



madison
AUDUBON



Curriculum Set: Climate Initiative

Young Ambassadors for Birds in the Face of Climate Change

Lesson 8: Phenological Mismatch

Goal: Students learn the effects of warming springs on migratory birds.

Science

Adaptable for Grades 4-8

Created By:

Carolyn Byers, Education Director
(608) 255-2473, ext. 555 (office)
carolyn.byers@madisonaudubon.org


Contact us at MAS:

1400 East Washington Ave
Madison, WI 53703
608-255-2473
info@madisonaudubon.org



Produced under a 2014-2016 Grant from National Audubon Society and a 2015-2016 grant from the Wisconsin Environmental Education Board.





Total lesson time: 1 hour – 1.5 hours

Lesson: 40 minutes

Hunger Cranes: 30 minutes

Materials needed:

Presentation on Climate Initiative Lesson 8, Phenological Mismatch


Projector & laptop/ smartboard for PDF presentation

Hunger Cranes Game

Lesson


Tips:


- Write the new vocabulary words on the board so that kids know how they are spelled AND teachers can refer to them later on in the presentation and throughout the day.
- During our pilot lessons, it was more engaging for the class if one student took notes in a visible way during the presentation (either on a large notepad, chalk board or white board). The rest of the class saw what that student was highlighting, and this reinforced key ideas.




PDF Presentation: (30 minutes)

1. Introduction: review the definitions for generalist and specialist species.
2. Review Migration:
 - a. What is migration? Seasonal movement of animals from one place to another.
 - b. Why do some birds migrate? They need to find food.
 - c. Do all birds migrate? No.
 - d. Why not? They are able to switch food sources as the seasons change so that they can find food in one place year-round.
 - e. Today we will talk about how climate change may affect bird migration.
3. Review how far birds migrate:
 - a. Long distance- usually eat insects and/or fruit, they travel to central or south America during the winter
 - b. Short distance- usually only travel as far as they need to in order to find food, typically to the southern United States.
 - c. Irruptive migrants- only move when they can't find food (examples: Snowy or Great Gary Owls moving south to WI in years when food is hard to find).
4. Phenology data:
 - a. Discuss the data that your students collected, and what other pieces of data they could have collected if we had more time (temperature, ice cover, rainfall/precipitation, data on plants greening up, etc). Make sure to end the discussion talking about bird phenology data.
 - b. Compare the data we collected this year with historical data from the early 1900s.
 - c. Explain the timeline (months progressing through time), point out which month we're currently in, and explain that where the bird appears on the timeline is when it arrives back in WI after spring migration.
 - d. First group of birds:
 - i. Red-winged Blackbirds used to arrive in mid-March, and now arrive in mid-February.
 - ii. Canada Geese used to arrive in mid-March, and now arrive in late January (some stay in Wisconsin all year)
 - iii. Eastern Meadowlarks used to arrive in mid- March, and now arrive in Late February
 - iv. Eastern Phoebe used to arrive in early April, and now arrive in early March
 - v. Ask kids what has happened? For all of these birds, there has been a shift: they are arriving earlier each year.
 - e. Second group of birds:
 - i. Bobolink and Upland Sandpiper are STILL arriving at the same time that they used to in 1900. They have NOT shifted.
 - ii. Ask kids what they think of this. Can they come up with a hypothesis about why this is?
 - f. Explaining the shift (or lack there of): how birds know when to migrate
 - i. The first group of birds are all short distance migrants.

- 
1. Ask kids to tell you how far short distance migrants travel. (to the southern United States, sometimes Central America)
 2. How do short distance migrant birds know when it's time to migrate?
 - a. They rely on LOTS of cues. While they're down in the Southern US, they are able to use temperature, sunlight, plants sprouting, and food availability to know that they can start heading north.
- ii. The second group of birds were long distance migrants.
1. Ask kids to tell you how far long distance migrants travel (to South America!)
 2. How do long distance migrants know when it's time to migrate?
 - a. PHOTOPERIOD. Discuss this word: what does "photo" mean? Light. What does "period" mean? A length of time.
 - b. Photoperiod is the length of the day, or how much daylight there is in a day.
 - c. Remember how early it used to get dark during the winter? And how long it stays light during the summer? In Wisconsin, day length is always changing depending on the season.
 - d. Even though day length changes during the year, there is always the same amount of daylight on the 4th of July every year. And there is always the same amount of daylight on your birthday. Continue discussing this concept if it is challenging for students.
 - e. Long distance migrants travel so far that they are not able to rely on the environmental cues that short distance migrants are. They cannot rely on insect activity or plant growth to determine when to start their migration north. They are too far away for that. Instead they rely on the sun-something that is almost never changing in its cycle.
- iii. Look at the two groups of birds. Short distance migrants have shifted their arrival time to January, February, and early March. Long distance migrants are still arriving in April. They used to arrive in March and April-much closer to the same time.
1. Ask students what they think of this. What will be easier or harder for these birds because of this difference?
- iv. Review the ways that climate change is expected to alter our climate.
- v. Now discuss the ways that climate change may alter bird migration
1. Let's talk about short distance migrants, and when they return to WI in the spring.
 - a. Our data showed us that there was a shift so that they are arriving earlier each year.
 - b. Explain the timeline to students if necessary

- 
- c. Adult birds used to arrive back in WI in March- what happens next (hint, why do birds come back)?
 - d. They built nests and laid eggs in late April or early May. What comes next?
 - e. Chicks hatch in May or June. Ask the class why they think birds time it like this.
 - f. Many insects also hatch young in May and June. Why is this a good thing for birds?
 - i. Lots of food for parents to feed chicks!
 - g. We know that NOW, adult birds are arriving back in WI earlier. Let's see how that changes things. Explain the new timeline to the kids (February is added in).
 - h. Some birds are arriving back in February, instead of March (or, if they used to arrive in April, they're arriving in March- if necessary, explain that this is one example of how early birds are coming back).
 - i. This means that they start building nests and having chicks earlier too.
 - j. What do you think about this?
 - k. Birds aren't the only ones shifting their phenology with the warmer springs. Insects are starting things earlier too!
 - i. This means that short distance migrants are still able to feed their chicks all of the insects that hatch!
 - l. Remind kids that those were short distance migrants we just talked about: they shifted their migration earlier to match the warm weather and insect populations.
2. Now let's talk about long distance migrants
- a. Remember, they have not shifted their migration time. They still come back to Wisconsin at about the same time they did 100 years ago.
 - b. Remember, this is because they rely on photoperiod to know when to migrate back (this is day length). They cannot rely on other cues like temperature, plants, or insect activity.
 - c. Birds return in April (again, remind them that this is just an example of ONE kind of long distance migrant)
 - d. They build nests in May, and have nestlings in late May or early June.
 - e. In the past, insects are also having babies in May or June.
 - f. What did we just talk about, though? Are insects in WI making changes?
 - g. Insects are responding to the earlier warm weather in spring, and are having babies sooner.

- 
- h. Discuss this: will it cause problems for birds? (eventually, lead them to the idea that it might be harder for parents to find food to give to their chicks. The major insect hatches happen earlier in the year.
 - i. THIS is phenological mismatch. When the phenologies of animals that rely on each other don't match up any more (birds rely on the big increase in insects so they have enough food to feed to their babies).
 - j. Ask students to think of another type of "mismatch" we discussed earlier this year.
 - i. Hint: it has to do with winter animals
 - ii. Hint: it has to do with color
 - iii. Snowshoe hares and weasels turn white in winter. If there is less snow, they could be white when it would not help them to hide- they would stick out in the brown forest.
 - iv. This is called phenotypic mismatch instead of phenological mismatch.
 - k. Right now, it doesn't look like long distance migrants are able to shift their migration time to match the insects.
 - i. Scientists are studying these birds to try to determine if they will be able to shift their migration in the future
 - ii. They're also looking for other ways to help these birds!

The last 3 slides are useful for introducing the Hunger Cranes game.

Tell students that we will be focusing on two different places on the card for this game.

1. How far their bird migrates. For this game, all three options are possible. If more than one box is checked, you must pick one and stick with it throughout the entire game.
2. Whether their bird is a diet specialist or diet generalist.