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This document provides one perspective for teaching the WoW Express lessons. -AW

WoW Immersion Trailer

Objectives

- Define a habitat and give examples
- Describe the importance of the food chain through interconnectedness (i.e. food chain, ecosystem services, etc.)
- Give examples of food chains
- Define and identify structural and behavioral adaptations of plants and animals

Notes: The set-up of the trailer means that it works best with small groups (less than 8), since students in the back have a tougher time hearing the teacher (and, thus, paying attention). Kids tend to be very excited to explore and touch the different things they see inside the trailer. I try to encourage them to ask me first, or give them options on which animals are best for them to feel. With lower level students, you can focus solely on texture and color with the different species. I ask the students a lot of questions, to both encourage their critical thinking skills and to make sure they are engaged learners. By laying the rules out before we enter (and you have their full attention), reminding the students inside the trailer of how we said we'd behave inside goes much more smoothly. It's important at the end, either in the house habitat or outside, that you review what you went over. You can choose a theme (habitats, food chains, mammals, etc.) and have each student name one, or ask a question about the importance of each piece we learned about.

Inside the trailer, we are going to talk about habitats. What's a habitat? Animals and plants need five things in order to call a place their habitat. Those five things are food, water, shelter, air, and space (not outer space, but space around us to move and grow). When we go inside, we'll be looking at a few different habitats and talking about some of the animals and plants that live in those spaces. I'll ask just a few things of your guys. First, I'll be the leader the whole time, so don't pass me. Also, if you have a question, or see something interesting that you'd like to talk about, just raise your hand. It'll be a little dark inside, since we'll be talking mostly about nocturnal animals. But nothing moves, so you don't have to worry about that.

What sorts of things do we see here in this habitat? We've got frogs, snakes, turtles, birds, and plants. Why do you think these things are here? What does this space provide for them? What about this giant bird? Has anyone seen a bird like this before? Even if we don't know what kind of bird it is, we can still guess what it might eat. Take a look at its beak, what could it eat? It doesn't eat a lot of bugs or plants, it mostly sticks to animals. Things like fish, turtles, snakes, frogs, and crayfish. Most of those things we already identified here in this habitat. Imagine you were a fish in this habitat, since it would be very wet in this type of wetland. If you were a fish swimming in between the plants, would you know if you'd swum past that bird? Not until it was too late! What type of habitat is this? A marsh or a swamp is a very

wet place, but these plants, called cattails, love those wet, mucky soils. And great blue herons, that giant bird, can find all of their food hiding in the marsh plants. We'd find a lot of fish here in this wetland. The next habitat is also a type of wetland, but you would not find fish in it.

Anyone seen a habitat like this one before? What sorts of things are living here? A lot of frogs, even a turtle! Why do you think that fish can't live in this habitat? There isn't enough space or water for them, they'd probably run out of food pretty quickly, and there isn't actually a way for them to get into this tiny habitat! How come frogs and salamanders can live here? Do they need puddles of water all year round? This habitat has a special name; it's called a vernal pool. The word 'vernal' means springtime, so what time of year do you think you'd find this habitat? Spring is also when frogs and salamanders are laying eggs, so that's why they use them! What do you think happens to the water in the summer? How come there isn't any water in the fall or winter time? Most vernal pools evaporate, and you might walk right through or past one in the fall and not even know it! Where do you think you'd find a habitat like this? Often, they can be seen in the forest, so let's check out some other forest animals.

There are a lot of animals living here! Mammals, birds, amphibians, and reptiles!

- Flying squirrels don't actually fly, but glide, like a paper airplane. They have to climb up on something tall, like a tree or a roof, and then jump off.
- Fishers, sometimes called fisher cats, aren't actually a cat, but a weasel. They don't even like to eat fish! They eat cats and chickens from people's yards, but also love to eat porcupines. How do you think they do that? The porcupine has about 20,000 or 30,000 quills on their body, so they wouldn't pull them all out first. Porcupines don't have any of those sharp quills on their belly, so the fisher flips them over or chases them up a tree and then eats them through their belly. The fur on their face and paws is super thick, so the quills can't actually reach their skin.
- Did you know we had rattlesnakes in New England? They like to live in rocky areas on mountainsides, and don't really like to be around people. They are also an endangered species, which means what? There aren't a lot of them around. This is a venomous snake, which means that they have venom that they inject their prey with. You can tell a venomous snake from a non-venomous snake in a couple of different ways. Anyone know? Rattlesnakes will have a rattle, like a warning. The shape of their eyes also can be a clue, but the shape of their head is also an indicator that they are venomous. They have cheek pouches, filled with venom, so their heads are triangular shaped. If they have a neck, they are venomous! Some non-venomous snakes (like that black rat snake we saw in the marsh) aren't venomous, but pretend they are by shaking their tail as if they had a rattle. Sometimes, they even move their tail around in the dry leaves, making it sound even more like a rattle. They have figure out that many animals are afraid of rattlesnakes, so they pretend they are one- even if they aren't!
- There are a couple different types of owls here in this habitat. We have the smallest owl here in New England, the saw-whet owl, which doesn't grow more than 7 or 8 inches tall; and we have the largest owl here in New England, the great horned owl. Owls can't turn their heads all the way around, but are able to turn it around about as much as you can turn your wrist around: almost 270 degrees of a circle. They have to be able to turn their head so much because they

can't actually move their eyeballs! They are stuck in a sort of binocular vision. We don't often hear owls flying through the forest, because they have an adaptation on their feathers that make them silent flyers. It's like a stealth mode. Why would they want to be silent flyers? What are they trying to sneak up on?

Caves are often found in forests, and they aren't always above the ground, like we imagine they are. Many times, they are under the ground and we won't even know we are walking above them as we make our way through the woods.

- Bats, here in the cave, are pretty interesting creatures. What type of animal are they? A bird? A reptile? A mammal? They actually have fur on their bodies, they give birth to live babies that they feed milk to, and they are warm-blooded, making them mammals. They are not blind, but have another sense that they use more at night- their sense of hearing. They use a special kind of tool to find their tiny prey at night: echolocation. Around here, we don't have any fruit bats, so these guys are eating a lot of insects, primarily mosquitoes and moths. A little brown bat might eat up to 1,000 mosquitoes in just one hour!

We've got one more place to check out. Sometimes, we can find them near forests. This habitat is probably pretty familiar to you. It's our backyard! A lot of different animals live here: frogs, birds, insects, rabbits, and humans!

- Opossums sometimes play dead. What would be the advantage of that? Most predatory animals want to eat animals that they themselves have killed. If the opossum plays dead, the animal loses interest and moves on, and the opossum is safe. They don't really have a pouch like a kangaroo, but opossums are marsupials: their babies are born alive but very small. The babies climb through the mother's fur to her belly, where they drink milk. They ride around on her back for a while after they are born.
- Scarlet tanagers have a special behavior for eating their favorite food: bees. Any ideas how they do that? They fly through the air and catch the bee, but don't eat it right away. Instead, they bring it back to their tree branch and, holding it in their beak, rub it against the branch, rubbing the stinger off. Then they eat it!
- Garter snakes are also called garden snakes, and they are not venomous. You can see that it's difficult to tell where the head ends and the body begins. Since they don't have a neck, that lets us know that this snake is not venomous.

There are a lot of animals that live in our backyards that aren't pictured here. The longer we stand here and look, the more we will probably see. Do you think we should protect habitats? What should we do? Why is it important? Can we live in all types of habitats? We may not eat all of the animals pictured in the vernal pool, but frogs still live there, and frogs like to eat bugs, which are pests to us. So it's important that there are healthy habitats available to all sorts of animals so that the food chain stays healthy. Even if we don't eat an animal, they still have an important role in the food chain. Imagine what the world would be like if there weren't any more snakes.

River table

Objectives:

- Define erosion and find an example of it
- Describe how the Connecticut River was formed (and is still forming)
- Explain how natural things (i.e. trees/plants, rocks) change the river, and people don't need to adjust its shape
- Describe how people might affect the river (i.e. it's shape, the water quality, how people interact with the water, etc.)
- Explain how changing seasons affect the flow of water in the river

Notes: The students are pretty excited to touch the sand at this station. I typically invite the students to gather around the table, but to keep their hands at their sides to start with. I let them know that we will have a chance to touch the sand, but that I'll invite them to do so in a few minutes. Setting this rule out in the beginning should alleviate any anxiety they might have, but I've also found it easier to remind them of the rule later on if I've set it out initially. The key to this station, I think, is flexibility. The river tends to do similar things each time you run it, but it's much better to teach what's in front of you then trying to force the river in a certain direction. If the river erodes toward an edge of the table, I ask if the water is strong enough to wash away the metal, and how the side might be changing the river. We can also relate what we see to real life. If we talk about housing placement or storm drains or hurricanes, the students may be able to make more connections to the simulation.

We are going to build a river. Does this look like a river to you? What does it look like? What are we going to have to do to make this look more like a river? Does anyone know how the Connecticut River formed? Did people build it? Do you know what a glacier is? Thousands of years ago, there was a giant block of ice, a glacier, sitting on top of Massachusetts. It was miles thick, and really heavy. It pushed down the land because it was so heavy. (Pound down the land in the middle)

Is there a glacier in Massachusetts today? We would probably notice a giant block of ice on our heads, I think. Where did it go? The air started to warm up, and the glacier began to melt. What do you get when ice melts? All of the water melting off of the glacier had to go somewhere. The easiest place for it to go was down the valley that the glacier had pressed down. As the glacier kept melting, the water kept moving down towards the ocean. Now, there is no glacier feeding the Connecticut River. Where does it get its water from now? Snow and rain coming off of the land feed the river today, meaning that it is fresh water. And it flows from the north towards the ocean in the south. (Turn water on)

The water should follow the path that the glacier created. What do you notice about it? Is there erosion happening along the banks? What does erosion mean? Is there sand coming out of the source? All of the sand moving in the water is being picked up by the moving water and carried downstream. A lot of it is getting dropped off, or deposited, near the end of the river, and it's forming what's called a delta. Is this what the Connecticut River looks like? What do we still need to do? How do we get a curvy river? (Hand out rocks to add)

What's happening to our river now? It's beginning to get curvy. Why? Water is really lazy. It takes the easiest path to get from the highest point to the lowest point. If something is in its way, it either picks it up or goes around it. We can see where this is happening along our river. Is the water strong enough to move the sand? Is it strong enough to move the rocks? Instead, it's going around the rocks, and some have created islands below them. Are we done building a river now? What do we still need? What do you know about plants? They have branches, leaves, and roots. What do those structures help the plant to do? Leaves help the tree do photosynthesis. What about roots? Under the ground, the roots grab onto water and nutrients in the soil. They also help the tree to stand upright, like thousands of tiny hands. Without roots, the tree would fall over. (Hand out trees to add)

Are the trees changing our river at all? How is the water moving around the obstacles? Are the rooted trees catching any of the sand moving down the river? Do they slow down the speed of the water at all? Do they slow down erosion at all? Let's do an experiment, which involves putting your hand into the sand. Find a spot covered in water and hold your hand out over it, but not in it. Now, squeeze your fingers like you have claws on the end of them. Your hands are now tree roots. Let's see what happens when we add large trees into our river. (Place hands into soil, palms all the way down)

What's happened to our river? Are all of our plants still in the water? Is the water moving differently? Is there more erosion or less erosion? What will happen if we take our hands out one at a time? Do we notice more or less erosion? Do trees and plants help the river change at all? (Take hands out, one at a time, or add both hands in first to see a larger effect)

Let's do another experiment. This time, find a spot not covered in water and take one finger and push it all the way to the bottom and swirl it around a little bit. What do you find? Where is that water coming from? To test if it really is coming from the river, let's drain our river. (Turn water off and let river drain)

Do that experiment again. If the water in our holes was coming from the river, they should be dry now, since our river is dry. What do you find? So where is the water coming from? Underneath the ground, even under our feet, if we dug far enough, is water, just called groundwater. It doesn't come from the river or the ocean or rain; it's just water in the ground. Many people get water for their houses from groundwater, digging holes just like those we just dug, called wells. (Flatten out land)

Conte case

Objectives

- Define what makes a mammal a mammal
- Describe what an adaptation is
- Explain the importance of having adaptations (i.e. what they allow the organism to do)
- Give examples of structural adaptations, specifically with teeth (i.e. herbivores, omnivores, carnivores)
- Recognize that humans are mammals and have adaptations for survival

Notes: This station does work with more people, but smaller groups are ideal for optimal learning. We've found that allowing the students to guide the discussion (with a theme of adaptations) is useful in helping them retain the information. We may begin the lesson talking about adaptations of desert animals or polar bears, but we can relate those back to New England wildlife. Making connections to humans seems to be useful as well, especially if we only have one artifact for the animal (i.e. the fur with no teeth). I have started our discussion talking about the different kinds of teeth that humans have (incisors, canines, and molars) and what we use each of them for. Then I can relate back to that definition when we are looking at another skull. It is helpful to make sure the kids are sitting, and that they are able to touch what you bring out. I try to let them know that they will have a chance to touch what I bring out, but that we'll just make observations about each artifact first. At some schools, we found it useful to take everything out of the box that we weren't going to use, so as to limit the distraction when it was time to switch. At other schools, we found it helpful to have a lot of options to navigate the interest level.

We are going to explore adaptations, mostly mammal adaptations. What is a mammal? An animal that gives birth to live babies, feeds their babies milk, is warm-blooded, and has fur is a mammal. We are mammals, as well as squirrels, deer, raccoons, bears, and whales. What is an adaptation? An adaptation is something an animal has or does that helps it to survive- to get food or water or protect itself from predators and weather. Before we identify what these animals are, let's make observations about them.

- [Moose skull] This animal has large teeth, what do you think it eats? Are they good for eating meat or plants? Does it have front teeth to grab onto animals with? Probably, it eats plants. It has a very long nose. Do you think it might be able to smell very well? What about its eyes? They are pretty large, perhaps it can see well. What direction are they pointing, outward or forward? Something I know about eyes on a mammal is that if you have eyes pointing outward, you are looking around you for predators nearby. The rhyme is "if you have eyes on the side, you hide; if you have eyes in the front, you hunt." This animal's eyes are facing outward, meaning it is a prey for some other animal, even though it is very large! What sort of animal do you think this is? Moose are found throughout the Connecticut River watershed, but not usually near cities. They like to live in wet areas where they can eat a lot of water plants and tree buds. They have to eat about 60 pounds of food every single day; that's like the weight of a 3rd grader in salad! Moose might weigh up to 1,500 pounds! Their teeth are perfectly shaped for eating that much. As they get older, their teeth get flatter. How does that happen? Just like the bottoms of our shoes, they wear out. Their teeth grind against each other – they have a bottom jaw as well – and older moose have flatter teeth. What is an animal called that only eat plants? Herbivores only eat plants.
- [Moose antler] Male moose also grow these things on their head. Antlers are grown every year, and take about 6 or 7 months to get this size. What are they made out of? It looks like wood, but moose and deer cannot grow trees out of their head! They can grow bone, so this is made out of bone – some of the fastest growing cells in the world are antler cells. Males grow them for a couple of reasons. First, to impress the females. Second, they use them to defend those females

from other males. It's like carrying around a bunch of jousting sticks on your head, a pretty good defense. In winter, they fall off their head, and they'll start growing new antlers in the spring.

- [Bobcat skull] What observations can you make about this animal? It has triangular shaped teeth; do you think it eats plants? These teeth are probably better at tearing apart meat. Its eyes are very large compared to its skull, so it can probably see pretty well. Which direction are its eyes facing: outward or forward? Eyes in the front, you hunt. This animal is going to look in front of it and chase down its food. What kind of animal is this? Bobcats are meat eaters; their teeth act like steak knives and tear their food apart. They don't actually chew their food like we do or like a moose does.
- [Bobcat fur] This is the fur of the bobcat. You can see that they would blend in pretty well to the forest habitat in which they live. Their fur is camouflage, and also helps them to stay really warm all winter, since they don't hibernate and they don't migrate. Why do you think they are called bobcats? Their short tail is described as being 'bobbed' or short, so they are called a bobcat. Bobcats eat chipmunks, squirrels, rabbits, and other small mammals. What is an animal called that only eats meat? Carnivores only eat meat.
- [Bear fur] What sort of animal is this? What type of bears do we have around here? Black bears are the type of bear we have here in New England. They are pretty small, maybe a couple hundred pounds, and what do they eat? Black bears are pretty lazy. Fishing is tough work. You may have seen a picture of a bear standing in the river with his mouth open, waiting for a fish to jump into it. That's easy fishing – there are a lot of fish moving upriver at once. That doesn't really happen around here. Instead, bears in New England eat a lot of berries and insects. They'll eat all sorts of berries and other seeds, as well as worms, grubs, ants, bees, and honey. Notice that near the bears head, the fur is really dense. The bees would have a tough time reaching the skin to sting the bear, so they don't bother him too much. Bears eat both plants and meat. What are those types of eaters called? Omnivores eat both plants and meat.
- [Beaver skull] What observations can you make about this animal? It has very large front teeth, which may be good for grabbing onto things. It also has flat back teeth, called molars, for chewing its food. Do you think this animal is a predator of other animals? Its eyes are a little tricky; since this animal lives mostly in the water, it needs to be able to see above the water while its body is mostly underneath. What sort of animal do you think this is? Beavers have all sorts of adaptations for living in their water habitat, which they mostly build themselves. Their teeth are specially coated in something to make them really strong, since they eat wood and use trees for building their dams and lodges. They even have two sets of lips! When they are carrying a branch or a tree in their mouth through the water, they don't want water to go into their throat, so they have a set of lips just in front of their molars to seal off their mouth from filling with water. Then they have lips in front of their front teeth as well. What sort of eater are beavers? Herbivores only eat plants. Even though his teeth look a little different from the moose, those molars are perfect for grinding.