



# Missouri River Detectives

## Lesson 2

**Lesson Title:** Can Some Fish in the Missouri River Really Fly?

**Grade:** 4<sup>th</sup>

**Theme:** Invasive Species Damage the Balance of the Missouri River Ecosystem

**Topic:** Models, Sense Receptors, and Silver Carp

**Length:** 30 minutes

**Overview:** In this lesson, students will investigate the process by which Silver Carp are able to “fly” based on their physiological response to sounds. Students will compare the hearing processes between humans and Silver Carp and how Silver Carp respond when startled. In the activity, they will explore how this response can be used to control the spread of the invasive Silver Carp species.

**Student Outcomes:**

- Understand that species have different sense receptors that process information to the brain and how these receptors are used to guide their survival in the Missouri River.
- Know that species have different types of sense receptors that detect specific types of information.
- Use a model to describe how a species’ sense receptor processes information to the brain and how it is used to guide their survival in the Missouri River.

**Next Generation Science Standards:** 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

**Getting Ready:**

- Materials: Projector, computer, speakers, and pens/pencils for students.
- What to Print:

| Number of Copies | Item to Print                                 | Page #   |
|------------------|---|----------|
| # of Students    | Missouri River Detectives: Lesson 2 Worksheet | Attached |

- Open the Missouri River Detectives: Lesson 2 video file and have lesson plan available for reference. The video is (9:15) minutes in length.
  - Be sure that the computer device and projector used to display the Missouri River Detectives: Lesson 2 video has a working audio system.
- Space Requirements: It is best to have the classroom arranged in a way that allows space for students to be able to view the screen and be able to work on and reference the accompanying worksheet.

**SCRIPT:**

**Slide 1: Welcome**

**Slide 2: Can Some Fish in the Missouri River Really Fly?**

Welcome back, fellow Missouri River Detectives, to a new investigation brought to you by Missouri River Relief. We will be looking into the investigation question of whether or not some fish in the Missouri River can really fly. Has anyone ever seen a flying fish? I know some students have mentioned fish that glide over the ocean. But I'm really only interested in flying fish from the Missouri River. Let's see if we can find an example.

**Slide 3: Can Some Fish in the Missouri River Really Fly?**

Take a look at this video clip. I can understand why someone would say that these fish are flying. The height of some of these jumps is incredible! I wonder what makes these fish want to jump out of the water like this. It looks like we have video evidence of flying fish in our local rivers afterall!

**Slide 4: What is This Fish Called? What is an Invasive Species?**

Rather than asking "Can Some Fish in the Missouri River Really Fly?" let's change our question to "Why Do Some Fish in the Missouri River 'Fly'?" or jump out of the water the way we saw in the video.

These "flying fish" are actually an invasive species called the Silver Carp. Invasive species are not originally from the area that they now reside in and they're usually harmful or dangerous to the native plants and animals who have lived in that habitat for a very, very long time.

Maybe you have heard the word "invade" before. For example, someone who gets too close to your personal space and "invades" it. I want you to think of invasive species like that, plants or animals that invade the personal space of native plants and animals.

These "flying" Silver Carp are originally from Asia, but they have escaped into Missouri waterways where they now live among our native species of fish.

**Slide 5: Why Are Invasive Species Harmful?**

You may be wondering why are invasive species harmful? For Silver Carp in particular, they are harmful because of their ability to breed quickly and grow their population which makes it easier for them to out-compete native species when looking for food. Silver Carp are filter feeder type fish, like the Paddlefish discussed in lesson one – so they eat a lot of the plankton and algae that other native fish lower down in the food web would consume. This takes away from these native fish and ends up affecting not only the filter feeders, but all of the predators who eat those fish as well. Because they are invasive, Silver Carp have few predators who can eat them in order to lower the population in the Missouri River area.

### **Slide 6: Range of Silver Carp Population**

The highlighted red area on this map shows the current locations of Silver Carp in the United States. You can see that they have already invaded large areas along the Missouri and Mississippi Rivers. Their large numbers are causing problems for native species and have pushed scientists to learn more about the Silver Carp in order to find ways to keep them from invading other areas.

One of the most interesting things scientists have learned about the Silver Carp is how they hear and process sound. To understand Silver Carp hearing, we must first understand: How Humans Hear.

### **Slide 7: How Do We Hear? Sound is VIBRATIONS**

Let's start with sound. All sounds are vibrations that travel through the air like waves. For example, as I am speaking, my vocal chords are vibrating to produce the sound. These vibrations are projected from my mouth to my microphone. The microphone is able to record these vibrations and transform them into data that can be mimicked by the computer's speakers when replayed. Currently, the speakers on the device playing this video are vibrating to recreate my voice. These vibrations travel from the speakers to your ears.

### **Slide 8: How Do We Hear? Simple Pathway**

When the source of the sound vibrates, the waves travel through the air and to your ear. Your ear receives the sound and passes it through the middle and inner ear where the information is transmitted to the brain so that you can notice the sound. This process happens in an instant. Sometimes that sound is loud, which causes your brain to make your body have a physical response. Like when you get startled by an alarm.

### **Slide 9: Get to Know the Senses: Activity 1**

Let's all be quiet for a few moments and test out ears. Listen to the room around you, what do you hear? Cup your hands over your ears. Did you notice a slight change in the sounds around you?

### **Slide 10: How Does a Silver Carp Hear? No External Ears!**

Silver Carp have their own way of "hearing" underwater. Instead of traveling through the air, vibrating soundwaves travel through the water to the fish. Another difference is that Silver Carp do not have external ears. Instead the vibrations travel through the Carp's skull and pass to their inner ears. It looks a little something like this.

### **Slide 11: How Does a Silver Carp Hear? Simple Pathway**

A loud sound is made and travels through the water to the Carp's inner ears where the information is transmitted to the brain. To Silver Carp, loud sounds mean danger! They want to swim away quickly, which means their brains tell them to JUMP or momentarily fly for a quick escape.

### **Slide 12: Why Do Silver Carp Jump? Swim Bladder Explanation**

But why do Silver Carp jump? It's not like they can jump up onto legs and run away from a sound like us. Scientists know that Silver Carp have a special organ which helps them regulate their buoyancy – how they balance in the water. Scientists call it a “Swim Bladder” which can be found in most fish species. Fish can fill their swim bladder with air or release it in order to float properly. The pressure of the air in their bladder is different when they are at varying depths of water. As they swim closer to the surface, the pressure increases.

Have you ever felt your ears pop when driving down a big hill in the car or taking off in an airplane? The “popping” sensation happens because of a quick pressure change. Something similar happens with a Silver Carp's swim bladder. Scientists have found that it normally takes time for the Silver Carp to let out some of the air and lessen the pressure, but when startled, Silver Carp know that “flying” out of the water and splashing down on the surface can help to get rid of the extra air and make it easier for them to swim away and escape. How cool is that?

### **Slide 13: Get to Know Your Senses: Activity 2**

Just like scientists, we now understand how Silver Carp are able to hear sound, process that information in their brain, and respond to the information by jumping into the air. Native fish do not respond to sound in same way, they remain in the water and do not have the same jumping or “flying” response that Silver Carp do. Can we use this information to find ways stop the Silver Carp spread.

Controlling the spread of this invasive species is an issue that requires all hands-on deck. So today, we are going to brainstorm some ways that might help keep Silver Carp from spreading.

### **Slide 14: Get to Know Your Senses Activity 2 (*OPTIONAL PAUSE*)**

Knowing what you have learned about the Silver Carp, what kind of invention could you create to keep the Silver Carp from spreading to new rivers and streams? Draw your ideas for this invention on your worksheet.

*(Teachers are welcome to pause here. Give some time for work, let students share with the class if there is enough time in the lesson.)*

### **Slide 15: Closing**

We've investigated the question “Why Do Some Fish in the Missouri River Fly?” and uncovered the truth behind what type of fish leap out of the water and why they do it. So, if you are ever on the Missouri River and a Silver Carp flies out of the water and lands in your boat, you can explain to everyone on board exactly what just happened!

Thank you all for joining Missouri River Relief on this investigation into whether or not some fish in the Missouri River can really fly. See you on the River!

## Slide 16: Credits

---

### **\*Imagine & Video Credits**

Missouri River Relief respects the intellectual property rights of the owners of visual assets. We make every effort to use images and videos under appropriate licenses from the owner.

- **Imagine Sources:** "used under cc by"
  - Silver Carp by Dan O'Keefe
  - Flying Silver Carp by Asian Carp Coordinating Committee
  - Map by Kaldari and Halava
- **Video Sources:**
  - PBS NewsHour. "Midwest Battles to Keep Invasive Asian Carp out of the Great Lakes." YouTube, uploaded by PBS NewsHour, 6 Jan. 2019, [www.youtube.com/watch?v=IIRXDDG6yB8](http://www.youtube.com/watch?v=IIRXDDG6yB8).

**Script by Anna Miller & Kristen Schulte**

**Visuals by Anna Miller & Kristen Schulte**

**Narration by Dan Miller**

**Additional Contribution by Laura Waldo-Semken & Melanie Knocke**

\*Google search images using the "usage rights" filter and select "labeled for noncommercial reuse with modifications."