



madison
AUDUBON



Curriculum Set: Climate Initiative

Young Ambassadors for Birds in the Face of Climate Change

Lesson 5: Winter Adaptations of Animals

Goal: Students learn the ways that animals can survive the harsh Midwestern winters. We discuss the ways that winter will be different as climate change progresses, and what that will mean for wildlife.

Science

Adaptable for Grades 4-8

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Total lesson time: 1 hour +

Lesson: 30 minutes

Group Activity: 30 minutes (optional)

Nature Walk: 30 + minutes (optional)

Materials needed:

Presentation on Climate Initiative Lesson 5


Madison Audubon Animal Tracks lesson kit


Madison Audubon Animal Scat lesson kit


Outline


Introduction


1. Ask the class what all animals need to survive- food, water, shelter.
 - a. Discuss natural and man-made sources of each.
 - b. Discuss whether humans are animals (yes) and how we find food, water, and shelter.
2. Discuss what it means to “adapt”
 - a. The definition we are using now is: when an animal makes changes in behavior or body so it is easier to live in their environment.
 - b. There are lots of ways to use the word “adapt”-
 - i. Sometimes we’re talking about an evolutionary adaptation, which takes a very long time (it could take thousands or millions of years!). Think about when birds were evolving wings. That was an adaptation that took a loooong time to happen.
 - ii. Adapting can also take a very short time. If I said “the class adapted to the substitute teacher’s strict rules”, I’m talking about an adaptation that took minutes to happen. The kids realized the sub was very strict, and had different rules than their usual teacher. They began behaving differently so they wouldn’t get in trouble!
 - iii. In this lesson, an adaptation will be something that is NOT permanent, and only takes a few days (maybe two weeks) to happen. These changes last for a few months – winter- and then can change back to the way they were.
 1. An example would be the way we wear coats outside in the winter. There is a week or two in the fall where you wear a light coat before switching to your heavy winter coat. Then in the spring, you wear a light coat again, before going back to no coat.
3. How will winter change as Climate Change progresses?
 - a. What Happens in winter?
 - i. Snow!

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- ii. Cold!
 - iii. Ice!
 - b. Ask the class if they think it is easier or harder for animals to find food, water, and shelter in the winter (harder).
 - i. Discuss why-
 1. food could be covered by snow or ice, it could die during the winter (plants), it could migrate away (many little birds leave).
 2. Their shelter needs change. They need a warmer place to sleep than they would during the summer.
 3. Water is frozen! Animals would lose a lot of energy if they only ate snow or ice to get water. They would need to warm the water up to turn it into a liquid, and would then need to warm their bodies back up. It can be hard to find running water in the winter.
 - 4. Maps of climate projections:
 - a. Start with the map of Wisconsin.
 - i. Ask students to describe the WI climate during the winter (cold, snowy, icy, winter weather starts getting very cold in November or December, and can last through February or March).
 - b. Explain that scientists are able to take all of the information that they have about climate change, and create models.
 - i. Models are something simple that help us to understand something complicated. Think about a model of our solar system- it is very small, and doesn't include everything. It helps us to understand our HUGE solar system a little better.
 - ii. They are able to get ideas about what Wisconsin will be like in the future, because they know what the rain, snow, and temperature might be like in the future.
 - iii. **find out more here: <http://www.wicci.wisc.edu/climate-map.php>
 - c. We want to know what Madison will be like in the future, right?
 - i. Look at all of the lines on the map. Since the scientists are making a hypothesis about the future, we can't know exactly what it will be like. Remember a hypothesis is an educated guess: they're taking all of the information they know about climate change, and are using it to try to find out what Madison will be like in the future.
 - ii. Each line represents one way that the future COULD be. The red line is the way the future will MOST LIKELY be.
 - iii. Geography break: is the climate warmer or colder in Northern states? Colder. What about Southern states? Warmer.
 1. Do any of those lines point north? No. In every single scenario, Madison will be WARMER in 50 years.

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- iv. These scientists tried to pick a city in the US that has a climate right now that will match Madison in 50 years.
 - 1. So right now, there is a city in Kansas that is having a winter that COULD be like Madison's winter in 50 years.
 - v. ** stop to make sure the kids understand this concept.
 - vi. They also wanted to see what Madison would be like in 100 years.
 - 1. Ask students to tell you how the maps for 50 and 100 years in the future are different. (the lines point farther South, and farther West, generally).
 - 2. Has the red line (most likely future) changed? (yes, it used to point to central Illinois, not it points to central Missouri.)
 - 3. Ask students how the climate will be different in WI in 100 years (warmer!)
 - vii. Continue comparing the three maps if you like.
 - d. Now let's talk about some real data on the Madison climate in February.
 - i. If your students haven't been introduced to graphs yet, spend a lot of time explaining this.
 - 1. Remind them what "average high temperature" and "average low temperature" means.
 - 2. Walk them through each of the axes, point out what the different colors mean. Put your finger on a point on one of the lines, and move it along the line. Ask the class if the temperature is getting warmer or cooler. Ask the class if your finger is on "today", "50 years in the future" or "100 years in the future".
 - 3. As your finger slides to the right (the future), discuss how the average high temperature increases, so does the average low temperature.
 - ii. Do the same thing for precipitation.
 - 1. Walk through the axes, discuss all of the vocab words (precipitation, rain, snowfall).
 - 2. Start with the snowfall line: ask kids if we'll be getting as much snow in WI in 100 years (no!- lots less!)
 - 3. Move to the rainfall line. Will we be getting the same amount of rain in 100 years? (no, more!)
 - 4. Point out that even though we will be getting more rain, it still won't be the same amount of precipitation that we get now when you think about snow and rain together. There will be less precipitation in general in the future.
 - a. What does this mean for animals?
 - b. It will be a dryer environment.


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- c. Ask students if they think all of the animals living in WI could still live here if there was less water? (probably not).
 5. Let's jump back to animals in winter. They all need food, water, and shelter. How do they find it?
 - a. Some animals migrate. They adapt to winter changes in weather by leaving! They head to locations with more food & a warmer climate, and don't deal with cold weather. This is still a long, hard, dangerous trip though. (The birds in the picture are Canada Geese)
 - i. Migration is a really cool event that millions of animals do twice a year. We could talk for a long time about that- but we'll save it for another day.
 - b. Some animals stay in WI all winter. They adapt to changes in the environment by making changes to their behavior or their bodies.
 - i. Ask students to think of animals that stay in WI all winter (deer, squirrels, bears, coyotes, foxes, robins, geese, eagles, chickadees, blue jays. . .etc).
 6. Ask students to think about the maps we just looked at, and think about how winter will change in the future.
 - a. Warmer
 - b. Less snow
 - c. ** Ask students if they remember a time when the temperature is right around freezing. Maybe one day it rains, another it snows (or sleet). Maybe both happen in the same day!
 - i. **now ask students to think about snow on the ground. Pretend it gets just a little warmer- what happens? The snow on the top layer melts just a little. Now pretend it got cold again at night- what happens? The snow that had melted freezes again. This forms a hard crusty layer on top of the snow.
 - ii. Because the temperatures will be warmer in general, there will be more days when the temperature is right around freezing. We'll have more of the freeze/thaw, and more crusty snow.
 7. How do birds survive the cold?
 - a. Ask the class if they have ideas.
 - b. Many birds that stay in WI are able to switch food sources. This chickadee eats lots of insects during the summer, but eats many seeds during the winter.
 - i. Is it easy or hard to find insects in the summer? How about in the winter?
 - c. How do birds stay warm? Their feathers!
 - i. When birds get cold, they fluff up their feathers. This holds more air near their bodies, and their bodies warm the air. It's like they're carrying around a little bubble of warm air with them.

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1. When a bird is too warm, they flatten their feathers close to their body. This squeezes all of the air out, and means they AREN'T carrying around that warm air. It's like taking off a coat.
 2. If you see a bird that looks really fluffy or fat, it's probably cold. If you see a bird that looks very sleek and skinny, maybe it is too warm.
 - ii. Birds also cover their legs, feet, and beaks when they get cold. They don't have feathers on those parts, and they lose a lot of heat through them. This is a lot like when we put gloves on our hands or a hat on our heads.
- d. **New word! Microclimate.
- i. What does micro mean? Small.
 - ii. What does climate mean? The average weather of a place- how warm it is, how much it rains, how windy it is.
 - iii. So microclimate is a small part of an area that has a climate that's different from the rest of the place.
 1. Ask students to think of your school. Are there rooms in your school that are much warmer or colder than the rest? That's a microclimate!
 - iv. Birds and other animals look for microclimates that will help them to survive.
 1. Pine trees are a good example of a microclimate- ask students to think about why (the pine needles stay on all year, and help block the wind. If snow piles up on a pine branch, it does an even better job at blocking the wind.)
 2. Old woodpecker holes are used by lots of animals during the winter. Why would an animal want to use that?
 - a. Safe from predators, blocks the wind. Small area that the animal could warm with their body heat.
 3. Other animals use the snow for shelter- this is another type of microclimate.
 - a. ***New Word: Subnivian= beneath the snow.
 - b. Many types of mice and voles are subnivian animals in the winter. They make tunnels and burrows in the snow. Why is this a good idea?
 - i. The air underneath the snow is warmer than the air above it. They are also out of the wind.
 - ii. Predators can't see these little animals when they are under the snow (but some can hear them!)
 - c. The ruffed grouse is a bird that is a bit like a chicken. It will dive into the snow at night time,



and make a little snow-cave. This keeps it warmer during the night.

- d. Ask students to think about how we said the snow would change in the future.
 - i. Less snow, more freezing and thawing.
 - ii. Can they think of problems that this might make for animals?
 1. Less snow to hide in- this will be a problem for mice and voles and ruffed grouse.
 2. If there is a hard crust on top of the snow, animals hiding in the snow might have trouble getting back out again.
 - e. Pictures: voles & their runways under the snow, marten standing in the snow- they hunt subnivian animals.
 - f. The freezing & thawing (more ice) will also make problems for animals that eat things that are under the snow.
 - i. Wild Turkey eat lots of nuts and grains during the winter. These things are usually on the forest floor under the snow. They scrape the snow away with their feet to find food. If the snow is very icy, they may not be able to get through it.
4. Less snow will be good for the deer. They are strong enough to break through crusty icy snow, so they will still be able to eat the food beneath it. Less snow will mean that they can forage easier, and run faster to get away from predators.
- a. Is this a good thing?
 - i. No! Wisconsin already has enough deer. They eat a lot of vegetation (plants!) all year, and actually change the forests.
 - ii. Picture on left: this is a fence to keep deer out. On the left, inside of the fence, you can see what the plants should look like without deer. On the right, you can see that the deer ate the plants almost down to the soil.
 - iii. Picture on the right: the deer have eaten this tree so much that it has no leaves or



branches lower than a deer's mouth can reach. They have pruned it!

8. Some animals adapt to winter by changing their colors.
 - a. Can you think of animals that change color (not necessarily for winter)?
 - i. Birds change the colors of their feathers. Sometimes they do this twice a year. American Goldfinches are bright yellow in the summer, and an olive-brown color in the winter. Why do they do this? (to attract a mate).
 - ii. Other animals change the color of parts of their bodies to attract mates too (baboons, chimps, fish).
 - b. The animals we'll talk about today change color to help camouflage themselves in their environment.
 - i. The Snowshoe Hare is brown during the summer, and changes to white during the winter. It sheds most of its fur, and grows new fur that is a different color. There is about a 2 week period in the fall when it has both brown and white fur. It changes back in the spring, and spends the summer in brown fur again.
 - ii. Ask students if they think the hare is well camouflaged. Which picture is easiest to see the hare in?
 - iii. All three of our weasels (short-tailed, long-tailed, and least) change colors too. This helps them to hide from predators, and also to sneak up on their prey.
 - c. Bring it back to climate change:
 - i. What did we say would happen to winters in the future? (shorter, less snow)
 - ii. If there is less snow, and these animals turn white each year, what do you think will happen? (they will stand out, and be easily seen by predators)
 - iii. These animals may be able to evolve & adapt to the changing climate, but they may also be mis-matched to their environment.
 1. Scientists at UW Madison and other universities are studying this right now to try to find out what will happen!
 - d. Now talk about climate change & winter in general:
 - i. Think about animals that migrate or animals that stay put. What will changing winters mean for them?
 1. Those that migrate may not need to migrate as far, or may not be in Wisconsin anymore at all.
 2. Those that stay will need to adapt to the changing environment.
 3. All animals will still need to find food, water, and shelter- but they may need to do it in a different way.