Platte Basin Timelapse Project

LESSON PLAN - Terns & Plovers

Step by Step Instructions

During instruction, adhere to a gradual release of responsibility. First, explain and model the strategy for students (me) and then have the class complete the strategy together (we). Next, put students into pairs to practice the strategy (two), and finally, have the students work independently to complete the strategy (you).

Math Extension (Grades 8-12)

See page 5

Lesson Modification: K-2

See page 7

Engage (me):

Read: Go to the Platte Basin Timelapse site and begin reading Chapter 1: Terns, Plovers & the Platte. http://plattebasintimelapse.com/learn/terns-and-plovers/

View: Watch timelapse video taken at Rowe Tower, Central Platte, Nebraska, from the 2015 breeding season of tern and plover nesting habitat.

Watch the video interview of the Sand and Gravel Operators talking about their relationships with the birds and their unlikely partnership with the Tern and Plover Conservation Partnership. https://vimeo.com/142285588

Listen: Finally, listen to the radio story "Endangered Birds Depend on Heavy Industry for Survival." Note: The "play" bar shows up at the bottom of the screen. It may take a couple minutes to load. http://plattebasintimelapse.com/2014/10/endangered-birds-depend-on-heavy-industry-for-survival/

This is the introduction to the lesson as it provides a hook and a glimpse into the story that will be revisited later. The story further allows for continuity when completing the entire lesson. Part of the **Explore, Explain, Elaborate, and Evaluate** sections refer to the scientists in action (banding etc.) and the conservation efforts with industries. The story is a theme found throughout the lesson.

Read: Have the students begin reading Chapter 2 on Research & Monitoring birds. http://plattebasintimelapse.com/learn/terns-and-plovers/research-monitoring

View: Watch the video of two bird biologists as they band interior least terns and piping plovers. https://vimeo.com/138224200

Time: 30-60 min.

Materials:

- internet enabled
- computers,
- printer (optional),
- downloadable field journal for recording results

Grade Level:
Upper Elementary & Middle School
Modification: K-2 (page 7)

Subjects:
Science, Math, Visual Arts, Geography

Standards/Indicators:
Next Generation Science Standards:
MS-LS2-5

- LS2.A Interdependent Relationships in Ecosystems
- LS2.C Ecosystem Dynamics, Functions and Resilience
- LS2.D Biodiversity and Humans
- ETS1.B Developing Possible Solutions

NE State Standards:
SC8.1.1.e, SC8.1.1.f, SC8.1.1.g, SC8.1.1.h, SC8.1.1.j
SC8.1.2 (all)
SC8.1.3.h & i
SC8.3.3.e & g

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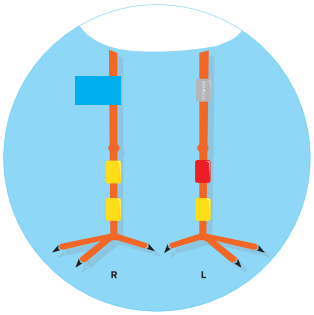
(WE). Next, put students into pairs to practice the strategy (TWO), and finally, have the students work independently to complete the strategy (YOU).

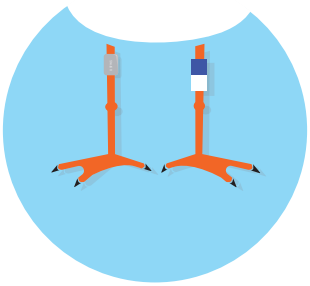
Explore (we/two):

Discuss the following synthesis questions prior to exploring the learning object activities: “Breaking the Bird Band Code”.



1. How long has the Tern and Plover Conservation Partnership been working with local environmentalists, landowners and businesses cooperatively to protect these threatened and endangered birds? (Answer: Sixteen years since 1999)
2. How long have these birds been on the federal Endangered Species List? (Answer: Plover - since 1986 / Tern – since 1985)
3. What time of year are the biologists working with the interior least terns and Piping Plovers? (Answer: Mid-April to Mid-August)
4. Why are the biologists capturing a small chick? (Answer: for banding purposes)

Once students have read, listened to and viewed videos of the story have them begin to explore “Break the Bird Band Code” with the Banding Toolbox online activity http://plattebasintimelapse.com/birdbandingactivity/breakthebirdbandcode.html



Activity explained: Students will be acquainting themselves with the banding of birds using the Piping Plover as the example. The activity covers the Explore, Explain, Elaborate and Evaluate sections of the lesson..

Part 1: Break the Bird Band Code - Students as Bird Biologists

1. Using the Banding Toolbox, students will use a drag and drop system to learn about banding process for monitoring birds, specifically the Piping Plover. The Tool Box is set up for students to learn through exploration. Students read the instructions for selecting the bands and flag/region that will go on the bird's legs. Each band signifies a unique characteristic such as sex, banding year, site captured and site type. Students choose the color for each characteristic so that each bird may have a different combination of bands. One marker is consistent and universal among all banded birds: a USGS (U.S. Geological Survey) metal band with a numeric code that identifies an individual bird. A colored flag indicating the general region where the bird was banded and a unique combination of color bands on the lower legs indicate characteristics such as age, sex, year banded and the specific location the bird was captured. The scientists accurately record this information in their field journals and enter the USGS number in a federal database.
2. Read the Piping Plover Profile at the top of the activity. Click on each tab and read specific instructions. Download the field journal. Drag and drop the correct band onto the bird's legs. Once all six bands are placed, the student will be prompted to go to the next acivity.

Part 2: Record data in Field Journal

3. Next, students will be prompted to "record" the data in the virtual field journal by selecting the correct band/marker in the drop down menus provided. Students may also be asked to record their band choices in their actual field journals. This can be done by printing the available journal (pdf) located on the website.
4. This piece is very important, as students will be doing real science. By having students become a scientist banding plovers, the connection between career and school becomes much more salient.
5. All other data that can be recorded about the bird and the conditions in which the bird was captured must be written in the journal. All information here should be standardized so that there is consistency between all scientists (students). This information may need to be student or teacher generated unless students have access to weather web sites.

Students could record the following information:

1. time of day captured (CST using 24-hour clock)
2. temperature of the day (time of day captured) (Celsius)
3. wind speed (estimate) and direction
4. weather from previous 24 hours
5. current weather conditions such as cloudy, sunny, windy, rain, etc. (estimate % of cloud cover)
6. any unique weather patterns or events for that year such as drought, flooding, wildfires, etc.
7. physical description of location: topography, landscape,
8. any other relevant information stated by students/teachers such as description of what bird was doing before and after capture.

All the information in the field journal will be used for analysis by scientists. This is why information must be recorded accurately and efficiently to promote valid inquiry among scientists.

Evaluate (you)
Part 3: Quiz

Finally, students will proceed on to the Banding Quiz. Students are asked to study the band combinations on 3 given graphics (Piping Plovers with bands already present). The student must then match the graphic to the profile that best describes the banding combination. This activity is the problem-solving piece using all the banding information gained up to this point.

http://plattebasintimelapse.com/wp-content/uploads/2015/09/Field-Journal_4-5.pdf

Explain (two/you)

Students now will share their journals with peers. Scientists must do peer reviews of their work, which means showing the work with others. Each student must explain why he/she chose the specific bands and justify choices to others. Students will also share any other data they collected in their field journals.
NOTE: Positive, constructive criticism is an important part of peer review.

Elaborate (you)

Students will now need to use all their knowledge gained up to this point to answer the following questions.

1. How long has bird banding been happening and who started it all?
2. Why should birds be banded in the first place? What is the value?
3. How do scientists use the bands?
4. Why do you think it is important to include all the color bands in addition to the USGS metal band?
5. Why do you think scientists and conservationists care so much about working with a small Piping Plover?
6. Have you ever spent so much time with something that is becomes familiar and perhaps you develop and attachment to it? If you have something that you value explain what it is and why you value it so much.
    - Students are guided to the idea that learning deeply about something or becoming familiar with something helps to better understand and protect that thing. This promotes conservation practices through teaching kids to love the earth.
    - A follow up to this activity as well as another scientist link is the story of Erwin the Piping Plover. This is the story of a single female plover and how it has touched the hearts of those who know her. Kids will see the humanity in plight of the Piping Plover, which is an important link between passion and true scientific research and sequential data-repeated observations within and between years.
    - Link to Erwin's Story
      http://plattebasintimelapse.com/ed/chapter/why-care/

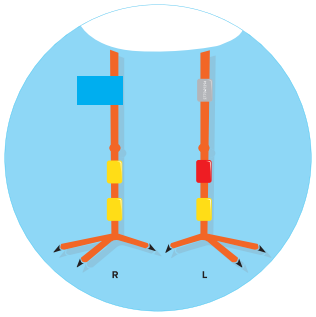
The use of the following web sites are recommended.

History of USGS Bird Banding
https://www.pwrc.usgs.gov/BBL/homepage/historyNew.cfm

Why Bird Banding should be done from USGS
https://www.pwrc.usgs.gov/BBL/homepage/whyband.cfm

How the Bands are used from the USGS
https://www.pwrc.usgs.gov/BBL/homepage/gswhy.cfm

Bird Band types and the code used for USGS universal bands
https://www.pwrc.usgs.gov/BBL/homepage/btypes.cfm



Math Extension: Population Estimation- Grades 8-12 (optional)

Students will also complete a math problem with population estimation based on the data provided in this evaluation section. This is a common tool used in population studies to estimate population sizes. There are several assumptions that must be made in the field to gather the most accurate information. In this exercise, the assumptions typically met in an actual population estimate are ignored in order to facilitate a smoother experience for students.

The method used to estimate Piping Plover populations can be the Mark & Recapture method. Since Plovers have been captured and marked since 2008, the data gathered can be used to estimate the local population size of Piping Plovers. A simple formula can be used to estimate the wild population of Plovers within a defined boundary. The equation is called the Lincoln-Petersen Index. Ecologists use several different formulas to calculate population sizes/ densities as each formula accounts for the differences in animal behaviors. The formula used here is a standard formula used for a variety of animals.

Formula with variables explained:

$$\text{Population Size (n)} = \frac{m \times t}{r}$$

n = the estimated population size, the answer you are calculating.

m = the total number of Piping Plovers marked in a given year or sample time.

t = the total number of Piping Plovers captured (even marked ones) during a sample of an area a few years later.

r = the total number with the mark, out of the Piping Plovers caught during the sample of an area a few years later. This total number will be less than the number (t) because not all the Plovers caught would have a band (be marked).

Here is a simple example to follow using fictitious data. Let us say that scientists went out in the field in 2009-2010 and captured 45 Piping Plovers and marked them all using leg bands. That means the initial marked (m) is 45. Two years later (2011), the same team went out in the field to the same location and captured as many as they could again. This time they captured 110 total Piping Plovers. This means that (t) is 110. Now we have two of our 3 numbers needed to solve the math problem. When the scientists examined the 110 Plovers, they noticed that 25 of them were marked (had leg Bands) from their initial capture in 2009. Now we have r = 25.

Math works as such: 45 X (times) 110 equals 4,950. We now need to divide that number by the 25 (r). That gives as an estimated number of Piping Plovers of 198 birds. That's it!

Now have students try the following numbers and estimate the population size of the Piping Plover from one year to the next.

Art Extension:

Sketching a Piping Plover (optional)

Once students have recorded their banding choices for future use, student must then sketch a plover to the best of their ability. The bands should be recorded on the leg in the proper location indicated by the student scientist. (Note: Birds right leg and left leg must be correctly recorded).

Field drawings have always been a part of scientific discovery. More modern methods of photographing have made for incredibly striking images of described organisms. However, despite the beauty and ease of photography, many details of organisms can be overlooked. By sketching a plover, students will be forced to observe deeply and take note of any difference between similar organisms, such as field marks and individually identifying characteristics, or even behavior as well as participating in true field work of a scientist. Close observation is key.

Resources

Migration Maps, mostly Europe but also one Africa:
http://vimeopro.com/south422/animal-gps-track-animation/page/1

Massive Database of Bird Migration from the Cornell Lab of Ornithology. Very well done and very robust with information.
http://birdcast.info/forecasts/

University of Nebraska's portal for bird banding of the Tern and Plover. This site has some excellent information and images of banding kits etc.
http://www.ternandplover.unl.edu/monitor/banding.asp

Meta Tagging

Bird Banding, Endangered Species, Plovers, Conservation, Scientist, Field Work, Success Story,

Modification for Lower Level Students (K-2):

Banding Activity Lesson Adaptation:

Teachers will need to guide students in the lower levels through the bird banding activity. Here are some ideas how to facilitate the lesson.

1. Provide students with two dowel rods and label them R (right) and L (left). These rods represent the bird legs from the online banding activity. Students will be learning about perspectives, directional terminology and color patterns while participating in the banding activity. Have students work with directional terms while looking at each other, noticing that right and left directions appear reversed on their peers. This demo will help kids understand why the bird legs labels look backwards (opposite).

2. Once students understand the directional terminology for right and left, provide the students with small pieces of colored pipe cleaners. The pipe cleaners need to be the following colors: blue, orange, green, yellow, red, black, grey. The cleaners need to be but to the size that would wrap around the dowel rods. The cleaners represent the bands in the online activity.

3. As the facilitator of the lesson, walk students through the banding process step by step, directing your students to wrap the “blue” pipe cleaner around the upper right leg. This blue band means the bird was banded in Nebraska.

4. Follow the banding activity in the same format in order to reinforce directional and color terminology.

5. Not all students will be able to remember or understand the various categories from the banding activity. You would facilitate whatever level your students can handle.

6. The career video is also relevant to lower levels as it provides context for the banding activity, allowing students to think of themselves as “scientist.”

7. Journals can simply be the dowel rods glued to construction paper with the bands (cleaners) attached. A key to the bands can be provided with each “poster” that you could write up depending on the level of your students.