

# Ecosystems

Amazing Earth - 4th Grade

**Quick-Start Notes for Parent Presenters:**

- **Visual Action Cues:** Highlighted in **[BOLD AMBER BRACKETS]** so you know exactly when to click to advance slides or play videos.
- **Student Participation:** Questions to ask the class are highlighted in **[BLUE CALLOUT BOXES]** along with answer keys and guidance.

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 01: Intro**<br>*(On-Screen: Title slide 'Ecosystems' with a photo of a lush Virginia stream landscape)*<br><br>Ecosystems Amazing Earth - 4th Grade | This year in science, you are learning more about how we fit into this vast and amazing universe. From right here in Reston, to all of Virginia, to the planet Earth, and even our solar system.<br><br>You started this year by exploring watersheds and ecosystems. Today let's zoom in and learn more about an amazing ecosystem that plays a big role in Virginia's watersheds - our stream ecosystems!<br><br>**[CLICK: Advance to Slide 02]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 02: Streams as Ecosystems**<br>*(On-Screen: Photo of two researchers wading in a clear Virginia stream taking measurements)*<br> | Healthy streams are the backbone of the Potomac watershed, feeding larger rivers and supplying drinking water to 5 million people in our region.<br><br>But streams are not just flowing waterways - they are diverse ecosystems teeming with life. Even small streams provide the habitat for a vast number of organisms, including fish, aquatic invertebrates, and algae.<br><br>These organisms interact with one another and with the nonliving components in the ecosystem in fascinating ways. Sometimes they compete and sometimes they cooperate.<br><br>Today, we're going to look at a freshwater fish whose cooperation surprises even top scientists!<br><br>**[CLICK: Advance to Slide 03]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 03: Meet the Bluehead Chub**<br>*(On-Screen: Close-up photo of a male Bluehead Chub carrying a stone in its mouth underwater)*<br> | Meet the Bluehead Chub.<br><br>This little guy is a common minnow that is typically 3 to 7 inches long and lives in the streams of Southwest Virginia.<br><br>But there is something very extraordinary about this fish. Out of over 34,000 fish species in the world, the Bluehead Chub is one of only about 10 species that can pick up and carry pebbles in its mouth to build a mound nest for its eggs!<br><br>Bluehead Chubs carefully move each individual pebble to its new location up to 10 feet away - they do this 20,000 to 100,000 times per nest!<br><br>**[CLICK: Advance to Slide 04]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 04: Virginia Tech Field Research Video**<br>*(On-Screen: Video playback)*<br><br>**[PAUSE FOR VIDEO: 2 MIN VIDEO]** | When scientists realized what the Bluehead Chub were doing, they got really curious and asked if this uncommon activity has an effect on the whole stream ecosystem.<br><br>Let's hear from the scientists at Virginia Tech about what they have found.<br><br>**[CLICK: Play 2-Minute Virginia Tech Video]**<br><br>**[CLICK: Advance to Slide 05]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 05: Ecosystem Engineers**<br>*(On-Screen: Photo of Dr. Emmanuel Frimpong measuring a stream habitat)*<br> | As you saw in the video, a Bluehead Chub nest isn't just a single-family home — it's like a high-rise apartment building for the whole stream!<br><br>Up to 40 different fish species rely on this one nest to lay their eggs.<br>Because the chub actively changes the physical environment of the stream floor, scientists call the Bluehead Chub an 'Ecosystem Engineer.'<br><br>**[CLICK: Advance to Slide 06]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 06: Step Into the Role of Fisheries Biologists!**<br>*(On-Screen: Photo of a fisheries biologist wading in a stream with clipboard and gear)*<br> | Today, you aren't just students — you are Fisheries Biologists!<br><br>We are going to investigate three big questions:<br><br>• Is there a relationship between the size of the nest and the number of other species that use it?<br><br>• Is there a relationship between the size of the nest and the total number of eggs laid on the nest?<br><br>• Why would the Bluehead Chub do all this hard work? What is the ecological advantage?<br><br>**[CLICK: Advance to Slide 07]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 07: Activity Overview**<br>*(On-Screen: Activity Images)*<br><br> | Unfortunately we cannot take you to Southwest Virginia today. But we can use our imaginations and data to explore more about this fascinating fish.<br><br>You are going to make your own bluehead chub. You will each be given a clothespin and a set of googly eyes.<br><br>Then you are going to build a nest using your bluehead chub clothespins to grab 'rocks' aka pompoms as fast as you can.<br><br>You will record data on your nests using the handout and at the end we will see who can build the tallest nest, the widest nest and the nest with the most pebbles.<br><br>**[CLICK: Advance to Slide 08]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 08: Think like Fisheries Biologists!**<br>*(On-Screen: Title slide 'Think like Fisheries Biologists!')*<br><br>Think like Fisheries Biologists! | Our first step is to think about our three big questions and formulate hypotheses.<br><br>**[STUDENT PARTICIPATION]**<br><br>**"Please go back to your desks and start the Hypothesis Worksheets."**<br><br>*Tip: Guide students through writing 'If... then... because...' predictions for Nest Size vs. Species, Nest Size vs. Eggs Laid, and Ecological Advantage.*<br><br>*Give the students a few minutes before moving to the next slide.*<br><br>**[CLICK: Advance to Slide 09]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |

**SLIDE 09: Craft Your Fish**

*(On-Screen: Close-up diagram & photo of Bluehead Chub and clothespin craft model)*

Bluehead Chub Have...

- a blue head with white spots
- a green and orange body
- big lips to help carry rocks





**[STUDENT PARTICIPATION]**

**"Now it is time to build our Bluehead Chub!**

**As you decorate your fish, keep this in mind - Bluehead Chub have:**

**• a blue head with white spots**

**• a green and orange body**

**• big lips to help carry rocks"**

*Tip: Give the students time to complete their fish before advancing to the next slide.*

**[CLICK: Advance to Slide 10]**

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 10: 60-Second Nest Building Challenge**<br>*(On-Screen: Clothespin fish grabbing pompom & 60-second timer video graphic)*<br><br> | Now it's time to build our nests!<br><br>Bluehead Chub build their nest in a dome-shaped mound.<br><br>Bluehead Chub have an urgency when building a nest with predators around and bad weather coming.<br><br>We are going to see who can build the tallest nest, who can build the widest nest and who can use the most pebbles.<br><br>**[STUDENT PARTICIPATION]**<br><br>**"You will have 60 seconds to build your nest! Is everyone ready to start?"**<br><br>*Tip: Make sure everyone is ready.*<br><br>**[CLICK: Start 60-Second Timer Video on Screen]**<br><br>**[CLICK: Advance to Slide 11]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 11: Measuring Nest Data**<br>*(On-Screen: Title slide 'Data Collection')*<br><br>Data Collection | Great building! Now turn your worksheet to the Data Collection Worksheet.<br><br>Start with Part 1, and just like real field biologists, measure your nest's height and width in inches using your ruler. After you have measured the height and width, count your total pompoms.<br><br>Then look at Part 2 on your worksheet. Locate your pompom count in the reference table to find out how many fish, eggs, and species your nest supports!<br><br>But oh no! A flood is coming our way! Look at Part 3 to consider what could happen if human activity hurts our stream.<br><br>**[STUDENT PARTICIPATION]**<br><br>**"Start your data collection!"**<br><br>*Tip: Adult helpers assist students with measuring height, width, counting pompoms, and looking up their outcomes.*<br><br>**[CLICK: Advance to Slide 12]** |

| VISUALS | SPOKEN SCRIPT + CLASS INTERACTION + ACTION |
| --- | --- |
| **SLIDE 12: Three Big Questions**<br>*(On-Screen: Title 'Three Big Questions')*<br> | Let's go back to our three big questions:<br>**[STUDENT PARTICIPATION - QUESTION #1]**<br>**"Is there a relationship between the size of the nest and the number of other species that use it?"**<br>*[Let 1 or 2 students answer first.] ANSWER: Yes! There is a direct positive relationship. As the size of the nest increases (more pebbles), the number of other fish species using the nest increases. A small nest might only support 4 species, while a large nest can support up to 40 different fish species!*<br>**[STUDENT PARTICIPATION - QUESTION #2]**<br>**"Is there a relationship between the size of the nest and the total number of eggs laid on the nest?"**<br>*[Let 1 or 2 students answer first.] ANSWER: Yes! There is also a direct positive relationship. As the size of the nest increases, the total number of eggs laid on the nest increases significantly. A small nest (1–10 pebbles) holds about 2,000 eggs, while a large nest (30+ pebbles) can hold up to 24,000 total eggs laid by all the fish species combined!*<br>**[STUDENT PARTICIPATION - QUESTION #3]**<br>**"Why would the Bluehead Chub do all this hard work? What is the ecological advantage?"**<br>*[Let 1 or 2 students answer first.] ANSWER: Scientists have observed a mutualistic relationship with other fish species because they create and maintain pebble nests that benefit both themselves and their "nest associates."*<br>*The chubs get a "dilution effect" where their eggs are less likely to be eaten by predators because so many other fish eggs are also present. The nest associates benefit from the nest's protection and are able to keep their eggs safe from silt and predators.* |