

THE BWCA WILDERNESS KIT

Lesson Plan and Materials



UNIT TWO



UNIT TWO: HOW DIVERSE IS BIODIVERSE?

OVERVIEW

GRADES: 5-8

AGES: 11-14

TIME: 50 minutes

MATERIALS NEEDED:

1. Biodiversity Boogie Game Board
2. Species containers (7)
3. Ecosystem Photo Boards (5)
4. Exploring Ecosystems Worksheet (master in manual or on CD; make copies as needed)
5. Species Cards (185)
6. Instructor Reference Sheet: Ecosystem Descriptions
7. Instructor Reference Sheet: Species Card Descriptions/ Answer Sheet for Biodiversity Boogie Game
8. Unit Two Wilderness Passport (master in manual or on CD, make copies as needed)
9. Unit Two Wilderness Passport stamp and ink pad

CONCEPTS AND KEY IDEAS:

1. An ecosystem provides habitats for many organisms.
2. Organisms are interdependent.
3. Diversity within an ecosystem enhances the stability of that ecosystem.

GOALS:

1. Participants will be able to list and describe the five major ecosystems in the Boundary Waters Canoe Area Wilderness.
2. Participants will be able to explain how one ecosystem can be shared by many different species and how more than one ecosystem may be used by a single species.
3. Participants will be able to discuss the importance of diversity within an ecosystem.
4. Participants will be able to give examples of types of changes that may occur in an ecosystem and the effects of the changes on the organisms that live there.

SKILLS:

1. Observing
2. Analyzing
3. Comparing
4. Classifying
5. Identifying
6. Communicating with a small group
7. Identifying patterns and themes
8. Predicting

UNIT TWO: HOW DIVERSE IS BIODIVERSE?



BACKGROUND (1 OF 2)

Think of all the different plants and animals which live in your backyard: squirrels; birds; mice; voles; mosquitoes; wasps; grass; dandelions; daisies; maple trees; an oak tree; or a willow tree. If you looked carefully you would find many different **species**, or types of life, in this relatively small area. All these different **organisms** represent **biodiversity**.

Biodiversity is understood as the sum of all the plants, animals, fungi, and **microorganisms** in the world, or in a particular area. The basic units of biodiversity are the species. Biodiversity includes all of the species individual variation and **genetic variation** (just like humans are all of one species, yet there is huge variety within our species!) and all of the interactions between species. The more biodiverse an area or place, the more stable it is.

Imagine your backyard again. What if it were just grass and nothing else? It could only support those species that ate grass, found shelter in grass, or ate the species that ate grass. Now, add to the grass some trees and shrubs, some flowers and soil, add a rotting log or two and the diversity of species that can survive in this place dramatically increases. In the first instance, where there is only grass, if something happened that caused all the grass to die most of the species would die. In the second instance, where there are other types of habitat remaining, if something happened to the grass that caused it to die, some species would die, but because not all of the species relied on the grass, not all would die. The second scenario, where there is more diversity, can more easily adapt to change and is more stable. The same is true in wilderness.

It is important to protect whole **ecosystems** rather than just a single species or parts of a species **habitat**. For example, in order to protect the gray wolf population, we must protect its entire habitat. Wilderness is important to biodiversity because places like the **BWCAW** and other designated wilderness areas in the **National Wilderness Preservation System** protect large ecosystems.

What is an ecosystem?

An ecosystem is a community of living (biotic) organisms and the non-living (abiotic) environment which interacts and exchanges materials necessary for survival.

What is a habitat?

A habitat is the place where an organism finds the necessary food, water, shelter and space to survive.



UNIT TWO: HOW DIVERSE IS BIODIVERSE?

BACKGROUND (2 OF 2)



FUN FACTS:

Did you know that...?

...the fruit on the bearberry, a small red berry, will stay intact all winter, providing food to birds and some mammals.

...fresh white pine needles make an excellent tea, filled with vitamin C!



The Boundary Waters Canoe Area Wilderness includes **diverse** habitats and several different ecosystem types. Ecosystem boundaries can be described in different ways. Ecosystems do not have strict and defined boundaries; there are subtle transitions between them. Although there are actually nine or more different plant community types in the BWCAW, for the purpose of this unit we have classified or grouped these community types into five main ecosystems:

1. rocky cliffs and outcrops
2. northern needleleaf (conifer) forest
3. deciduous aspen-birch forest
4. forested and open peatlands (such as bogs and fens)
5. lakes/ponds/marshes.

UNIT TWO: HOW DIVERSE IS BIODIVERSE?



PREPARATION AND INTRODUCTION

INTRODUCTION: (5 minutes)

1. Ask the following questions to assess the participants' knowledge and get them ready to learn.
 - Have you heard the word ecosystem before?
 - Can anyone give an example of an ecosystem?
 - Have you heard the word biodiversity before?
 - How would you describe biodiversity?
2. Explain that the unit is about exploring the different places in the BWCAW and what types organisms can survive in the different places (ecosystems).

PREPARING FOR UNIT TWO:

1. Read through the unit and familiarize yourself with all of the materials before starting the activities.
2. Take the items out of the BWCA Wilderness Kit marked "Unit Two: How Diverse is Biodiverse?"
3. Set up the room so there is a 10 feet by 10 feet open area for the Biodiversity Boogie Game Board or hang it where everyone may see it.
4. Spread the Species containers around the room.



UNIT TWO: HOW DIVERSE IS BIODIVERSE?

ACTIVITY ONE: EXPLORING ECOSYSTEMS

TIME: 10 minutes

MATERIALS NEEDED:

1. Ecosystem Photo Boards
2. Exploring Ecosystems Worksheet (master in manual or on CD; make copies as needed.)
3. Instructor Reference Sheet: Ecosystem Descriptions



FUN FACTS:

Number of species in the BWCAW:

Mammals	52
Amphibians	13
Reptiles	5
Birds (breeding)	155



OBJECTIVES:

1. Participants will define habitat and ecosystem.
2. Participants will list and describe five major ecosystems in the BWCAW.

INSTRUCTIONS:

1. Split participants into five teams, one for each ecosystem.
2. Distribute one Ecosystem Photo Board and one Exploring Ecosystems Worksheet to each team.
3. Assign roles of reader (to read the description on the back of the Photo Board to team members), recorder (to write down the team's thoughts), time keeper (to keep track of time), and speaker (to present to the group).
4. Using the Exploring Ecosystems Worksheet, instruct each team to create a list of all the words that describe its ecosystem (sandy, wet, buggy, dry, dark, shaded, open, hot) and then predict what kinds of animals and plants would use this ecosystem for survival.
 - Encourage participants to think beyond mammals. What about the largest group of species in the world—INSECTS!! Prompt them to think of birds, reptiles, and woody and non-woody plants.
 - Remind participants to think about which ecosystems are necessary for an organism's survival, as opposed to where you would find this organism.
 - There may be more than one correct answer.
5. Each team then presents its ecosystem to the rest of the group. The team will: 1) read the description of its ecosystem; 2) read the words it compiled; and 3) list the organisms that live there.



UNIT TWO: HOW DIVERSE IS BIODIVERSE?

ACTIVITY ONE: EXPLORING ECOSYSTEMS WORKSHEET

Your **ecosystem** is called _____ .

What would it feel, look, or sound like if you were standing in the middle of your ecosystem? List the words that you think best describe your ecosystem.

1. _____
2. _____
3. _____
4. _____
5. _____

There is a lot of life in your ecosystem. Based on the photograph you see as well as your descriptive words, what types of plants and animals would most likely live in your ecosystem?

Plants

1. _____
2. _____
3. _____

Animals

1. _____
2. _____
3. _____





UNIT TWO: HOW DIVERSE IS BIODIVERSE?

INSTRUCTOR REFERENCE SHEET

ECOSYSTEM DESCRIPTIONS

1. Rocky Cliffs and Rock Outcrops

Cliffs and outcrops are open and exposed to the elements. Plants and animals inhabit these areas but they must be able to cope with little to no soil, and lots of sun, rain, wind, and snow. **Lichens**, such as reindeer moss and British Soldier Lichens, cover the ground in some places. Small shrubs, like tasty blueberry shrubs, or wildflowers take hold where there are pockets or crevices of soil.

2. Northern Needleleaf (conifer) Forest

This forest can be made up of dry, sandy, or shallow soils. Jack pine and other fire-adapted **conifers**, such as mature red pines with thick bark, are the dominant trees. The forest floor receives patchy sunlight because these trees grow tall, creating a **canopy** or ceiling. In moister or deeper soils, fire-sensitive conifers such as white spruce, balsam fir, and white pine dominate the forest. These trees create a darker, shadier forest as they grow thick and tall.

3. Deciduous Aspen-Birch Forest

Trees and other plants that live here adapt to a lot of light. That means they are the first plants to re-sprout after a fire, a big windstorm or some event that creates a clearing. Plants like quaking aspen and paper birch trees grow quickly but don't live long—less than 100 years. Over time, shade-tolerant conifers like balsam fir will replace these trees.

4. Forested and Open Peatlands

These areas are low and wet. The water here is always cold and usually stagnant, or not moving. A floating mat of **sphagnum moss** covers some peatlands. Conifer trees, such as tamarack and black spruce, grow creating small forests. Open **peatlands** are areas that look like a lawn but are filled with mosses, grasses, dense shrubs and wildflowers.

5. Lake, Pond, and Marsh

These areas are WET! They come in different shapes, sizes, and depths. Some can be deep and cold; others are shallow and warm. These different conditions determine which plants and animals are parts of the ecosystem. Plants such as marsh marigolds, water lilies, blue flag iris, and animals such as water striders, frogs, fish, beavers, and ducks are found near these areas.

UNIT TWO: HOW DIVERSE IS BIODIVERSE?



ACTIVITY TWO: BIODIVERSITY BOOGIE

OBJECTIVES:

1. Participants will identify and categorize plant and animal species that rely on the five major ecosystems in the BWCAW for survival.

INSTRUCTIONS:

1. Maintain “ecosystem” teams from Activity One.
2. Set up the Biodiversity Boogie Game Board either on the wall or the floor, and the species containers at the other end of the room.
3. The teams have 10 minutes to get: 2 woody plants, 1 non-woody plant, 2 mammals, 1 insect, 1 bird, 1 reptile, 1 team’s choice (Team’s choice means that the team decides what kind of organism it needs, or would best fit in the team’s ecosystem).
4. Each team member is allowed to pick one Species Card on his or her journey to the species containers. When he or she returns, the team decides if that species would use the team’s ecosystem to survive.
 - If yes, the team keeps the card.
 - If no, the team’s next “runner” returns the card and picks up a new one.
 - Each team is allowed only three returns.

TIME: 20 minutes

MATERIALS NEEDED:

1. Biodiversity Boogie Game Board
2. Species containers (7)
3. Instructor Reference Sheet: Species Card Descriptions/Answer Sheet
4. Species Cards (185)



UNIT TWO: HOW DIVERSE IS BIODIVERSE?

ACTIVITY TWO: BIODIVERSITY BOOGIE

FUN FACTS:

...whirligig beetles carry an air bubble on their hind end whenever they dive. It is like an oxygen tank, giving them oxygen as they need it. By replenishing the “tank” with oxygen that is dissolved in water, the “tank” can last for up to 20 minutes.



5. Once time expires, the team places its cards on the Biodiversity Boogie Game Board.

INSTRUCTOR'S NOTE:

If a species is in a “wrong” place (i.e. a whirligig beetle in the northern needleleaf forest) ask questions to correct the group. For example, what does a whirligig beetle need to survive? Lots of water. Which ecosystem has a lot of water? You will find information about each species on the Species Card Description/Answer Sheet.

6. Gather the group around the Board and have each team present its ecosystem and the species it collected.
7. The entire group then evaluates the choices.
 - Teams help each other add or remove species.

UNIT TWO: HOW DIVERSE IS BIODIVERSE?



INSTRUCTOR REFERENCE SHEET (1 OF 5)

SPECIES CARD DESCRIPTION/ANSWER SHEET

The following is a list of the organisms used in the Biodiversity Boogie Game. Included are descriptions, the color and corresponding species, and the number indicating in which ecosystem(s) the organism is found.

Ecosystems are as follows:

- 1 = Rocky Cliffs and Rock Outcroppings
- 2 = Northern Needleleaf (conifer) Forest
- 3 = Deciduous Aspen-Birch Forest
- 4 = Forested and Open Peatlands
- 5 = Lake, Pond, and Marsh

1. Balsam Fir (Brown—Woody Plant)

I am an evergreen with short, flat, waxy, single needles. I grow in the shade of leaf-bearing trees. I am also found in the company of tamarack trees.

(Ecosystems 2, 3, 4)

2. Barred Owl (Yellow—Bird)

I am the most common species of owl to inhabit the north woods. I need tall trees for roosting and nesting, but the area beneath the trees (the understory) needs to be fairly open. I need this extra space so I can fly and attack my prey. Mice are my favorite things to eat.

(Ecosystems 1, 2, 3, 4)

3. Beaked Sedge (Green—Non Woody Plant)

I am a large, grass-like plant that grows near or in the water. My leaves are wide, flat and long. I can grow up to four feet tall. You are most likely to find me in wet meadows, marshes, edges of lakes, ponds, and streams. I start growing along the shore and weave a mat with

my roots that extends out over the water like a shelf. I have spiky-looking flowers that produce seeds the ducks and geese love to eat. Red-winged blackbirds like to perch on me.

(Ecosystems 4, 5)

4. Bearberry (Brown—Woody Plant)

I am an evergreen shrub with clusters of pink or white bell-shaped flowers that become bright red fruit. My leaves are shiny and oblong. I like to grow in sunny, dry, well-drained places like rocky hill sides, open pine forests and forest clearings. Bears and many types of birds enjoy my berries.

(Ecosystems 1, 2, 3)

5. Beaver (Red—Mammal)

I am a fur-bearing animal with a flat tail. I thrive in, near, and around the water. My favorite foods are alder, willow, maple, aspen, and birch. In order to bring water closer to my food, I build dams, which make the surrounding area flood. I can then easily swim to the trees I eat. I build my lodge in the middle of a pond or on the shore of a larger lake.

(Ecosystems 2, 3, 4, 5)

6. Black Bear (Red—Mammal)

I love nuts and berries, but will also eat grass, leaves, and buds. Sometimes ant hills, mice, and bird's nests are treats I can't pass by. And I will risk being stung on the nose for a bee's nest full of honey. (Ecosystems 1, 2, 3, 4)

7. Black Spruce (Brown—Woody Plant)

I am a small pointy tree or shrub with drooping branches, dark bluish-green needles and scaly, grayish-



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INSTRUCTOR REFERENCE SHEET (2 OF 5)

brown bark. You are most likely to find me in wet areas like bogs and swamps, but sometimes I will grow in areas that are a little drier. I am a popular place for squirrels and birds of many types to perch, nest, and gather food. My fallen branches provide homes for shrews, garter snakes, and salamanders.

(Ecosystems 4, 5)

8. Black-Throated Green Warbler (Yellow—Bird)

I am a colorful little bird who comes to the north woods to breed in the summer. I eat insects. I build my nest 15 feet or higher among the prickly branches.

I can be identified by my call which sounds like zee zee zee zoo zee.

(Ecosystem 2)

9. Blueberries (Brown—Woody Plant)

I ripen in July and August. I have adapted to grow in many different areas as long as I am not under water. People and bears like to eat me right off the bush.

(Ecosystems 1, 2, 3, 4)

10. British Soldier Lichen (Green—Non Woody Plant)

I am a small, slow growing plant. All lichens are a combination of two organisms—fungus and algae which need each other to survive. I am a ground cover with small, red caps which is how I got my name.

(Ecosystems 1, 2, 3, 4)

11. Common Loon (Yellow—Bird)

I am an excellent swimmer and diver because I have webbed feet and powerful legs that are set far back on my body. I nest on the water's edge where I have easy

access to food yet can quickly get back into the water when threatened.

(Ecosystem 5)

12. Eastern Garter Snake (Purple—Reptile/Amphibian)

I am the most common snake found in the BWCAW. I am not poisonous, nor are any of the other snakes found there. I got my name because I look like the striped garters that men used to wear to hold up their socks. I eat toads, frogs, insects, worms, mice, tadpoles, and minnows.

(Ecosystems 1, 2, 3, 4, 5)

13. Fathead Minnow (Blue—Fish)

I spend my days swimming and eating small insects and other aquatic animals. I have to be quick because I am a favorite food for larger predators such as the northern pike and the walleye.

(Ecosystem 5)

14. Great Blue Heron (Yellow—Bird)

I am a very tall, blue-gray, long-legged bird. My wing span can be as large as six feet. I can be found hunting for fish, small rodents, birds, reptiles and amphibians along lakes, ponds, rivers, meadows. I stalk my prey and then stab it with my long yellow bill. I nest in big trees, high cliff ledges or rock outcroppings along with several others in a colony of nests called a rookery.

(Ecosystems 1, 2, 4, 5)

15. Herring Gull (Yellow—Bird)

I am a white bird with light gray on my back and wings, black on my wing tips, a yellow bill and

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INSTRUCTOR REFERENCE SHEET (3 OF 5)

pinkish legs. You can find me flying around lakes, rivers, islands, and exposed rocky shorelines where I like to breeds on terraces, grassy hummocks, lakeside cliffs, and grassy islands scavenging for anything from berries to eggs and young of other gulls to eat. I look for terraces, grassy hummocks, lakeside cliffs and grassy islands for making my nest.

(Ecosystems 3, 4, 5)

16. Interrupted Fern (Green—Non Woody Plant)

I am a large fern with unusual leaves. I prefer to grow in rich, shaded woods, but I also grow in open, drier areas.

(Ecosystems 2, 3)

17. Luna Moth (Orange—Insect)

I am a beautiful green moth with a short life. I live only about a week. My job as a moth is to mate and die. I don't even have a mouth or stomach. When I was a caterpillar, I spent my time eating as many birch and aspen leaves as I possibly could so that I would metamorphose to survive the winter as a pupa in a cocoon.

(Ecosystems 1, 2, 3)

18. Moose (Red—Mammal)

I am the largest mammal in the BWCAW. Fully grown, I weigh 1,200 pounds or more! The Ojibwe named me "moose," which means "twig eater." My favorite twigs are willow, aspen, birch, mountain maple, beaked hazel, dogwood, and balsam fir. In the summer months I eat pond weed, bur weed, and water lilies. To survive I eat 50-60 pounds of food each day.

(Ecosystems 1, 2, 3, 4, 5)

19. Mosquito (Orange—Insects)

I am about 1/4-inch long, with long legs, a pair of clear wings, a narrow body and long, slender sucking mouthparts. Before I become an adult I live in the ponds, puddles, tree holes, swamps or other places where there is standing slow moving water. Once I become an adult I must have a blood meal in order to develop eggs, but also sip nectar, honeydew and fruit juices.

(Ecosystem 1, 2, 3, 4, 5)

20. Needle Spike Rush (Green—Non Woody Plant)

I am a low, grass-like plant and grow in large mats near water. You are likely to find me along the edges of ponds, lakes, marches and in shallow waters. Tiny white flowers grow in spikes on my stems. Ducks and geese enjoy eating the small straw-colored seeds I produce.

(Ecosystems 4, 5)

21. Northern Pike (Blue—Fish)

I am a long slender fish and am the largest, and most voracious, predator of northern waters. I prefer to hang out in shallow, weedy, clear waters in lakes and marshes and slow streams. I will ambush my prey from weedy cover, seizing other fish with needlelike teeth. I also dine on frogs, crayfish, mice, muskrats, and ducklings.

Ecosystem 5)

22. Paper Birch (Brown—Woody Plant)

I am recognized by my white papery bark. I like full sunlight and grow well after a forest fire or after logging.

(Ecosystems 2, 3, 4)

UNIT TWO: HOW DIVERSE IS BIODIVERSE?



INSTRUCTOR REFERENCE SHEET (4 OF 5)

23. Pitcher Plant (Green—Non Woody Plant)

I am a short plant, which lives in wet areas surrounded by moss. I love to eat meat! The soil I live in has so few nutrients that I must get them from another source. I attract insects with my fragrance. When the insects land on the lip of my pitcher-shaped leaves, they slide down the pointing hairs which direct them to the bottom of my pitcher. There they become liquefied in an enzyme and bacteria mixture. My cells then absorb the liquid. An insect shake!

(Ecosystem 4)

24. Quaking Aspen (Brown—Woody Plant)

I have leaves that flutter in the wind. I grow next to the red pine or in areas that have been logged. I am also called “Trembling Aspen, Poplar, or Popple.”

(Ecosystems 2, 3)

25. Raven (Yellow-Bird)

I am a large black bird, a thick black bill and a deep croaking voice. I like to soar over cliffs, forest, and rocky shorelines. I like to eat little fish in shallow rivers, rodents, eggs, grain and carrion. I build a big nest of sticks, moss and lichens on a tall tree or cliff.

(Ecosystems 1, 2, 3, 4, 5)

26. Red-bellied Snake (Purple—Reptile/ Amphibian)

I am a small woodland snake most at home under logs, stones, and litter on the forest floor. You might see me curled up on a sunny rock warming up. Don't let my bright red underbelly frighten you – I am quite docile and rarely attempt to bite humans, but I might play opossum if I get scared.

(Ecosystems 1, 2, 3, 4)

27. Reindeer Lichens (Green—Non Woody Plant)

I grow on patches of thin soil covering the bedrock usually found in older forests. I am a combination of fungus and algae and grow in coral-like clusters that can be any shade of yellow, gray, or green. My nicknames are “reindeer moss,” “caribou lichen,” and “caribou moss” because I am the primary food for the caribou that live up north.

(Ecosystems 1, 2, 4)

28. River Otter (Red—Mammal)

I am long and sleek with webbed feet that help me swim fast and smoothly. I spend most of my day searching for meals of fish, frogs, and crayfish.

(Ecosystem 5)

29. Rock Vole (Red—Mammal)

I am a small, round, and furry rodent. I may look like a mouse, but I have short ears and a short tail. I live in rocky areas where I can find seeds, grasses, and small insects to eat. I need to eat all the time because my teeth constantly grow; the grass that I eat helps wear down my teeth so that they do not grow too long.

(Ecosystems 1, 2)

30. Speckled Alder (Brown—Woody Plant)

I am a shrub which grows in clumps up to 16 feet high. I like to grow in wet, rich soil. Sometimes my branches scrape the sides of canoes that pass.

(Ecosystems 2, 3, 4, 5)

31. Sphagnum Moss (Green—Non Woody Plant)

I am a small green plant which forms large spongy floating mats. When I decay, I form peat. I grow in a

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INSTRUCTOR REFERENCE SHEET (5 OF 5)

near sterile environment that is very acidic.
(Ecosystem 4)

32. Spruce Grouse (Yellow—Bird)

I am a speckled, chicken-like bird that loves to browse on spruce, fir, and jack pine buds and needles. I also enjoy the leather leaves of the heath plant which grows in very cold, wet areas. I eat in the upper canopy of the forest, as well as on the ground, which is where you will also find my nest.
(Ecosystems 2, 4)

33. Tamarack (Brown—Woody Plant)

I am a conifer because I have cones and needles instead of leaves and flowers. When autumn arrives my needles turn gold like those of a deciduous tree and fall off. My fallen needles pile up on the spongy moss around my trunk and roots.
(Ecosystems 2, 4)

34. Twinflower (Green—Non Woody Plant)

I am a delicate little plant with pairs of pink nodding flowers. I grow on the forest floor among the thick piles of pine needles.
(Ecosystems 1, 2)

35. Whirligig Beetle (Orange—Insect)

I am a water beetle which whirls and twirls my way along the water. My hind legs paddle; my front legs catch insects trapped on the surface. When I dive under the water, I take an air bubble along so that I can breathe. Because I am a beetle, I chew my food when eating. I am different from a bug, which sucks juices out of its food.
(Ecosystem 5)

36. White Pine (Brown—Woody Plant)

I am a large evergreen with long, soft needles in bundles of five. Before being logged, I used to cover large areas of what is now the BWCAW. I can grow over 225 feet tall.
(Ecosystem 2)

37. Wood Frog (Purple—Reptile/Amphibian)

I am found as far north as the Arctic Circle. I have a biological antifreeze that allows me to freeze solid during the winter. After I thaw in the early spring, I breed in small ponds that are formed by melting snow in the woods. I spend my time among the damp leaves and soil of the deep woods because my skin must stay moist.
(Ecosystems 2, 3, 4, 5)



UNIT TWO: HOW DIVERSE IS BIODIVERSE?

ACTIVITY THREE: BIODIVERSITY DISCUSSION

TIME: 10 minutes

MATERIALS NEEDED:

1. Biodiversity Boogie Game Board
2. Completed Exploring Ecosystems Worksheet from Activity One
3. Species Cards (as left on Biodiversity Boogie Game Board in Activity Two)

OBJECTIVES:

1. Participants will analyze patterns on the Biodiversity Boogie Game Board and compare them to descriptions on the Exploring Ecosystems Worksheet.
2. Participants will learn how changes in ecosystems affect organisms.

INSTRUCTIONS:

1. Ask the group to examine the Biodiversity Boogie Game Board. Ask for initial observations regarding the ecosystems and the species, compared to what was recorded on the Exploring Ecosystems Worksheet.
 - What patterns, if any, have developed?
 - What overlap do participants notice?
 - Would participants change their initial predictions and/or descriptions they made in Exploring Ecosystems?
2. Ask the group to discuss how the following changes in these ecosystems might affect the organisms:
 - A pond drying up
 - A fire
 - People trampling a bog or peatland
 - A windstorm in a pine forest
 - Air pollution
3. Ask the group to discuss the color pattern on the board.
 - How do different situations like a pond drying up affect the mammals, insects, or plants?
 - Is there a chain reaction to other organisms as well?

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UNIT CLOSING

1. Review with participants the five major BWCAW ecosystems and their descriptions, including the types of species dependent on them for survival.
2. As a group, develop a definition of biodiversity.
 - Do the five major ecosystems of the BWCAW meet the criteria in their definition of biodiversity?
3. Ask the group to think about the definition and key components of legal wilderness (as covered in Unit One: What is Wilderness?).
 - How important is biodiversity to wilderness areas? Why?
 - What factors may affect biodiversity?

TIME: 5 minutes

FUN FACTS:

...the common loon can beat its wings 260-270 times a minute to stay airborne, and fly up to 75 miles per hour. That's fast for a bird that weighs about 9 pounds.





UNIT TWO: HOW DIVERSE IS BIODIVERSE?

WILDERNESS PASSPORT

MATERIALS NEEDED:

1. Unit Two Wilderness Passport (master in manual or on CD; make copies as needed.)
2. Unit Two Wilderness Passport stamp and ink pad

OBJECTIVES:

1. Participants will write a short story about an organism that uses all five ecosystems in the BWCAW.
2. Participants will draw a representation of all five ecosystems and what things that organism uses from each ecosystem.

INSTRUCTIONS:

1. Give each participant a copy of the Unit Two Wilderness Passport (master in manual or on CD).
2. Ask participants to complete the Unit Two Wilderness Passport.
3. Stamp each participant's passport when the section is complete.



WILDERNESS PASSPORT

UNIT TWO: HOW DIVERSE IS BIODIVERSE?

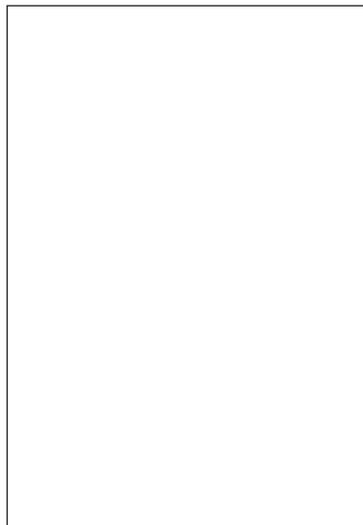
NAME _____

1. Think of an **organism** that uses all five (5) **ecosystems** in the BWCAW.

2. Write a short story explaining how that **organism** relies on the **ecosystems**.



3. Draw a representation of all five (5) **ecosystems** and what that **organism** uses from each area.



UNIT TWO STAMP HERE



UNIT TWO: HOW DIVERSE IS BIODIVERSE?



EXTENSIONS

1. Arthur Carhart National Wilderness Training Center's "Wilderness and Land Ethic Curriculum." Additional information may be found at www.wilderness.net/carhart/.
2. Fill in the last column on the Biodiversity Boogie Game Board (Your Neighborhood). Participants decide which organisms will survive in their neighborhood or ecosystem. Discuss which organisms would not survive and why.
3. Research a particular ecosystem. Participants can work in a group or individually to find more information on their ecosystem and prepare a visual and/or written report.
4. Animal Alphabet Chain: Participants sit in a circle where they can all see each other. The leader starts by saying, "I went to the Boundary Waters Canoe Area Wilderness and I saw an AQUATIC PLANT" (any ecosystem, habitat or species that begins with the letter "a"). The next person says "I went to the BWCAW and I saw an AQUATIC PLANT and a BEAVER." (must start with "b"). The third person says "I went to the BWCAW and I saw an AQUATIC PLANT, a BEAVER, and a COYOTE." Each successive person adds to the alphabet list. The whole group tries to make it through the whole alphabet using only species and habitats of the BWCAW.

Suggestions for difficult letters: q=quagmire, quaint tree, quill, quaking aspen, quacking duck. u=unique flora, undergrowth. v=violets w=wintergreen x=eXcellent lakes, eXciting eagles y=yellow marsh marigolds, yellowjackets, z=zillions of mosquitoes!

FUN FACTS:

...the Quaking Aspen has photosynthetic bark making it able to create food for itself, even after its leaves have dropped.

...balsam fir is also known by these names: ginggop (Ojibwe), Canada Balsam, blister fir, balm of Gilead fir, and silver pine.





UNIT TWO: HOW DIVERSE IS BIODIVERSE?

MINNESOTA GRADUATION STANDARDS

FUN FACTS:

...wood frogs produce a natural antifreeze, glycerol, that floods their bodies as the temperatures drop each winter. That way the wood frog freezes solid; only the fluids outside the cell walls freeze, and the cells are not damaged because of the antifreeze inside the cells.



MIDDLE:

Read, Listen, and View (Learning Area 1)

NON-FICTION:

1. Comprehend, interpret and evaluate information from reading and listening.
2. Comprehend information from selections that address abstract or complex ideas by interpreting presentations of data in connection with other information in the text.

MIDDLE:

Write and Speak (Learning Area 2)

INTERPERSONAL COMMUNICATION:

1. Communicate effectively in a small group by solving a problem and presenting new information.
2. Communicate appropriately with individuals of different gender, age, culture, and points of view.
3. Adjust communication on the basis of verbal and non-verbal feedback.
4. Express tone, mood, and vocabulary appropriate for a given situation.

MIDDLE:

Mathematical Concepts and Applications (Learning Area 4)

PATTERNS AND FUNCTIONS:

1. Recognize, analyze, and generalize patterns found in data from lists, graphs, and tables.

UNIT TWO: HOW DIVERSE IS BIODIVERSE?



MINNESOTA GRADUATION STANDARDS

MIDDLE:

Inquiry and Research (Learning Area 5)

DIRECT OBSERVATION:

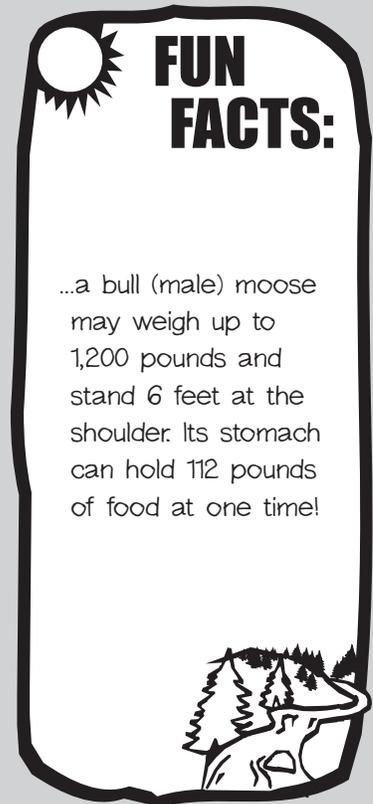
1. Gather information to answer a scientific or social science question through direct observations, including framing a question; collecting and recording data; displaying data in appropriate format; looking for patterns in observable data; relating findings to new situations or large group findings; answering a question or presenting a position using data; and identifying areas for further investigation.

MIDDLE:

Scientific Concepts and Applications (Learning Area 6)

LIVING SYSTEMS:

1. Demonstrate knowledge of interactions and interdependence of living systems by understanding plants, animals, and microorganisms including diversity and adaptation of organisms, and populations and ecosystems by formulating questions to be answered based on systematic observation.





UNIT TWO: HOW DIVERSE IS BIODIVERSE?

ADDITIONAL INFORMATION & RESOURCES

FOR MORE INFORMATION:

The BWCA Wilderness Kit was jointly produced by the Boundary Waters Wilderness Foundation and the United States Forest Service-Superior National Forest. Both are available to answer questions regarding content, instruction, and materials of the kit.

Boundary Waters Wilderness Foundation

401 North Third Street
Suite 290
Minneapolis, MN 55401
(612) 332-9630
Fax: (612) 332-9624
E-mail:
info@friends-bwca.org
www.friends-bwca.org

Superior National Forest

8901 Grand Avenue Place
Duluth, MN 55808-1102
(218) 626-4300
Fax: (218) 626-4354
E-mail:
r9_superior_NF@fs.fed.us
www.fs.fed.us/r9/superior

- **www.enature.com:** a source for information on local species; will create 'local field guide' for your area. Provides information on animals and some plants.
- **www.plt.org:** Project Learning Tree website. Offers curriculum, resources to teachers, and links to related sites.