



A MULTI-DISCIPLINARY Science Technology Engineering and Math EDUCATION PROGRAM

**Middle School STEM Curriculum  
2022**

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Developed by Jamie Garaventa for Wings Over Water, a joint program of the Montana Natural History Center and the Montana Osprey Project.



**Montana Natural  
History Center**  
Connecting People with Nature





## Middle School STEM Curriculum MODULE ONE Lesson 7: Osprey Adaptations

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In this lesson, students investigate some of the anatomical adaptations of Osprey. After conducting research online and watching a video from the Montana Osprey Project, they design and create their own comic strip featuring Osprey adaptations.

### Objectives

Students will be able to use their understanding of Osprey adaptations to create a comic strip that includes at least two of their anatomical adaptations.

### Materials

- Osprey adaptations notetaker
- Lesson 7 slideshow
- Access to internet and a device for research
- Comic strip handout

### Essential Question

How do the anatomical features of Osprey help them survive?

### Key Vocabulary

- Osprey
- Adaptation
- Spicule

### Time

75 minutes

### Assessment

Application: Students will create a comic strip that explains adaptations of Osprey.

Reflection: Check for understanding on the exit ticket activity.

### NGSS Standards

**MS-LS4-2.** Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

## Invitation: 10 minutes

Students describe Osprey and watch a video showing the precise ways they move their wings.



Notes

1. Ask students to describe an Osprey. Encourage students to review their notes and include details about anatomical structures.
2. Show **slide 2** and play [this video of an Osprey angling](#) (video starts at 28 seconds in.) Have students focus their attention on the movement of the wings throughout the video. After watching, ask students to share their observations, particularly about the wings.

## Exploration: 20 minutes

Students look at a series of photos and explore a website to make observations about Osprey adaptations.



Collaborative Activity



Technology



Class Discussion

1. Explain that wings are just one of Ospreys' special adaptations. There are four main adaptations we will take a closer look at: feet, wings, nostrils, and eyes. Pass out the **Osprey adaptations notetaker**.
2. Show **slide 3**. Have students visit the [Outstanding Osprey website](#) and direct them to work with a partner or group to explore these four adaptations. Have students use the notetaker to record their observations and respond to the questions.
3. After students have explored the webpage, review the images as a class and discuss each adaptation including:
  - Feet: Osprey feet are covered in *spicules*, special scales that are extra spiky, for grabbing onto slippery fish. Their talons are bigger, thicker, and more curved than other raptors. Osprey also have a reversible toe! Most raptors have three toes on the front of their foot and one in the back. Osprey can move their fourth toe around to the back so they have two in front and two in back. They do this when diving for and carrying fish. Other birds cannot move their toes around like this.
  - Wings: When Osprey dive they dislocate their wings and throw them straight back. Some other diving and fish-eating birds can do this but no other raptors can. Osprey also have huge pectoral muscles ("pecs"), making them extra strong for lifting off from the water. See the video in **lesson 8** for a demonstration of this. These muscles are attached to a large sternum (breastbone).
  - Nostrils: Ospreys' nostrils close before they hit the water, like a swimmer using nose plugs.
  - Eyes: Osprey have clear membranes that they pull over their eyes before they hit the water, like a swimmer using goggles.

## Concept Invention: 10 minutes

Students watch Dr. Erick Greene explaining Osprey adaptations in more detail.



Technology



Notes

1. Show **slide 4** and have the class watch [this video](#) of Dr. Erick Greene (from the Montana Osprey Project) explaining these adaptations in more detail. Have students add additional notes on their handout or another piece of notebook paper as they watch.

## Application: 30 minutes

Students apply what they have learned about Osprey adaptations to create a comic strip.



Collaborative  
Activity



This portion of the  
activity may take  
additional class  
time or time

outside of class.

1. Pass out the **comic strip handout**. Have students use it to brainstorm and plan their ideas. Clarify the expectations for the comic strip.
2. Have students work by themselves or with a partner to create their comic strip.

## Reflection: 5 minutes

Students share their comic strips and complete a quick-write activity as an exit ticket.

1. Have students share their comic strips with the class. If possible, you can share them using a document camera.
2. As a whole class discuss: *How do the anatomical features of Osprey help them survive?*
3. As an exit ticket, have students respond to this prompt: *Which Osprey adaptation do you find most interesting and why?*

## Osprey Adaptations Notetaker

In the space below record your observations and ideas about Osprey adaptations.

<b>Wings</b>	<b>Feet</b>
<b>Nostrils</b>	<b>Eyes</b>

1. Why would being able to rotate the outer toe be useful for catching fish?
2. Why would these sorts of talons be useful for catching fish?
3. Why might large diving birds throw their wings back before they hit the water?
4. How does the ability to close their nostrils and cover their eyes help Osprey survive?



## Osprey Adaptations Comic Strip

Create a comic strip about Osprey. Your comic should include:

- A story about Osprey
- At least two Osprey adaptations
- Correct spelling, grammar, and punctuation

First, brainstorm:

Characters	Problem & Solution	Setting	Two Adaptations

Then, practice formatting and planning your comic:


