Large Native Fish
- 10 Native Mussels
- 30 Zebra Mussels (will be on the back side of each of the native species)
- Dixie Cups
- Freshwater mussel artifacts and images
- Zebra mussel artifacts and images
- Dry erase board, eraser and dry erase markers

BIG SCIENCE WORDS

- Habitat
- Organisms
- species
- native species
- invasive species
- Fresh water mussels
- Zebra mussels

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger: Observe and match pictures of native species and invasive species. The game could be made more high energy by putting all the chips on one end of the playing field and requiring the students to run back and forth, collecting only a few at a time.
- Older: Create an on or off-site assignment to search for examples of native and invasive species in the local area though use of phone pictures
- ELL: Use visuals when explaining different species. Bring lots of specimens. Demonstrate game visually while explaining. Give clear, concise directions.
- Special needs: Have students work in partners: one picking up the chips, the other holding the chips. Speak with and support classroom assistant for ways to adapt lesson

CLASS PREP

- http://www.dnr.state.mn.us/invasives/aquaticanimals/zebramussel/index.html and https://www.maisrc.umn.edu/zebra-mussels and http://dnr.wi.gov/topic/invasives/fact/zebra.html
- When making the nametags, use these so students can just flip them around: http://www.avery.com/avery/en_us/Products/Name-Badges/Name-Badges/Top-Loading-Insertable-Name-Badges_05384.htm
- Designate the playing field parameters with cones and scatter the chips evenly around the area. The field size is dependent on numbers of students. Suggested size 10'x15' area for 6-10 students.

SAFETY STUFF

- This is an active game with students running within an area competing for chips.

10 MINUTES TO TEACHING

- Area for play should be marked off and paper chips ready for use

INVITATION (5 min)

1. Greet the students and introduce yourself.
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. Ask students if they remember or have heard of the term habitat before?
4. Turn and talk to the person next to you. What is habitat? What does habitat provide for an organism?
5. Ask students about their own habitat (food, space, shelter, air).
6. **Think, Pair, Share:** Imagine habitat for water organisms. What does food, space, shelter and air look like in an aquatic environment?
7. Allow a few students to share their ideas out lout with the rest of the group.

EXPLORATION (15-20 min)

Now, we are going to play a game where we pretend we are aquatic organisms (the living creatures in the river) and we need to gather the things we need to survive from our habitat.

ACTIVITY PROCEDURE

1. Hand out a name tag with the native organism facing out and talk about their relationship to each other in the ecosystem. **What do all organisms need to survive in their aquatic habitat?**
   a. Dissolved oxygen and food to survive, and in some cases, they are food for each other.
   b. Dissolved oxygen is the form of oxygen in the water.
2. Students should form a large circle in the play area. Explains that the area represents the St. Croix or Namekagon River.
3. Explain that 100 blue poker chips (identified as food) and 100 white poker chips (identified as dissolved oxygen) are scattered inside the circle.

ROUND ONE

1. Students must collect as many game pieces as possible. No pushing, shoving, stealing, etc.
2. Students must pick up just one piece of food or dissolved oxygen at a time.
3. Give students 30 – 45 seconds to collect.
4. Explain that each species needs a certain amount of dissolved oxygen and food to survive. Determine which species have survived based on the species needs in the chart below. Each individual species must have at least the required number of the specific game pieces to survive.

	Dissolved Oxygen (white)	Food (blue)
Larval fish	6	6
Native mussels	6	6
Larger fish	10	10

5. Survivors continue as the same species during the next round. Species (players) that did not survive are now what are known as "invaders" or AIS, aquatic invasive species (zebra mussels).
    a. Important: it is critical that you are very careful when defining invasive species. The rhetoric surrounding the issue can be very politicized, and can make students of different backgrounds uncomfortable or feel targeted. Establish that not all non-natives are aggressive, and that some native species can become aggressive.
6. These zebra mussels are a little more aggressive than the others and don't play by the same rules. They take more than what they need to survive so they are allowed to scoop up as much oxygen and food as they want.
7. Record the total number of each species at the beginning of the game and the number of survivors in each species on the whiteboard (line graph works well; two lines – one for native species and one for non-native mussels).

ROUND TWO

1. Students reform circle and the instructor scatters all of the game pieces again. At the signal, students are encouraged to scramble and collect as many game pieces as possible.
2. For each round consider adjusting the collection time to represent scarce resources or brutal winter.
3. Once you end round two, explain what the zebra mussels need to survive. Just four pieces of dissolved oxygen and food!
    a. Depending on the size of your group or if you are finding that nearly everyone is surviving each round, you may need to increase the amount of resources needed, give the zebra mussels a head start, cut down the time, or give them some sort of restriction (like making them only use one leg or only being able to collect 2 at a time and needing to run back to the start before going back out to collect more).

	Dissolved Oxygen (white)	Food (blue)
Zebra mussels	4	4
Larval fish	6	6
Native mussels	6	6
Larger fish	10	10

4. Discuss who survived and what was different about that round with the invasion of the zebra mussels. Have anyone who did not survive flip their nametag over to become a zebra mussel.
5. Record the total number of each species at the beginning of the round and the number of survivors in each species. Ask the students to **predict** what they think will happen in round three.

ROUNDS THREE AND FOUR

1. Continue to play the game in the same way, but give students less and less time for collection.
2. Repeat rounds of play until all food and oxygen has been used up.

CONCEPT INVENTION (5-10 min)

1. Ask the students to analyze the line graph that you drew. What happened to our ecosystem?
2. Just like in the game, the invaders or invasive species out-competed the native species in the natural world.
3. Explain to students what zebra mussels are and do; show them images of zebra mussels.
4. What implications does this have for aquatic ecosystems?

APPLICATION (10 min)

1. Unfortunately, we have some aggressive non-natives in our lakes and rivers in Minnesota and Wisconsin,

including rivers and lakes within the St. Croix River Watershed.

2. **Think, pair, share:** How do you think these invaders entered our lakes and rivers?
3. Introduce freshwater mussels to the students. One of the reasons the St. Croix River is such a special river is because all of the 41 native mussels that were originally found year at still found here. That is significant because mussels are the most endangered species in North America.
4. Show students an example of zebra mussels and describe the damage they do and how they are a threat to native freshwater mussels.
5. **Group Think:** What can we do to reduce the spread of aquatic invasive species?
6. Have students work in small groups to come up with ideas about how we can manage AIS in our watershed.
7. Allow groups to share their ideas.
8. Share some of the work that is being done by scientists, the National Park Service and St. Croix River Association.

REFLECTION (5 min)

Have the student's think, pair, share or journal on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF → What is one thing you can do to help prevent the spread of invasive species?
- WORLD → What example of aquatic invasive species did you learn about during this activity and what problems does it cause in the river ecosystem?
- OTHERS → How would you explain the difference between native and non-native species?
- THOUGHTS → What are you still wondering about?

INVASIVE SPECIES

Definition: A non-native aggressive organism that is in some way harmful to either the environment, economy, or human health

Zebra Mussel

Native to Eurasia, these mussels outcompete and smother native mussels, clog intake pipes, alter whole food webs.

Invasive Carp

Native to Asia, these four species alter food webs, and the silver carp can jump ten feet out of water, posing harm to people.

Eurasian Watermilfoil

Native to Eurasia, this plant outcompetes natives for light and space, changing habitat and making boating difficult.

WHY DO WE CARE ABOUT INVASIVE SPECIES?

- They take over – they don't play nice, and they kick out the other species. This means our entire ecosystems change, and we are at risk for losing some of our native species.
- Some of them are harmful to people. Some plants like wild parsnip burn your skin if you touch them; broken zebra mussel shells on beaches will cut your feet; and jumping silver carp can knock you off your boat.
- They can impact how we use our outdoor areas. Curlyleaf pondweed dies in early summer, and its decaying leaves lead to increased nutrient levels and subsequent algae blooms.

WHAT CAN KIDS DO ABOUT INVASIVE SPECIES?

- Kids are an important part of our solution!
- Kids who fish should never release their bait (throw it out!).
- Kids whose families own boats can help check the boat and trailer for attached plants and animals to pick off before leaving the river or lake.
- Kids can learn which invasive species are in the area, and keep an eye out! Let an adult know if you see something.
- Finally… kids can talk about invasive species. Tell a parent or guardian. Tell a friend. Write about it in the school newspaper. The more people who know, the more we can protect our waters.

CONTACT INFORMATION:

Angelique Dahlberg
Invasive Species Coordinator
angeliqued@scramail.com
(715) 483-3300

Sean Griffin
Invasive Species Program Assistant
seang@scramail.com
(715) 483-3300

RIVERS ARE ALIVE

PROGRAM TYPE : ECOLOGY

Grade Level : 3 - 8 **Site : Interstate Park or Classroom**

ESSENTIAL UNDERSTANDING

Sometimes it's the smallest creatures in an ecosystem that tell us the most about how healthy it is.

BIG IDEAS

- A habitat is a home for a community of animals that provides everything needed for survival, including air, food, shelter, space, and water.
- A river or stream can be an ideal habitat for even the tiniest creatures.
- Macroinvertebrates are aquatic organisms without a backbone that we can see with our naked eye.
- Humans play an important part in keeping aquatic habitat clean and healthy.

LEARNING TARGETS (Students will be able to…)

- Define what a macroinvertebrate is;
- Observe and describe two characteristics about their favorite macroinvertebrate;
- Demonstrate an understanding of the Pollution Tolerance index
- Give two examples of ways to help prevent water pollution in our communities

ACADEMIC CONTENT STANDARDS

Minnesota Science Standards

3.1.1.1.1, 3.1.1.2.1, 3.1.1.2.4, 3.1.3.2.1, 3.1.3.4.1, 3.4.1.1.1, 3.4.1.1.2, 3.4.3.2.1, 3.4.3.2.2, 5.1.1.1.3, 5.1.1.2.2, 5.1.3.4.1, 5.3.4.1, 5.4.1.1.1, 5.4.2.1.1, 5.4.2.1.2, 5.4.4.1.1, 7.1.1.2.3, 7.4.2.1.1, 7.4.4.1.2, 8.1.1.2.1, 8.1.3.4.2, 8.3.4.1.2

Wisconsin Science Standards*

A.4.1, C.4.1, C.4.2, C.4.4, C.4.5, C.4.6, C.4.7, C.4.8, F.4.1, F.4.2, F.4.3, F.4.4, C.8.1, C.8.3, C.8.4, C.8.6, C.8.7, C.8.9, C.8.10, C.8.11, F.8.2, F.8.8

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- Toolbox with magnifying containers, water windows, and other larger containers
- Microscopes
- Whiteboard with dry erase marker and eraser
- Watershed map
- 5 white tubs
- Bug boxes, magnifiers and water windows
- 2 – 5 gallon buckets
- Coolers for holding and transporting macroinvertebrates
- Aerators
- 20 Invertebrate Identification sheets
- Invertebrate identification "Life in the River" key
- Set of macroinvertebrate pictures/interesting facts laminated sheets

BIG SCIENCE WORDS

- Organisms
- Macroinvertebrate
- Watershed
- Habitat
- National Park
- St. Croix National Scenic Riverway
- Life Cycle
- Metamorphosis
- Bioindicator species
- Pollution Tolerance Index

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger: Focus on observation and identification only.
- Older: Emphasize identification to determine the pollution tolerance index
- *ELL: Inform ELL teacher of this activity ahead of this class and ask teacher or aide to review vocabulary and instructions.
- Special needs: Give them leadership tasks, pair them with a friend and allow them to position themselves in a way that supports full activity participation.

CLASS PREP

- Coordinate with teacher ahead of time to organize the class into 4-5 observation groups.
- Charge digital microscopes ahead of time.
- It is important to have enough organisms for each observation station. Target at least three of the same species in all five tubs, plus enough additional species in each tub to keep it interesting.
- Spread out five tables in a classroom or spread out tubs on the carpet (1 tub per table) – this leaves plenty of room

for the entire class.

- Allow for at least one hour to divide the bugs up evenly among the five tubs and set up the stations.
- When presenting the introduction and conclusion, do not have the students at the tables with the tubs. That is distracting and attention spans are shortened.
- When presenting at the state park, have students facing the river when you do the introduction and conclusion.
- Kids can sit and listen for about the time that correlates to their age (i.e. a 1st grader who is 7 can actively listen for about 7 minutes- this caps at 12 minutes even for adult learners). Be sure to be concise in your explanation of concepts, since students will be so excited to participate. Let their curiosity drive the lessons as much as possible (while also bringing it back to the essential understanding, big ideas and learning targets). Do not over explain!!!

SAFETY STUFF

Have students wash their hands after the activity.

TEN MINUTES TO TEACHING

- Set up observation stations with tubs, magnifying boxes, and digital microscopes.
- Assess if all the tubs have a sufficient and equal number of animals and some habitat. Add or subtract animals from tubs based on assessment.
- Tubs should be spaced apart so 5-6 students can gather around a tub.
- If a large group and depending on time, break up students into activity groups: (e.g. 1st group about the watershed map, NPS and SACN, habitat meaning; 2nd group viewing and identifying animals; 3rd group playing Web of Life game)
- List BIG science words on a white board

INVITATION (Time: 5 min)

1. Have students sit in a circle, where they can see the whiteboard.
2. Greet the students and introduce yourself.
3. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
4. Share with them that they are in a National Park, just like Yellowstone or the Grand Canyon. Show them where they are located on the St. Croix National Scenic Riverway Map.
5. **Turn and Talk**: Have you ever visited the St. Croix River or another river or creek? What did you see and experience?
6. Today we are going to be taking on the role of a scientist and are going to be researching the health of the river.
7. **Turn and talk:** what are some examples of living creatures that you might find in the St. Croix River?
8. Today we are going to be scientists researching the health of the St. Croix River by looking at a specific group of living creatures that live in the river.

EXPLORATION (Time: 30 min)

Pre-Activity Discussion

1. In a little bit we are going to tiny water creatures. There are many species of these creatures.
2. I'm going to tell you the scientific name for this group of creatures. I am going to say the name and then I want you all to repeat it after me: *macroinvertebrates*.
3. **Think, pair, and share;** what do you think macroinvertebrate means?
4. Allow the students to share their answer.
5. We can break the word into two parts.
6. The first is macro. Does anyone know what macro means? I'll give you a hint it is the opposite of micro, like microscopic or microscope.
    a. Macro means big enough to be seen with the naked eye
7. A lot of the critters we are going to find are going to be small but we will be able to see them with our eyes.
8. The next part on the word is invertebrate.
9. I want everybody to feel their backbone. An animal with a backbone is called a vertebrate
10. **Turn and talk:** what are some examples of animals with backbones?
11. Now if vertebrate means an animal with a backbone what do you thin invertebrate means?
    a. Exactly an animal without a backbone!
12. The majority of what we are going to find today are going to be insects.

Observations

13. Give 5-15 minutes (depending on the length of program) to simply observe what is in the bins without worrying what each macroinvertebrate is called.
14. Show students the observation tools that are available to them:
    a. Spoons – great for picking things up
    b. Magnifying boxes – two different sizes to put macroinvertebrates in.
    c. Larger plastic containers – can be used to place macroinvertebrates in or to collect and separate debris from the bins.
    d. Digital microscopes – distribute evenly throughout observation area. Can either give directions on how to use to large group or small group (with a small group it's easier to demonstrate with an actual specimen)
        i. Turn on with orange power button.
        ii. Place macroinvertebrate in magnifying box without lid and place on stand.
        iii. Move course adjustment knob to move specimen closer to the lens.
        iv. Once close, adjust the focus using the dial on the lens.
        v. Brightness and magnification can be adjusted with levers next to screen.
15. Remind students that we need to handle the macroinvertebrates with care as we will be releasing them. They are aquatic species so they need to remain in the water at all times during observation.
16. As students are observation, they should remember these prompts:
    a. I notice…
    b. I wonder…
    c. It reminds me of…

CONCEPT INVENTION (Time: During the Exploration)

Identification

1. Depending on the group, you should decide whether to explain the keys to the whole group or to smaller groups.
    a. If there is a large number of students, they are younger, or ELL students, the key explanation will be easier in smaller groups where everyone can see what's happening better.

2. Explain to students that the key uses a series of questions about features that will move them through it until they have identified the species more accurately than just looking at the pictures and deciding which one it most resembles.
    a. Students will be tempted to just point and choose what they are looking at based on appearance, remind them if they are struggling or falsely identify something to use the key and walk through it with them.
3. Demonstrate the key (either to the whole group or small groups) with a specimen. It is best to use a mayfly, dragonfly, or stonefly because those will take you all the way through the key.
    a. Start at the top and answer the question: Shell or no shell?
    b. Follow whichever path is appropriate.
    c. If it has no shell: does it have legs or no legs?
    d. Keep following whatever path it sends you down.
4. Students will be tempted to just point and choose what they are looking at based on appearance, remind them if they are struggling or falsely identify something to use the key and walk through it with them.
5. Students will start to ask questions about some of the macroinvertebrates and their features. Give information to individuals or groups of students who show curiosity. Suggested common themes and facts that will come up:
    a. Questions and facts about the life cycles of dragonflies, mayflies, caddisflies, stoneflies, etc.
        i. Many of these creatures start their life under water, but then undergo a change or metamorphosis where they are no longer dependent on their aquatic habitat. They grow wings and spend their adult lives flying around and catching their food outside the water.
    b. How caddisflies carry their homes with them and the materials they use to make their homes.
    c. Macroinvertebrate adaptations, such as how stonefly nymphs do pushups when they are in low oxygen environments to increase the oxygen around them.
    d. How do mussels reproduce?

APPLICATION (TIME: 10 - 15 MIN)

1. Macroinvertebrates are important for science research because they have the ability to tell us about the health of the water. This makes them a bioindicator species.
2. Introduce students to the pollution tolerance groups on the backs of the keys.
3. Some species are able to tolerate, or put up, pollution whiles others are sensitive, or can't handle, pollution.
4. Depending on the time left in class, you will have to modify how much time is spent on pollution.
5. You can either figure out the quality of the water as a whole class or, if time permits, there are laminated worksheets that can be done in small groups.
6. Have the class identify which species were found and which groups they belong to. Multiple the number in each group by the given factor and add up to get index. The index will tell the water quality.
7. What does our index tell us about the health of the St. Croix River?
8. The St. Croix River is one of the cleanest tributaries to the Mississippi River. It is a very healthy river that supports a lot of life.
9. **Turn and talk:** when we talk about pollution, what are we talking about? What are some examples?
    a. As you do this try to get the students past litter and trash. A lot of times they seem to get hung up on that being the only type of pollution.
10. How does pollution get into the water?
    a. Storm drains – anything on the streets washes away directly into the river.
    b. Run off – rain can wash away things on the earth (pesticides, fertilizers, etc.)
11. **Turn and talk**: If pollution gets into the water way up here on the St. Croix River how does it affect the people, plants, and animals further downstream?
12. **Turn and talk**: What can you do to be a friend of the river, lake, stream, pond or creek in your neighborhood or community?

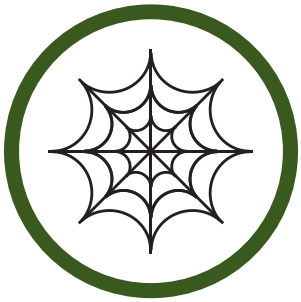
REFLECTION (Time: 5 min)

Have the student's **think, pair, share or journal** on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF →What are two observations you made about two different macroinvertebrates today?
- WORLD → What are two ways you can help to protect aquatic habitat in your community?
- OTHERS → How would you describe what a macroinvertebrate is to your family?
- THOUGHTS → What are you still wondering about?

RIVER WEB OF LIFE



PROGRAM TYPE : ECOLOGY

Grade Level : 3 - 8 **Site : Interstate Park or Classroom**

ESSENTIAL UNDERSTANDING

Interactions in your daily life include eating food, playing with friends, and sleeping; the living and non-living members of a river ecosystem experience similar interactions in their habitat.

BIG IDEAS

- An ecosystem is made up of all of the living and nonliving things in an area, including plants, animals, and other living things, as well as nonliving materials—for example, water, rocks, soil, and sand.
- There is a web of interactions in a river ecosystem where everything is connected?
- Humans may contribute to both the health and decline of an ecosystem.

Learning Targets (Students will be able to…)

- Define what an ecosystem is;
- Describe what a healthy ecosystem looks like (a web of strong connections); and
- Give an example of how humans are connected to the river ecosystem.

ACADEMIC CONTENT STANDARDS

Minnesota Science Standards

0.3.2.2.2, 0.4.1.1.3, 0.4.2.1.1, 1.1.1.1.1, 1.1.3.1.1, 1.4.1.1, 1.4.2.1.1, 1.4.2.1.2, 2.4.2.1.1, 3.1.1.1.1, 3.4.1.1.2, 5.4.1.1.1, 5.4.2.1.1, 5.4.2.1.2 , 5.4.4.1. 7.4.2.1.1, 7.4.2.1.2, 7.4.2.1.3, 7.4.2.2.1, 7.4.2.2.2

Wisconsin Science Standards*

C.4.1, F.4.1, F.4.4, F.8.8

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- Yarn Ball
- Web of Life cards with photographs
- Laminated John Muir quote (see above)
- White board, dry erase markers and eraser

BIG SCIENCE WORDS

- Ecosystem
- Biotic
- Abiotic
- Producers
- Photosynthesis
- Herbivore
- Omnivore
- Carnivore
- Predator
- Prey
- Decomposer

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger students - Have them repeat new vocabulary words and continue to review definitions throughout the activity
- Older students – Emphasize the vocabulary and deeper thinking about interactions and connections within a river ecosystem. Bring in relevant research and information to the activity. Use biotic and abiotic vocabulary when describing living and nonliving members of an ecosystem. Explain how the number of populations an ecosystem can support depends on the biotic resources available as well as abiotic factors such as amount of light and water, temperature range and soil composition. Explain how energy is transferred and how the web represents that transfer of energy.
- ELL – Consider sharing the Web of Life cards and activity with teachers prior so they can familiarize ELL students with members of the river ecosystem.
- Special Needs – This activity should meet the needs of all students with the exception of high energy students since it is low energy and stationary. It might be necessary to have high energy students get the wiggles prior to facilitating this activity.

CLASS PREP

- Make sure the Web of Life cards are still in good condition; if not, they may need to be recreated
- Make sure yarn is still wound in a ball
- Kids can sit and listen for about the time that correlates to their age (i.e. a 1st grader who is 7 can actively listen for about 7 minutes- this caps at 12 minutes even for adult learners). Be sure to be concise in your explanation of concepts, since students will be so excited to participate. Let their curiosity drive the lessons as much as possible (while also bringing it back to the essential understanding, big ideas and learning targets).

SAFETY STUFF

- This activity traditionally requires learners to wrap the yarn around their finger. This can result in others pulling too hard on the yarn resulting in injury, frustration and distraction. There are some groups who can handle that, but for the most part asking students to hold on to the yarn and requesting that they do not tug on it works best.

10 MINUTES TO TEACHING

- Make sure you have a whiteboard, dry erase marker and the Web of Life Cards ready to go.

INVITATION (10 min)

1. Seat students in a circle; greet students and introduce yourself to them.
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. What's an ecosystem? Think, pair, share.
4. Give a few students the opportunity to share their ideas.
5. Work together to come up with a definition of ecosystem.
    a. An ecosystem is made up of all of the living and nonliving things in an area. This includes all of the plants, animals, and other living things that make up the communities of life in an area. An ecosystem also includes nonliving materials—for example, water, rocks, soil, and sand.
6. Maybe some of you have visited a river before and noticed some of the living and non-living members. Turn and Talk to the person next to you; how many members of a river ecosystem can you name?
7. Allow for sharing with each other and out loud. List members they share on the whiteboard.

EXPLORATION (15 min)

1. We have a great list of river ecosystem members. Now, we are going to participate in an activity where we consider how the members of this ecosystem interact or depend on each other.
2. Describe the Web of Life cards and pass them out. Give the students a few minutes to read over their cards.
3. Once they have looked the card over, have the students place the card around their necks so that everyone can see the image.
4. Stand in the middle of the circle; you represent the sun, which gives life and energy to the ecosystem.
5. Ask the group, what member of the river ecosystem takes the sun's energy to produce food.
6. If students need a little assistance, you can explain that plants are called producers and they take the sun's energy to create food for themselves in the form of sugar. This process is called photosynthesis.
7. Pass the yarn to one of the students who has a plant card and have them hold on to the yarn tightly.
8. In an ecosystem, there are members who only eat plants. Does anyone know what we call plant eaters?
9. Yes, Herbivores! Who in this circle is an herbivore and only eats plants?
10. Have the student with the plant card holding the yarn, pass the ball of yarn to an herbivore.
11. In ecosystems there are animals called predators, who hunt for their meals (prey). Some predators might also eat plants. What do we call animals that eat plants and animals?
12. Right on! Omnivores eat both plants and animals. How do we classify animals that only eat meat?
13. Yes! Carnivores just eat meat.
14. Ask the group who the student with the yarn is connected to in the circle to find more food or become food for another animal. The student should pass the yarn and hold on tightly to the yarn.
15. As the activity goes on, continue to facilitate connections and interactions between members of the river ecosystem. These connections can be food, water, shelter, decomposer, etc.
16. With high energy students, it might be necessary for you walk the yarn to the "connected" student. The yarn should remain on the ground (if sitting).
17. Continue this until all students have are holding the yarn and a web has been created.

CONCEPT INVENTION (5 min)

1. Direct the students to think about what the yarn looks like—a web. The name of this activity is "Web of Life." Ask: Do you really think we are all connected?
2. Identify two students in the circle that do not have a direct connection. Example: Would a dragonfly have a connection with a pine tree? To find out, do this experiment. Have the dragonfly student hold up their hand (with the yarn). Tell the students that if they feel a tug on their yarn, they should hold up their hand (with the yarn) as well. Both the dragonfly and the pine tree should end up with their hands raised. In fact, everyone in the circle should have their hands raised.
3. Explain that although the dragonfly and the pine tree may not be directly connected, they are still connected to each other through the web of life.
4. Do the experiment again choosing two different cards with in-direct connections. Again, everyone should end up with their hands raised. It doesn't matter what cards you choose, this works every time.
5. Is everything connected in the universe? YES! The more complex the web is, the more connections there are.
6. Share the John Muir quote with the students. "When we try to pick out anything by itself we find it hitched to everything else in the universe."—John Muir

APPLICATION (10 min)

1. There is no card depicting a person. Do you think people belong in this circle? YES! Can anyone name one direct connection that people would have to a member of this river ecosystem?
2. A healthy ecosystem is one that is in balance, where these connections remain strong, and where people are working to keep the ecosystem healthy.
3. A compromised ecosystem; one that is showing signs of imbalance, may weaken the connections. What might that look like? (Students should not hold the web so tightly).
4. What events, factors or circumstances might negatively impact the health of a river ecosystem?
5. Facilitate this conversation strategically, so you can demonstrate how connections may be broken, as well as how human activity can impair ecosystem health and diversity.

REFLECTION (5 – 10 min)

Have the student's think, pair, share or journal on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF → In your own words, describe what an ecosystem is.
- WORLD → How do humans both help and hinder the health of river ecosystems?
- OTHERS → How would you describe what a healthy ecosystem should look like to someone who might not know?
- THOUGHTS → What are you still wondering about?

ST.CROIX VISITOR CENTER SCAVENGER HUNT

PROGRAM TYPE : HISTORY / ECOLOGY

Grade Level : 3 - 6 Site : St. Croix Visitor Center

ESSENTIAL UNDERSTANDING

We do not have to travel too far to visit a National Park or Monument.

BIG IDEAS

- The Namekagon and St. Croix Rivers are part of the St. Croix National Scenic Riverway under the Wild & Scenic Rivers Act of 1968.
- The National Park Service manages and protects the Riverway for future generations to enjoy.
- National Parks are scenic or historically important areas of countryside protected by the federal government for the enjoyment of the general public or the preservation of wildlife.

LEARNING TARGETS (Students will be able to...)

- Find the St. Croix and Namekagon Rivers on a map of Minnesota and Wisconsin;
- Discuss the importance of these rivers; and
- Define what a National Park is and the job of the National Park Service.

ACADEMIC CONTENT STANDARDS

MN Science Standards
3.1.1.1.1, 3.3.1.1.1, 3.1.3.2.2, 3.4.1.1.2, 5.4.2.1.1

MN Social Studies Standards
3.1.1.1.1, 3.1.4.6.1, 3.3.1.1.1

WIScience Standards*
C.4.1
WI Social Studies Standards*
A.4.4, A.4.7, A.4.8, B.4.1, B.4.7

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- Movie
- Scavenger Hunt Papers
- Clipboards
- Pencils
- Lifejackets and Jr. Ranger books (optional)

BIG NEW WORDS

- National Park Service
- St. Croix National Scenic Riverway

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger: Younger students may need more assistance with the scavenger hunt; have them work in groups with adult helpers. For younger grades, don't go through the whole scavenger hunt, but pick a few examples.
- Older: Make it a competition for more advanced learners. Give them a time limit!
- ELL: Familiarize students with the St. Croix and Namekagon Rivers prior to the Visitor Center field trip; allow them to work with partners during the scavenger hunt. Have ELL students sit next to someone during the movie who can interpret for them.
- Special needs: For learners with ADHD or for students who are high energy, provide a fidget during the movie and make the scavenger hunt a fast paced adventure for them.
- Instructors may want to connect with individual teachers prior to the lesson to discuss adaptations for students (i.e. if groups or partners would be better- teacher could assign beforehand)

CLASS PREP

- Prepare scavenger hunt materials

SAFETY STUFF

- There are no safety concerns for this activity with the exception that the St. Croix Visitor Center is small and so students should walk and be under control during the scavenger hunt.

10 MINUTES TO TEACHING

- Set up movie
- Prepare scavenger hunt materials
- Alert staff involved with activity

INVITATION (5 min)

1. Welcome students, introduce Visitor Center and other instructors
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. Ask students if they know where they are located on the St. Croix National Scenic Riverway Map.
4. Show the students where they are along the St. Croix River and show them the Namekagon River, the St. Croix's largest tributary.
5. The St. Croix River forms the boundary between Minnesota and Wisconsin.
6. Did you know these two rivers are a National Park and you are in the National Park right now? **Turn and Talk:** Have the students turn and talk again with a different partner about the following questions:
    a. What is a National Park?
    b. You may have visited National Parks, such as Yellowstone or the Grand Canyon; what National Parks have you visited?
    c. What does it mean to be a National Park?
7. Allow a few students to share what they heard their partner share and discuss their responses.

EXPLORATION (15 min)

1. Have the students come to the Visitor Center desk and grab a scavenger hunt, clipboard, and pencil.
2. Give them time to work on the Scavenger Hunt.
3. Allow them to work on the Scavenger hunt from start to finish or as time allows (or until they seem ready).
4. If they finish early, they may quietly look around the Visitor Center.

CONCEPT INVENTION (20 min)

1. Lead the students to the movie room and tell them they are going to watch a movie that tells the story of this park.
2. Let them know that at the end of the movie you will ask them to share something they learned from the movie.
3. After the movie ask each of them to share something they learned from the movie.
    a. Who owns National Parks?
    b. What are some other National Parks?
    c. What else did you learn about the St. Croix National Scenic Riverway from the movie.
4. Share with students the significance of the Wild & Scenic River designation.

|**APPLICATION** (5 min & if time allows add the Jr. Ranger program here)

1. Ask everyone to sit down.
2. Go through the Scavenger Hunt.
3. This would be a good time to do the Jr. Ranger activity if there is time (see Jr. Ranger program sheet)
4. Thank them for coming and if possible send them back with a sticker or something for completing the scavenger hunt (give it to the teacher).
5. Tell them to bring their families to the Visitor Center during the summer!

REFLECTION (5 min)

Have the student's think, pair, share or journal on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF → What was your favorite part of the visitor center or scavenger hunt?
- WORLD → What makes the St. Croix National Scenic Riverway so special?
- OTHERS → What is the role of the National Park Service in managing the riverway?
- THOUGHTS → What are you still wondering about?

TREGO VISITOR CENTER SCAVENGER HUNT

PROGRAM TYPE : HISTORY / ECOLOGY

Grade Level : 3 – 6 **Site : Trego Vistor Center**

ESSENTIAL UNDERSTANDING

We do not have to travel too far to visit a National Park or Monument.

BIG IDEAS

- The Namekagon and St. Croix Rivers are part of the St. Croix National Scenic Riverway under the Wild & Scenic Rivers Act of 1968.
- The National Park Service manages and protects the Riverway for future generations to enjoy.
- National Parks are scenic or historically important areas of countryside protected by the federal government for the enjoyment of the general public or the preservation of wildlife.

LEARNING TARGETS (Students will be able to…)

- Find the St. Croix and Namekagon Rivers on a map of Minnesota and Wisconsin;
- Discuss the importance of these rivers; and
- Define what a National Park is and the job of the National Park Service.

ACADEMIC CONTENT STANDARDS

MN Science Standards
3.1.1.1.1, 3.3.1.1.1, 3.1.3.2.2, 3.4.1.1.2, 5.4.2.1.1

MN Social Studies Standards
3.1.1.1.1, 3.1.4.6.1, 3.3.1.1.1

WI Science Standards*
C.4.1

WI Social Studies Standards*
A.4.4, A.4.7, A.4.8, B.4.1, B.4.7

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- Movie
- Scavenger Hunt Papers
- Clipboards
- Pencils
- Lifejackets and Jr. Ranger books (optional)

BIG NEW WORDS

- National Park Service
- St. Croix National Scenic Riverway

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger: Younger students may need more assistance with the scavenger hunt; have them work in groups with adult helpers. For younger grades, don't go through the whole scavenger hunt, but pick a few examples.
- Older: Make it a competition for more advanced learners. Give them a time limit!
- ELL: Familiarize students with the St. Croix and Namekagon Rivers prior to the Visitor Center field trip; allow them to work with partners during the scavenger hunt. Have ELL students sit next to someone during the movie who can interpret for them.
- Special needs: For learners with ADHD or for students who are high energy, provide a fidget during the movie and make the scavenger hunt a fast paced adventure for them.
- Instructors may want to connect with individual teachers prior to the lesson to discuss adaptations for students (i.e. if groups or partners would be better- teacher could assign beforehand)

CLASS PREP

- Prepare scavenger hunt materials

SAFETY STUFF

- There are no safety concerns for this activity with the exception that the Trego Visitor Center is small and so students should walk and be under control during the scavenger hunt.

10 MINUTES TO TEACHING

- Set up movie
- Prepare scavenger hunt materials
- Alert staff involved with activity

INVITATION (5 min)

1. Welcome students, introduce Visitor Center and other instructors
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. Ask students if they know where they are located on the St. Croix National Scenic Riverway Map.
4. Show the students where they are along the St. Croix River and show them the Namekagon River, the St. Croix's largest tributary
5. The St. Croix River forms the boundary between Minnesota and Wisconsin.
6. Did you know these two rivers are a National Park and you are in the National Park right now? Turn and Talk: Have the students turn and talk again with a different partner about the following questions:
    a. What is a National Park?
    b. You may have visited National Parks, such as Yellowstone or the Grand Canyon; what National Parks have you visited?
    c. What does it mean to be a National Park?
7. Allow a few students to share what they heard their partner share and discuss their responses.

EXPLORATION (15 min)

1. Have the students come to the Visitor Center desk and grab a scavenger hunt, clipboard, and pencil.
2. Give them time to work on the Scavenger Hunt.
3. Allow them to work on the Scavenger hunt from start to finish or as time allows (or until they seem ready).
4. If they finish early, they may quietly look around the Visitor Center.

CONCEPT INVENTION (20 min)

1. Lead the students to the movie room and tell them they are going to watch a movie that tells the story of this park.
2. Let them know that at the end of the movie you will ask them to share something they learned from the movie.
3. After the movie ask each of them to share something they learned from the movie.
    a. Who owns National Parks?
    b. What are some other National Parks?
    c. What else did you learn about the St. Croix National Scenic Riverway from the movie
4. Share with students the significance of the Wild & Scenic River designation.

APPLICATION (5 min & if time allows add the Jr. Ranger program here)

1. Ask everyone to sit down.
2. Go through the Scavenger Hunt.
3. This would be a good time to do the Jr. Ranger activity if there is time (see Jr. Ranger program sheet)
4. Thank them for coming and if possible send them back with a sticker or something for completing the scavenger hunt (give it to the teacher).
5. Tell them to bring their families to the Visitor Center during the summer!

REFLECTION (5 MIN)

Have the student's think, pair, share or journal on these reflective questions:

MY RIVER CONNECTIONS TO…

- SELF → What was your favorite part of the visitor center or scavenger hunt?
- WORLD → What makes the St. Croix National Scenic Riverway so special?
- OTHERS → What is the role of the National Park Service in managing the riverway?
- THOUGHTS → What are you still wondering about?

WHAT IS A WATERSHED?

PROGRAM TYPE : ECOLOGY

Grade Level : 4 - 8 **Site : Classroom or Field Trip**

ESSENTIAL UNDERSTANDING

The ponds, streams, creeks, rivers and lakes in our communities are full of life, and they are all connected to each other.

BIG IDEAS

- Ponds, streams, and rivers in our community are all connected.
- We all live in a watershed.
- A watershed is any area of land that water flows across or through and collects in a river, lake or stream.
- Watersheds can be connected with larger regional or global watersheds.
- Humans play an important part in keeping their watershed clean and healthy.

Learning Targets (Students will be able to…)

- Define what a watershed is.
- Observe and describe how water moves through a watershed.
- Share two ways they can help to keep the water in their communities healthy and clean.

ACADEMIC CONTENT STANDARDS

Minnesota Science Standards

3.1.1.1.1, 3.1.1.2.1, 3.1.1.2.4, 3.1.3.2.1, 4.1.2.1.1, 5.1.1.1.3, 5.1.1.1.4, 5.1.3.4.2, 5.3.4.1.3, 5.4.2.1.2, 5.4.4.1.1, 7.4.4.1.2, 8.3.4.1.2

Wisconsin Science Standards*

C.4.1, F.4.1, F.4.4, F.8.8

*We are in the process of updating the Wisconsin Academic Content Standards to align with the newly revised 2018 environmental education and literacy, science and social studies standards

MATERIALS

- Watershed map
- Watershed model
- Spray bottles
- Washable markers
- Butcher paper/ tin foil
- Towel
- Food coloring

BIG SCIENCE WORDS

- Watershed
- River
- Tributary
- Slope
- Pollution
- Run-off
- Water quality

ADAPTATIONS for younger, older, ELL, and special needs students

- Younger: Use visual aids as much as possible. Using watershed model as a primary teaching tool for younger students may be more applicable. Letting students use and play with watershed model, food, coloring, and spray bottle.
- Older: Emphasize what makes a watershed, all of its parts, and point and non-point pollution.
- *ELL: Inform ELL teacher of this activity ahead of this class and ask teacher or aide to review vocabulary and instructions.
- *Special needs: make to be accommodating and inclusive to all student needs

CLASS PREP

- Coordinate with teacher ahead of time to organize the class groups.
- Cut tin foil or butcher paper into squares enough for each student or enough for students to work together as groups.
- Have food coloring for the watershed model
- Have enough washable markers ready for students to use
- Multiple spray bottles full of water for students to use
- Towels for cleanup

10 MINUTES TO TEACHING

- Have watershed model in a place that all students will be able to see
- Have cut pieces of tin foil/butcher paper, and markers ready for student use
- Have watershed map out in a place that students will be able to view it
- List BIG science words on a white board
-

INVITATION (5 min)

1. If you are a SCRA staff or volunteers, introduce SCRA as the "Friends of the River" organization that works to preserve, protect and celebrate the St. Croix National Scenic Riverway.
2. Share the "Essential Understanding", Big Ideas and Learning Targets with the students so they know what to expect.
3. Today, we are going to learn about something called a watershed.
4. Think, pair, share: Have you heard the word watershed before? What is a watershed?
5. Allow a few students to share what they and their partner talked about.

EXPLORATION (15 min)

1. Introduce the St. Croix National Scenic Riverway map. Encourage students to observe as much as they can about the map. What do they notice? What do they recognize?
2. As students are looking at the maps, walk around and listen to conversations. Encourage deeper thinking by asking some additional questions such as:
    a. Can you find where we are right now?

    b. Have been to any other of these places before?
    c. What do all the different colors mean?
    d. If you wanted to go on a crazy river ride with lots of rapids, where would you go?
3. After a couple minutes, bring students back together and allow for each group to share one thing that they learned about the map.
4. Did anyone figure out where the St. Croix River starts?
5. While they may figure out the St. Croix headwaters right away, it is more likely that someone will point out the Namekagon River headwaters instead. Take this opportunity to introduce tributary,
6. Does anyone know what a tributary is? Can you give a definition?
7. A tributary is a smaller river that flows into a larger river. The Namekagon is a tributary of the St. Croix. The St. Croix is a tributary of the Mississippi. All these rivers are connected and are a part of a watershed.
8. Have the students find 4 tributaries on the map. What are those rivers called?
9. **Turn and talk**: I told you that the St. Croix and Namekagon Rivers are a part of the St. Croix River Watershed, what do you think a watershed is?
    a. Have the students define what they believe a watershed is. List ideas on a white board if there is one available.
10. Give the definition of a watershed: an area of land that all drains to one spot. The analogy of a bathtub with the pipe that the drain flows into being the St. Croix works well.
11. Tell the students that they will be participating in some activities that will help them discover what a watershed is.
12. In the next couple of activities, we will learn more about what it means to live within a watershed and how we play a role in keeping the watersheds we live in, healthy and clean.

CONCEPT INVENTION (15 min)

1. Start by having the students create their own watershed using tin foil as their map.
    a. They should use multiple colors and have one large, main river with several tributaries.
2. Let's review the definition of a watershed one more time. Who can summarize what a watershed is?
3. Right on! A watershed is an area where all the waters from its rivers and streams flow to the same place.
4. Give the students only a couple of minutes to draw their own watersheds.
5. Ask the students if the land that the river flows through is flat?
6. What are some examples of things that make the landscape not flat?
    a. Hills, mountains, valleys, etc.
7. Explain how rivers flow through many different landscapes. What kind of landscapes might your rivers run through? How do rivers shape the landscape?
8. Have a few students share their answers.
9. Hopefully, they are understanding that the land is not flat, and there is slope on the landscape (review slope if necessary).
10. Now we are going to make our model 3D by giving it some hills and valleys
11. Demonstrate how to crumple their watershed maps to create slope.
    a. Remind them to be deliberate in how they crumple their papers. Rivers don't often flow on the highest piece of land. The St. Croix River is an example of a river that flows in a valley.
    b. If they crumple the whole piece of aluminum into a tight ball, the next part (spraying water) will not work as well.
12. **Turn and Talk:** Where do rivers get their water from? Have the students share their answers out loud.
13. Demonstrate with a spray bottle how to create a rainstorm on their watershed map.

14. Make sure the kids understand what the spray bottles are for. Once they get some good spraying in take the bottles away from them. Sometimes there will end up being way too much water. Also if they are working in groups younger students will argue about who sprayed the bottle more and what not.
15. Have the students make it rain on their watershed maps.
16. **Turn and talk:** What happened/what did you notice about your watershed and its rivers?
    a. The colors ran, collected, and mixed together!
17. Does this happen in real life with real rivers in a watershed?
18. Ask the students what is a nearby river to where they are?
19. Does anyone know what river that river flows into? Continue this conversation until you get down to the Gulf of Mexico.
20. If these different rivers flow into each other do their water mix?
21. Bingo! You bet it does… All of this water in our rivers in our watershed, where do you think it all goes?
22. **Turn and talk:** Can there be more than one watershed?

APPLICATION (15 min)

1. Turn the student's attention to the watershed model by having them gather around the model.
2. The students can help set up the model by each placing one item in the community.
    a. After they place them, feel free to adjust as add some others if necessary.
3. Explain to the students what the watershed model is – a community similar to theirs.
4. **Think, pair, share:** Since we learned today, that we live in a watershed, what are some human activities that you see or do in a watershed?
5. For their answers have some food coloring or food safe product available to represent a form of potential water pollution.
6. Explain what you are doing with the different forms of pollution.
7. Have the students reflect on what happened to their watershed map when they made it rain. What do you think is going to happen when we make it rain on our watershed model?
8. Make it rain on the model with a spray bottle. Allow each student to have 2-3 squirts. You may need to add some extra rain after they have to make things move. What happened?
9. Introduce point source and non-point source pollution.
    a. Point source comes from one specific spot that you can see, for example the sludge coming from the factory.
    b. Non-point source is harder to see where it came from. For example the river may become loaded in nutrients but we don't know which farm or yard it came from.
10. Do you think this happens in real life in real watersheds?
11. **Think pair and share**: What might be an outcome of this pollution run-off (introduce this important vocab word).
12. List the student's answers on a white board if there is one available.
13. I am now going to share one of our BiG IDEAS for today's class: Different watersheds around the world are connected! And, we have an example of that in our own backyard…
14. Just like we talked about before! If we look at our St. Croix River Watershed Map, can we observe where the St. Croix River flows to? That's right! The mighty Mississippi! And, what is the Mississippi River connected to? Yep, the Gulf of Mexico! The ocean!
15. What does this mean for us living here in the St. Croix River Watershed?
16. Have a few students share their answers
17. How we treat our water here in the St. Croix River watershed can affect water, wildlife, and people downstream.
18. The good news is that there are ways that people can prevent water pollution and so many people are doing just that, and you can help too!

19. Share a few water pollution prevention techniques with the group, such as: disposing of chemicals properly, proper fertilizer application, or opting out of using chemicals for gardening and landscaping, and timely and appropriate car maintenance.

REFLECTION (5 min)

Have the student's **think, pair, share or journal** on these reflective questions**:**

MY RIVER CONNECTIONS TO…

- SELF → What are two ways you can help to prevent water pollution in the St. Croix River Watershed?
- WORLD → Define what a watershed is. What part of the St. Croix River Watershed do you live in?
- OTHERS → How would you demonstrate to others what a watershed is and how it functions?
- THOUGHTS → What are you still wondering about?