



UPHAM
WOODS

Microclimates on Blackhawk Island

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Program Purpose: Participants will explore the concepts of aspect and microclimate using the tools of forestry and meteorology to answer the Essential Question, “How are the habitats on the north and south sides of Blackhawk Island different?”

Maximum Number of Participants: 42
[dependent on barge capacity]

Length of Program: 2.5 hours

Ideal Age: Elementary - Adult

Learning Standards: NGSS Cross Cutting Concept Standard 9. *Interpret cause and effect relationships.* (HSSCI9)

Wisconsin Science Standard. *Students use science and engineering practices, disciplinary core ideas, and cause and effect relationships to make sense of phenomena and solve problems.* (SCI.CC2)

Objectives:

After participating in this lesson, participants will be able to:

- Understand basic paddle skills involved in navigating a barge across the Wisconsin River
- Define the terms “aspect” and “microclimate” and describe the importance of each in determining what lives in a habitat
- Use measurement tools such as a Kestrel weather meter, densiometer, infrared thermometer, and thermal camera to describe a habitat’s characteristics
- Use scientific vocabulary and data to answer the Essential Question, “How are the habitats on the north and south sides of Blackhawk Island different?”

Teacher Preparation:

Before the class arrives:

- Confirm river flow rate is below 14,000 cfs (if higher, island hike is cancelled)
- Unlock the barge, boathouse, and rescue boat and gather water safety equipment
- Gather all program equipment (see list in materials)

Program Activities:

1. **Introduction:** Ask participants to line up on the path by the barge boathouse. Point to the barge and the island and say that in order to hike on Blackhawk Island, we must paddle to barge from the dock on the mainland to the island dock. Every person on the barge must wear a Personal Flotation Device (PFD). Model how to put on and tighten a PFD and the “check” (have a partner try to lift up the shoulders of the PFD you’re wearing; it should stay secure). Pass out appropriately sized PFD’s and assist participants in tightening and testing the PFD’s. Then take a paddle and explain that 14 lucky participants (7 per side of the barge) will be providing the power to get to the island dock. Model how to rest the paddle blade on your close-toed shoe (NOT the blade on the ground). Ask for volunteers to paddle (or select, depending on the size/ability of participants). Pass out the paddles to participants and **keep one for yourself**. Paddlers should line up **FIRST**, but **NOT** walk down the ramp until you tell them to.

2. **Loading the barge:** You are the first person on the barge. Model for participants the parts of the barge they should step on (front, stair, and bottom grate), and parts they shouldn’t (benches, middle, or outside gunwales). Ask the paddlers to walk down two at a time and split the paddlers to the outside of the barge benches (closest to the sides of the barge). Load all 14 paddlers. Then ask the non-paddlers to walk down two at a time and split the non-paddlers to the inside of the barge benches (closest to the center board where the boats are bolted together). Ask all participants to angle their knees to point towards the front of the barge

(where you are standing). Differentiate the sides of the barge by giving each side a name (EX: port side = peanut butter, starboard side = jelly). Check for understanding by asking each side to raise their paddles where they hear their name.

3. **River Crossing:** Model how to hold the parts of the paddle (inside hand on the top or “grip”, outside hand just above the blade, or “throat”.) Demonstrate how to paddle forward (reach forward with the blade, put it in the water, and pull back). Model how to paddle backwards (reach behind you with the blade, put it in the water, and pull forward). Demonstrate “break” (put the paddle on your knees). Untie the barge, push off, and begin giving paddling instructions. The naturalist has a paddle to use to help steer the barge more effectively toward the dock on Blackhawk Island. Have the participants begin paddling toward the Blackhawk Island dock. You may have to assist with paddling or steering.

Once landed and tied off on the Blackhawk Island dock, have the participants stay seated while you model what to do (wear PFD until on the landing, take off and clip the top clip over the railing). Wear your PFD back onto the barge and unload the middle of the barge first. Then have the paddlers lay their paddles down on the grate on opposite side of the bench (where the non-paddlers were just sitting) and unload. You are the last person to leave the barge. Check that all PFD’s are clipped to the railing before giving further instructions.

4. **Background:** Tell participants this program is called “Microclimates on Blackhawk Island.” Check for understanding by asking participants what they think of when they hear the word “microclimate.” It may be helpful to define “micro” and “climate” separately. **Micro** = very small; **Climate** = the average weather in a place over a long period of time. Ask how climate differs from weather.

Weather = the day-to-day state of the atmosphere which varies from minutes to hours to days.

Use multiple participant responses to develop a group definition for microclimate:

Microclimate is the climate of a very small area that differs from the surrounding climate.

Ask participants to brainstorm why the microclimate in one area might differ from another area? Some answers include:

1. Elevation (EX: the top of a hill vs. the bottom of a valley)
2. Land use (EX: a paved parking lot vs a natural area)
3. Large bodies of water (EX: areas along coasts are cooler than areas a few miles inland)
4. **Aspect**

The last term is what we’ll be studying today to answer the Essential Question. At our latitude (43°N) the sun is never directly overhead, so the sun's rays are always hitting the earth at an angle. Ask participants what **latitude** means (how far north or south a place is from the equator). *If the sun is directly overhead at the equator, what does this mean for how the sun’s rays hit the earth where we are?* As a hint, ask participants what the climate is like in Florida vs. in Wisconsin. Based on this information, do the sun’s rays hit the south or the north more? (South). On a hill, the side facing south will receive more direct sunlight than the side facing north. Ask participants *which side of the island they are on now?* (South side).

So what is aspect, and how does it relate to the Essential Question? Use multiple participant responses to develop a group definition for the word:

Aspect is the term used to describe **which direction a hill faces with respect to the sun.**

Essential Question: How are the habitats on the north and south sides of Blackhawk Island different?

Tell the participants you will revisit the Essential Question at your first stop. Hike to the Dell House Beach or other designated spot.

Stop #1: *If participants have not already filled out the Beginning level questions on the Data Collection sheet, hand out the sheets now to answer questions #1 and #2. Then recollect for all but the Data Recorders.*

Pass out the Data Collection packets and clipboards to the Data Recorders (should already be selected, or ask for 4-6 volunteers with good handwriting). Ask a participant to read the Essential Question. Ask the participants” *If you know the south side of the island receives more sunlight than the north, what could we measure to determine how the habitats are different on the north side of the island compared to the south?*” Brainstorm some ideas (bolded characteristics are data the participants will collect and record):

1. **Temperature**
2. **Wind speed**
3. **Humidity**
4. Soil moisture
4. **Plant species present**
5. **Animal species present**
6. **Canopy cover**

Today, each group of participants will be part of a team to study the microclimate on the north and south sides of the island to answer the Essential Question. Each team member has a role and a set of tools to use.

1 - **Data recorder:** keeper of the data sheet/clipboard/writing utensil + thermal camera

#2 – **Wildlife biologist:** observes and reports animal signs (burrows, nests, tracks, chew marks, scat, calls/songs, live animal sightings, etc)

3 - **Climate scientist:** measures and reports air temperature, wind speed and humidity

4 – **Forester:** measures and reports % canopy cover (densiometer) + tree identification with field guide

The procedure for each stop where data is collected is outlined below. Each team member will collect data three times at each stop point. Participants should always be within the boundaries you set for data collection but should spread out to try to take data from three distinct areas within the habitat.

If participants have not already been matched with a role, take a few minutes to divide students into teams of 4-6. For teams of 5-6, double up on the roles for Data recorder.

If participants have not already been introduced to the tools (Kestrel pocket meter, densiometer, and thermal camera), demonstrate how to use each of the tools while a participant reads the instructions for that tool below.

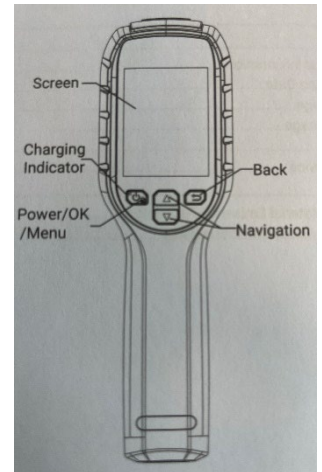
****SAFETY INFORMATION: Students **MUST NOT** look into the laser pointers of the thermal camera!! These tools should **NEVER** be pointed in a person’s face, nor should they be looked into by the operator. Doing so can cause damage to vision! If the instructor witnesses misuse of the tool, the operator will lose the privilege of using the tool.****

Procedure:

Each group member is responsible for reporting to the **Data Recorder** their findings.

#1: **Data recorder:** write all data provided by group members onto the data sheet. Using the thermal camera, locate areas of the greatest temperature difference within the area specified by your instructor and describe on the data sheet.

1. Turn the thermal camera on by pressing the red power button. Note the vertical color and temperature scale on the right side of the screen (blue shows colder, red shows hotter).
2. The Max and Min temperatures are on the top left in white.
3. The red & blue cross hairs show the hottest and coldest points in the view.
4. On the data sheet, draw or describe the area in the habitat with the greatest temperature difference.

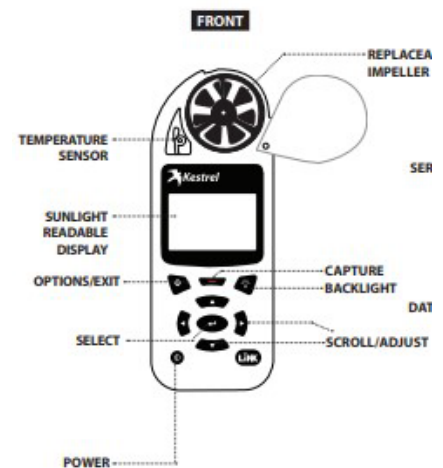


#2 - **Wildlife biologist:** within the area specified by your instructor, search for signs of animal activity (burrows, nests, tracks, chew marks, scat, calls/songs, live animal sightings, etc.) It is okay to not know for certain what made these signs, but you should make an educated guess based on what you see.

Report all evidence of animal activity observed to the Data Recorder.

3 - **Climate scientist:** To determine the temperature, wind speed and humidity:

1. Turn the Kestrel pocket meter device on by pressing white circle button with a line through it (Kestrel 5000 model). On the Kestrel 4000 model, press the red circle button with a line through it. On the Kestrel 2000 model, press the half-filled circle button in the center.
2. Use the down arrow to scroll through wind speed, temperature and humidity (Kestrel 5000 & 4000 models). On the Kestrel 2000 model, use the right arrow to scroll through the measurements. **NOTE THE UNITS on the screen (mi/hr and deg F).**
3. Hold the Kestrel towards the wind with the screen facing you. (If a plastic cover is over the impeller, open the plastic cover to allow air to pass through the impeller). You will see the impeller spin if the wind is blowing. **Report the wind speed number and units to the Data Recorder.**
4. Use the down (or right) arrow button to scroll to the temperature. **Report the temperature number and units to the Data Recorder.**
5. Use the down (or right) arrow to scroll past wind chill to humidity. **Report the % humidity to the Data Recorder.**
6. Repeat this procedure two more times for 3 locations total, each time reporting results to the Data Recorder.



4 - **Forester:** To determine % canopy cover (densiometer):

1. How much the canopy of trees overhead blocks light from reaching the forest floor can be measured with a densiometer as a percentage.
 - If there are no trees overhead, that would be rated as 0% canopy cover.
 - If half of your view overhead is trees and half is sky, that would rate as 50% canopy cover.
 - If you can only see trees overhead and no sky, that would rate as 100% cover.
2. Hold the densiometer (toilet paper tube with cross hairs) up to the sky straight overhead. Estimate how much of your view of the sky is blocked by tree canopy by choosing a number between 0 and 100.
3. **Report the % canopy cover to the Data Recorder.**



4. Use the tree identification guide provided to identify trees (time and youth age dependent)

Give participants about 10 minutes to collect data and report to the Data Recorder. Provide time checks so participants know how much time remains. Ask participants to hold on to all their materials as you hike to the second stop (Upham caves).

Before leaving the site, gather all the groups together and point out the major plant species in the area. For the south side of the island, this may include: red pine, white pine, Pennsylvania sedge, huckleberry, and others (see Appendix for botanical list). **Data recorders should write the plants identified on the data sheet.**

Stop #2: Before beginning data collection again, ask a participant to read the Essential Question. Without any data, ask participants *how does this place feel different from the previous location where they took measurements?* Tell participants this is the north side of the island where they will collect microclimate data. Reiterate the guidelines:

Each team member will collect data three times. Participants should always be within the boundaries you set for data collection but should spread out to try to take data from three distinct areas within the habitat.

Give participants about 10 minutes to collect data and report to the Data Recorder. Provide time checks so participants know how much time remains.

Gather all the groups together and point out the major plant species in the area. For the north side of the island, this may include: eastern hemlock, yellow birch, basswood, maidenhair fern, bracken fern, and others (see Appendix for botanical list). **Data recorders should write the plants identified on the data sheet.**

Before departing, tell participants they now have the data they need to answer the Essential Question. Ask participants to hold on to all their materials as you hike to the third stop (Snider Homestead, other designated spot, or hike back to the barge landing).

Stop #3 (if Snider Homestead): Ask participants again *how this place feels different from where they just took measurements?* Tell participants they have returned to the south side of the island and will use their data to answer

The **Essential Question: *How are the habitats on the north and south sides of Blackhawk Island different?***

Tell participants this is not the only type of data, nor the only tools, that can be used to answer this question. For example, at this site are two additional tools: Picture Posts and Trail Cameras.

In 2016, trail cameras and pictures posts were installed on the island. Picture posts are a way to monitor changes in the environment through pictures of the same space throughout the seasons. There are three picture posts on Blackhawk Island: one at the Snider Homestead site (here), one at the Dell House site and one near the intersection of the Overland and Narrows trails.

How do picture posts work? Following the numbers on the post, nine photos are taken. These photos are then strung together into a panorama; photos are taken during different seasons to monitor how the land changes throughout time. Ask participants how the land might change between seasons and show the Snider Homestead panorama.

For the Wildlife Biologists, trail cameras are a great tool to identify what animals live in a habitat without

relying solely on signs animals leave behind. These cameras take a photo whenever something activates a sensor on the front of the camera. Blackhawk Island (formerly) had three trail cameras: one at the Snider Homestead, one near the caves on the way to Serpent Cave and one facing a small pond on the Moccasin Flower trail. Show participants the photos of trail cam highlights and discuss how trail cameras can help scientists study wildlife.

Before departing, collect all of the materials and tools from all the participants. Tell participants you are about to head back to the dock and return to the mainland. This time, different people can paddle (if desired). They can think about whether or not they want to paddle on the short hike back to the dock.

5. River Crossing: At the landing, ask all participants to find their PFD, put it on, and conduct the

“check” for snugness (lifting up on the PFD shoulders) just like they did before coming over. Paddlers, whether same or different, will load by twos (splitting to opposite sides of the barge). Demonstrate once again where participants should and should not step. Paddlers can pick up a paddle from the inside of the barge after they are seated. Then load non-paddlers.

Review how to hold the paddle correctly and how to paddle forward and backward. Use the same names for sides of the boat (EX: port side = peanut butter, starboard side = jelly), or choose new names. Check for understanding by asking each side to raise their paddles where they hear their name.

Untie the barge, push off, and begin giving paddling instructions. You may have to assist with paddling or steering as now participants are moving against the current. Once landed and tied off on the mainland dock, have the participants stay seated while you model what to do (wear PFD until on the pavement, take off and clip the top clip. Then **hold onto it**. Demonstrate for paddlers how to rest the paddle blade on your close-toed shoe, not on the ground). Wear your PFD back onto the barge and unload the middle of the barge first. Then unload paddlers, carrying their paddles. When all are on the pavement, ask a few adults to help in collecting PFD's by gripping the left shoulder for 4-5 of them. Meanwhile, collect the paddles and hang up in the boathouse. Then hang the PFD's in bunches on pegs from the left shoulder.

Coordinate with the group leader on whether to hand back Data Collection sheets at that time, or at a later point. Thank all of the participants for being great team members for paddling and data collection to answer the Essential Question.

Appendix A: Additional Background Information

I. Forest Types

Blackhawk Island and the Wisconsin Dells area are at the bottom part of the Wisconsin tension zone. A tension zone is a geographic area that marks the change from one vegetation type to another. In Wisconsin, the tension zone marks the difference between mostly prairie habitats and mostly boreal habitats; plants and animals representing each habitat type can be found in this zone.

Ecological communities flourish or perish depending on their environmental conditions. The types of plants and animals that make up the community may change through a process called succession. On Blackhawk Island, the evidence of forest succession can be seen by studying the variation in trees and tree ages. The island was once home to towering red and white pines. Once those were all clear-cut, oaks were given the opportunity to germinate in the open sunlight, creating the towering oaks you see now.

Soon, however, shade-tolerant white pines and mixed hardwoods began to grow beneath the canopy of oak leaves. The pines began to take over in some areas, and as the oaks begin to fall and decompose, are given a chance to thrive. These changes in the flora and fauna will continue until a climax community is

established. A climax community is community of plants, animals, fungi etc. that will be able to replace themselves with a new generation of the same species.

I. Biotic Communities of Blackhawk Island

As participants hike around Blackhawk Island, be sure to note the different forest types. Differences in

forest types on the island can be observed when following the Overland or Narrows Trail to the north and northeast side of the Island, where the habitat changes from Dry-Mesic forest to Hemlock Moist Forest.

1. Hemlock Relict Forest: This forest type is associated with moist sandstone cliffs and ravines with eastern or northern exposure. Plant life typically includes eastern hemlocks, white pine, yellow birch and paper birch. Ferns and club mosses are the dominate ground layer, although often sparse due to the lack of light reaching the ground because of dense hemlock shade.
2. Southern Dry-Mesic Forest: This forest type is associated with loamy soils and is considered an upland forest community dominated by red oak, white oak, basswood, sugar maple and red maple. Characterized by a diverse understory including ferns and spring ephemerals.
3. Northern Dry- Mesic Forest: This forest type is associated with glacial topography with sandy or loamy soils. Dominated by white pine and red pine, with occasional mixing with red oak, red maple, sugar maple, paper birch, and aspens and a shrub understory. Historically considered the "great pineries", this forest type's biggest factor of change is logging disturbances.
4. Dry Cliff Communities: This community is found on the exposed Cambrian sandstone gorges flanking the Wisconsin River. It includes ferns, mosses, and lichens covering the moist rock faces. This diversity of smaller fauna helps to create small microclimates to support spring ephemeral and rare plant communities. Five endangered, threatened or species of special concern have been recorded on the island: maidenhair spleenwort, bird's-eye primrose, Sullivant's coolwort, cliff cudweed, and putty root orchid.

Appendix B: Materials and Maps

- Upham Woods/Blackhawk Island 11 x 17 GIS Map
- Picture Post Panorama & Trail Camera Highlights
- Early Vegetation & Land Use/Cover
- 6 densiometers
- 6 clipboards
- 30 Data Collection packets
- Golf pencils
- 6 Kestrel pocket meters
- 6 thermal cameras
- 6 tree identification guides

The following resources can be found in the Upham Woods Library or in the Black Hawk Island Resources Fold

Blackhawk Island Botanical List 1994.

Biotic Communities of the Wisconsin Dells State Natural Area, provided by Tom Meyer.

**Appendix C: Blackhawk Island
Botanical List 8/15/94**

Deer Enclosure 1 – Fenced off area (1/10 acre) on the White-tailed Trail just off the Overland Trail

Red Maple	Point-Leaved tick trefoil	Smooth Solomon's Seal
Maidenhair fern	Fern	White Lettuce
Hog peanut	Bedstraw	Bracken fern
Wild sarsaparilla	Wild Geranium	Red Oak
Jack-in-the-pulpit	Witch-hazel	Red Oak
Sapling staged ash	Spotted St. John's Wort	Raspberry
Large leaved aster	Canada Mayflower	Bristly greenbrier
Pennsylvania sedge	Partridgeberry	Rosy twisted stalk
Ironwood	Indian pipes	Basswood
Blue cohosh	Interrupted fern	Elm seedling
Yellowbud Hickory	Wood sorrel	Wild oat
Enchanter's nightshade	Panicum grass	Yellow Violet
Dogwood	Woodbine	
Honewort	White Pine	

Deer Enclosure 2 – Fenced off area (1/10 acre) on the Narrows Trail

Red Maple	Hickory	Orchid species
Sugar Maple	Blue cohosh	Clearweed
Baneberry	Enchanter's nightshade	Red oak
Maidenhair fern	Large coralroot	Buttercup
Hog Peanut	High bush honeysuckle	Black raspberry
Wild sarsaparilla	Fern species	Common elder
Jack-in-the-pulpit	Bedstraw species	Nodding pogonia
Ash Seedling	Wild geranium	Nettles
Grass	Witch-hazel	Violet
Pennsylvania Sedge	Round-lobed hepatica	

Boat Landing/ Allen Spring Gulch

Red Maple	Poverty grass	Jack pine
Silver Maple	Flowering spurge	Red pine
Sugar Maple	Black huckleberry	White pine
Lyre-leaved rock cress	Frostweed	Wild basil
Yellow birch	Hawkweed	Gray goldenrod
River birch	Round-headed bush clover	Spiderwort
Harebell	Panicum grass	

Dell House Area

Common ragweed	Indian tobacco	Common cinquefoil
Pussytoes	Wood sorrel	Heal-all
Calico aster	Panicum grass	Prickly ash
White snakeroot	Lopseed	Burnweed
Rattlesnake plantain	Plantain	Red-topped grass

Understory and Overstory of Black Hawk Island

Red maple	Pennsylvania sedge	Oak (variety)
Sugar maple	Ironwood	Basswood
Japanese barberry	Indian pipes	Hemlock
Yellow birch	Hophornbeam	