Textures in Nature
Part 2: Experiencing Texture

In Part 1 of this lesson series, we explored what it means to have texture and how we can describe our observations, but how does our sense of touch actually work?
As examples:
How do you know that a butterfly has landed on top of your head if you cannot see it?
How do animals navigate in the dark?
Why are some plants and animals covered in scary spikes?

All of these questions may seem disjointed, but they all relate!

In this lesson, we will explore the concept of textures in nature through the scope of biology, animal behavior and anatomy and determine how these topics are connected to how organisms function in their environment.

The Nervous System

The big question is: how do you experience your sense of touch? The secret is in your skin! (Well, under it truly…) Your skin is an organ, just like your heart, stomach, etc., and though it may look simple on the surface, it's a very complicated collection of *nerves*. Nerves carry information from the surface of every bit of your skin all the way through your body to your brain where the information is processed. Check out this great video lesson about your sense of touch and then explore your own sense with the following activities in this section!

Video courtesy of mocomi.com. Not affiliated with Duke Farms.

Activity 1: The Pencil Test

With a partner, use a blunt pencil or other object with a very small tip to test out how accurate your sense of touch is.

Procedure:

One partner sits with their arms relaxed in their lap and their eyes closed. The other partner gently presses the tip of the pencil somewhere on their seated partner's exposed skin for a second or two and then removes it. Without opening their eyes, the seated partner attempts to use one finger to press directly onto the spot where they felt the pencil touch them. Once they have their finger in place, they can open their eyes and compare the true spot with where they have placed their finger. Repeat this process on various body parts.

Recommended progression: outer forearm/leg, inner forearm/leg, back of hand, shoulder, palm, back of neck, cheek, lip. Optional to use different objects with different textures/materials/temperatures.

Discussion:

- How accurate was the sensation that the seated partner experienced?
- Did accuracy change depending on the location?
- Did accuracy change depending on the object?
- How did the experience change depending on the temperature of the object?
- Can you estimate what types of nerves you have more or less of in certain locations based on your observations?

Are You the Only Animal with a Sense of Touch?

Of course not! All animals have skin (of various types, which we will explore later) and they rely on touch in different ways to survive and navigate the world. Some animals almost exclusively rely on their sense of touch because they have little to no ability to see! A great example of this is the raccoon.

If there is very little or no light, would it make sense to use your eyes or your hands more to get around? Raccoons are mostly nocturnal, so they spend the majority of their time wandering around at night looking for food, which means their bodies have *adapted* to navigating in the dark; they have good night vision and incredibly sensitive paws that look more like a human hand than an animal paw. They have the same type of *mechanoreceptor* nerves in their front paws as humans and other primates! Here at Duke Farms, you may see raccoons foraging in the streams or on the forest floor, rapidly feeling their way around the water's edge or through the leaves in search of delicious snacks while discarding anything they do not want after touching it only momentarily.

Activity 2: Raccoon Race

Procedure:

In pairs, collect small items from inside and from nature that have a variety of textures (example: cotton ball, pencil, pine cone, rock, feather, etc.) Take turns; one person sits on the floor with a blind fold on and the other chooses some objects from the collection and spreads them around the seated partner who then tries to identify all the items as quickly as they can

just by touch. Try asking the person to choose an item based on a descriptive word ("Find something that is prickly." "Find something that is fluffy.") Try adding new items to the collection without the blindfolded partner seeing them first.

Discussion:

- Did accuracy change if you knew what objects were in the collection?
- How quickly could you find and identify the objects?
- Do all nocturnal animals rely on touch?
  - Answer: No, different animals are adapted to rely more on night sight, hearing, or smell. Examples:
    - Owls – night vision and hearing
    - Bats – hearing (echolocation)
    - Flying squirrels – smell, hearing, and vision
    - Opossum – smell and touch
- Do animals that live underground only rely on touch in the total absence of light?
  - Answer: No, different animals are adapted to incorporate other senses as well. Examples:
    - Moles – smell and touch
    - Ants – chemical trails (pheromones)
    - Armadillos - smell

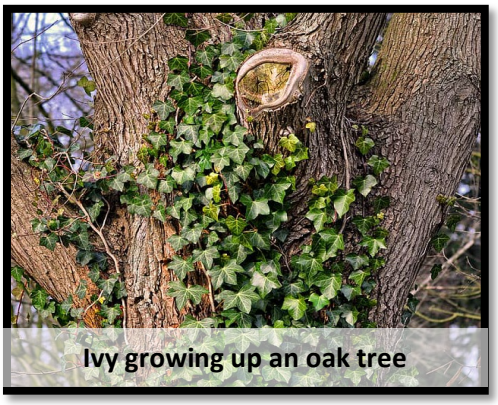
Textures of Animals and Plants

In Part 1 of Textures in Nature, we discussed that textures are all around us. There are so many outdoor places to observe and touch different textures. But *why* are there so many textures in nature and why do plants and animals all have specific textures? Why do some trees have smooth bark while others have grooved bark? Why are some leaves waxy while others are fuzzy? Why do some animals have soft fluffy fur while others have smooth silky skin? Let's figure it out!

Tree Bark

This is smooth beech bark

This is grooved oak bark



Ivy growing up an oak tree

Why is one smooth and one grooved? Both textures of bark provide pros and cons for the tree.

Smooth tree bark makes it difficult for ivy and pests to climb up it, but because it is smooth the tree must grow slowly to keep the structure and texture of the bark. If the tree were to grow too quickly the bark would split in places, consequently ruining its defense against vines and bugs. Slow growth of smooth barked trees also means that wounds and breakage on the tree will take longer to heal over.

Unlike slow-growing smooth bark, **grooved** tree bark grows quite quickly. For example, oak trees grow 4x faster than beech trees! Fast growth of this bark also allows for the tree to repair any lacerations quicker and retain more moisture. Unlike the smooth bark of the beech tree, grooved bark provides traction for creeping ivies and pests.

Source

Plant Leaves

Why does one plant have waxy leaves and the other plant have fuzzy leaves?

Just like the American holly shown above, rhododendron, pine, and fir are also trees and shrubs that have leaves with a **waxy** texture. These are all plants that keep their leaves throughout the winter, also known as "evergreens". Having waxy leaves provides a barrier or seal that keeps water locked inside the leaf. This aids the tree's survival during the colder months. Source

Plants like sage have **fuzzy** leaves. Interestingly enough, those little hairs on the leaves that make them fuzzy also help the plant retain and lock in moisture, just like the waxy-leaved plants. You might notice that other parts of some plants, like stems and flowers, may be fuzzy also. This texture on different parts of the plant still preforms the same task. Source

Think: If waxy leaves and fuzzy leaves both hold in moisture, why don't they both just have the same texture? … Have you ever seen plants with soft fuzzy leaves survive the winter?

Animal Texture

A fox with soft and fluffy fur

A salamander with smooth and silky skin

Why does a fox have fluffy fur, but a salamander has smooth skin?

Red foxes need to be able to survive the winter. Their **soft fluffy** fur helps them stay warm and insulated during cold days and even colder nights. Their coats grow longer and thicker in the winter but in the summer, they have shorter fur to keep them cooler. Source

A lot of amphibians, including salamanders, have **smooth silky** skin. Their skin is covered in a mucus that keeps them moist. It also allows them to absorb oxygen and water through their skin, which is the only way that they intake water. If salamanders had fur, they would not be able to stay hydrated. Source

Activity 1: Scavenger Hunt: Textures in Nature

Print this worksheet and bring it with you on your texture adventure! Get your eyes and hands ready to observe and investigate textures in nature. Once you have found something on the list you can check off the box. Use the extra space to make some more observations about what you have found

Duke Farms

Look or feel for...

- [ ] A **fuzzy** leaf
- [ ] **Grooved** tree bark
- [ ] A **bumpy** caterpillar
- [ ] A deer with **wiry** fur
- [ ] A patch of **soft** grass
- [ ] **Velvet** flower petals
- [ ] Some **springy** moss
- [ ] A **prickly** plant stem
- [ ] An animal with **fluffy** fur
- [ ] A **smooth** amphibian

Duke Farms

What else did you find that was…

Fuzzy

_____

_____

_____

_____

_____

Soft

_____

_____

_____

_____

_____

Springy

_____

_____

_____

_____

_____

Fluffy

_____

_____

_____

_____

_____

Grooved

_____

_____

_____

_____

_____

Smooth

_____

_____

_____

_____

_____

Wiry

_____

_____

_____

_____

_____

Velvety

_____

_____

_____

_____

_____

Activity 2: Nature Rubbings
Rubbings are a fun and simple way to engage learners of all ages.

Materials needed:

- Paper
- Crayons (wrapper peeled off)
- Nature objects
  (flat objects work best, but for exploration purposes, test out whatever interests you!)
- A basket or bucket to collect objects

Instructions:

1. **Collecting outdoors:** Take a little journey outside and find some objects that you can safely pick up and bring inside with you. Look for items of all different sizes and a variety of textures. Don't forget your bucket!

2. **Collecting indoors:** Once you are happy with what you have collected, make your way back inside. Grab your paper and crayons and find a flat surface to work on.

3. **Labeling:** Pick up one piece of paper and label it with the first object you will create the rubbing of. Then pick up the object, hold it in your hands and observe it. You can also write your observations on the piece of paper. Be sure to specifically make note of the object's texture.

4. **Rubbing:** Take your object and lay if flat on your workspace. Lay that same piece of paper you wrote on over the object. Now take the long, rounded side of your crayon and rub it over the object with even pressure.

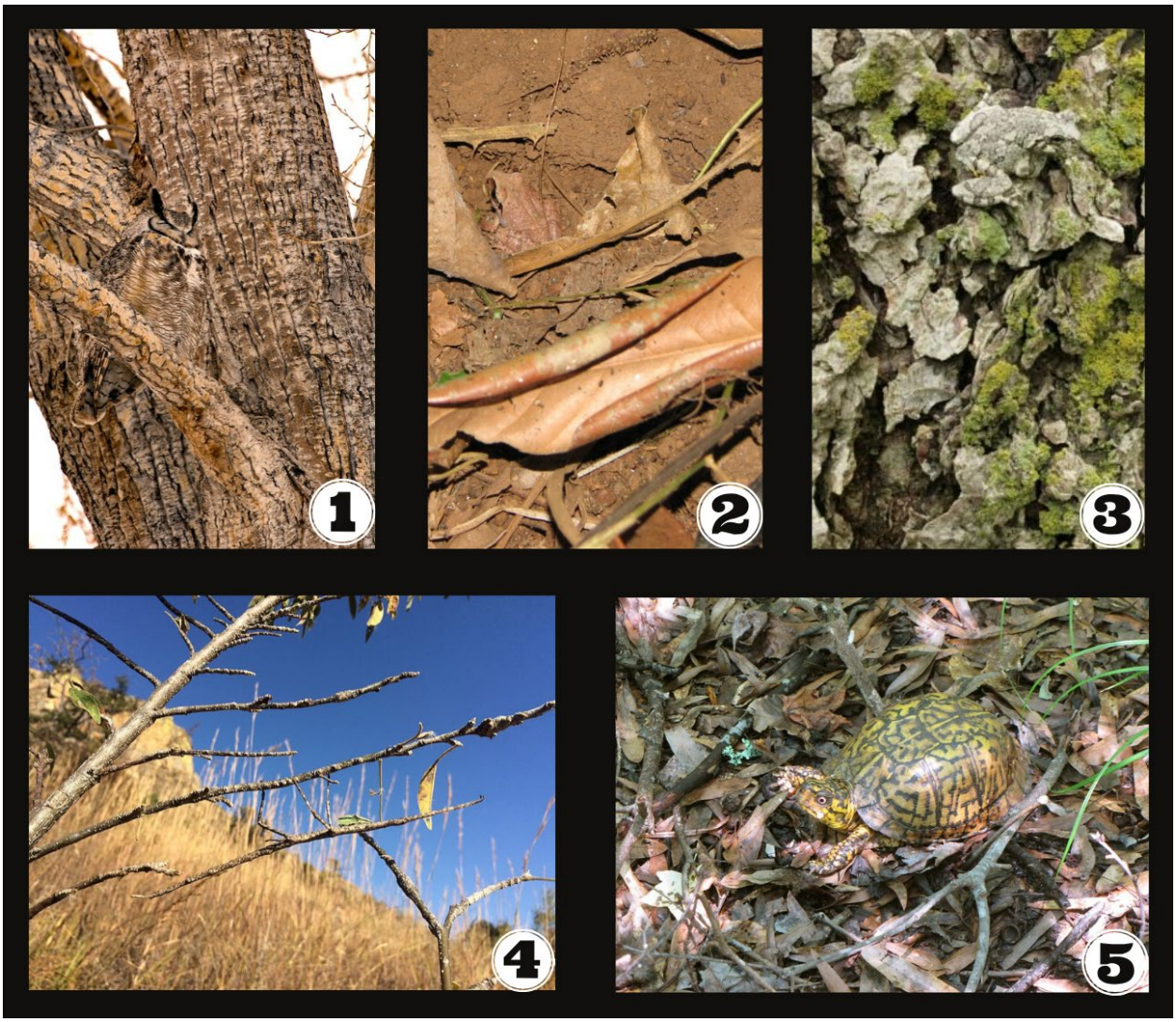
5. **Compare:** After you have completed a few rubbings of different objects, look at them all together. Use the guiding questions to examine textures.

   Guiding questions: Do the rubbings of different objects of the same texture look similar? Are there objects that have different textures that look similar? Can you tell what the texture of the objects are from their rubbings? Was it easier to complete a rubbing with a smooth or bumpy surface?

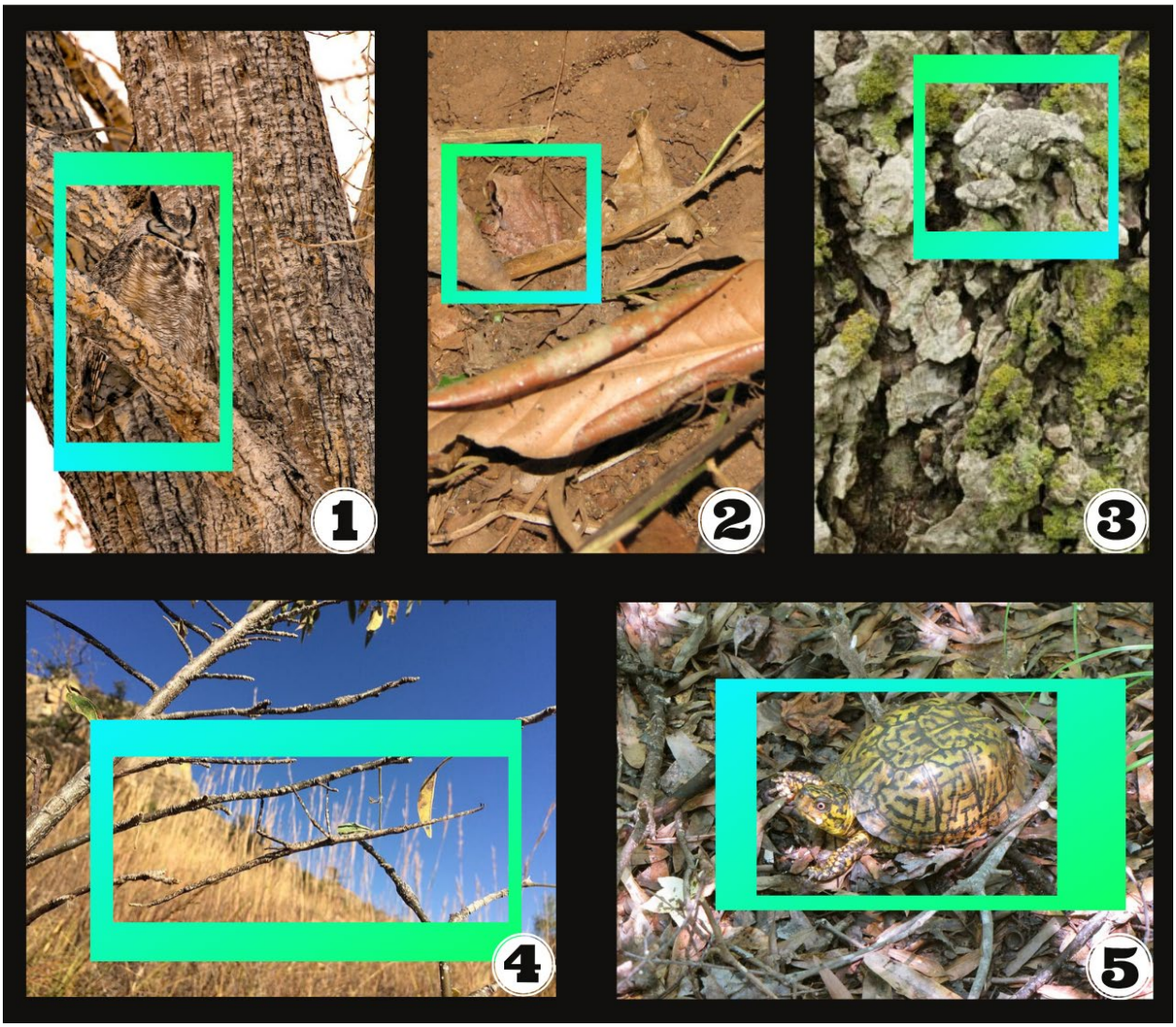
<u>Now You (Don't) See Me</u>
The texture of an animal's body also helps to *camouflage* them. Camouflage can be a mix of colors and textures that allow an animal to hide without having to bury itself or go behind anything; this can be used to both hide from something that wants to eat them or from the thing they want to sneak up on and eat! You can find animals with amazing camouflage power around the world, including right here in NJ and on the property at Duke Farms! What can you spot on your next visit to the Duke Farms property?

Activity 1: Hidden in Plain Sight

Can you find the animals in these photos? Scroll to the next page to see the answers and to note some information about the animals.



How did you do?



1) Great horned owl – These owls are not only colored perfectly to blend in to the bark of a tree, but they also have tufts of feathers on top of their heads to make them look like a jagged piece of wood! Many people mistake these for ears or horns, but owls have neither.

2) Wood frog – These little frogs are the color of the leaf litter that they live in and even have a similar shape to the dead leaves! Being so well hidden in plain sight is especially useful when they freeze solid during the winter months and have no way of defending themselves from predators while they are dormant.

3) Gray tree frog – You'll probably hear a gray tree frog before you see one! Their bird-like call helps them communicate with each other while staying hidden amongst the lichen and moss that grows on their tree trunk habitats.

4) Northern walking stick – There are 6 native species of walking stick insects in North America, but you'll be hard pressed to find them with such incredible camouflage skills. Not only have they adapted to be identical to a twig, but they can stay perfectly until a breeze comes along… then they sway to the same rhythm as the branches around them!

5) Eastern box turtle – This may have been a relatively easy find in this activity, but out in the wild the eastern box turtle can be a master of disguise as a rock or part of the leaf litter that it trundles through while looking for yummy worms and berries to munch on. They are turtles, but they do not swim, so don't be worried when you see them on the forest floor…if you can spot them, that is!

In the examples above, can you find and highlight the parts that demonstrate how texture is important for the animal's survival?

Activity 2: But Where's the Butterfly?

Butterflies and moths can be masters of camouflage! Their bodies have adapted colors and patterns to mimic their surroundings, and some species have even developed wings of different shapes to look just like dried leaves! Can you create your own camouflaged butterfly or moth?

Procedure:

Use the blank template on the next page. Go outside and find a spot where you would like to hide your butterfly. *Remember, camouflage means that an animal can hide in plain sight, so you cannot put it underneath or behind anything!* When you have chosen a spot, study it and look at all the colors and textures there. Color your butterfly to match it as perfectly as you can. Are you able to mimic the texture of the surface using only your colors? Cut out the butterfly and attach it to the spot using clear tape or sticky tack. Do this activity with a group and try to find each other's hidden butterflies.

Here are some examples of amazing butterfly and moth camouflage! Images courtesy of Adrian Hoskins@learnaboutbutterflies.com

Duke Farms

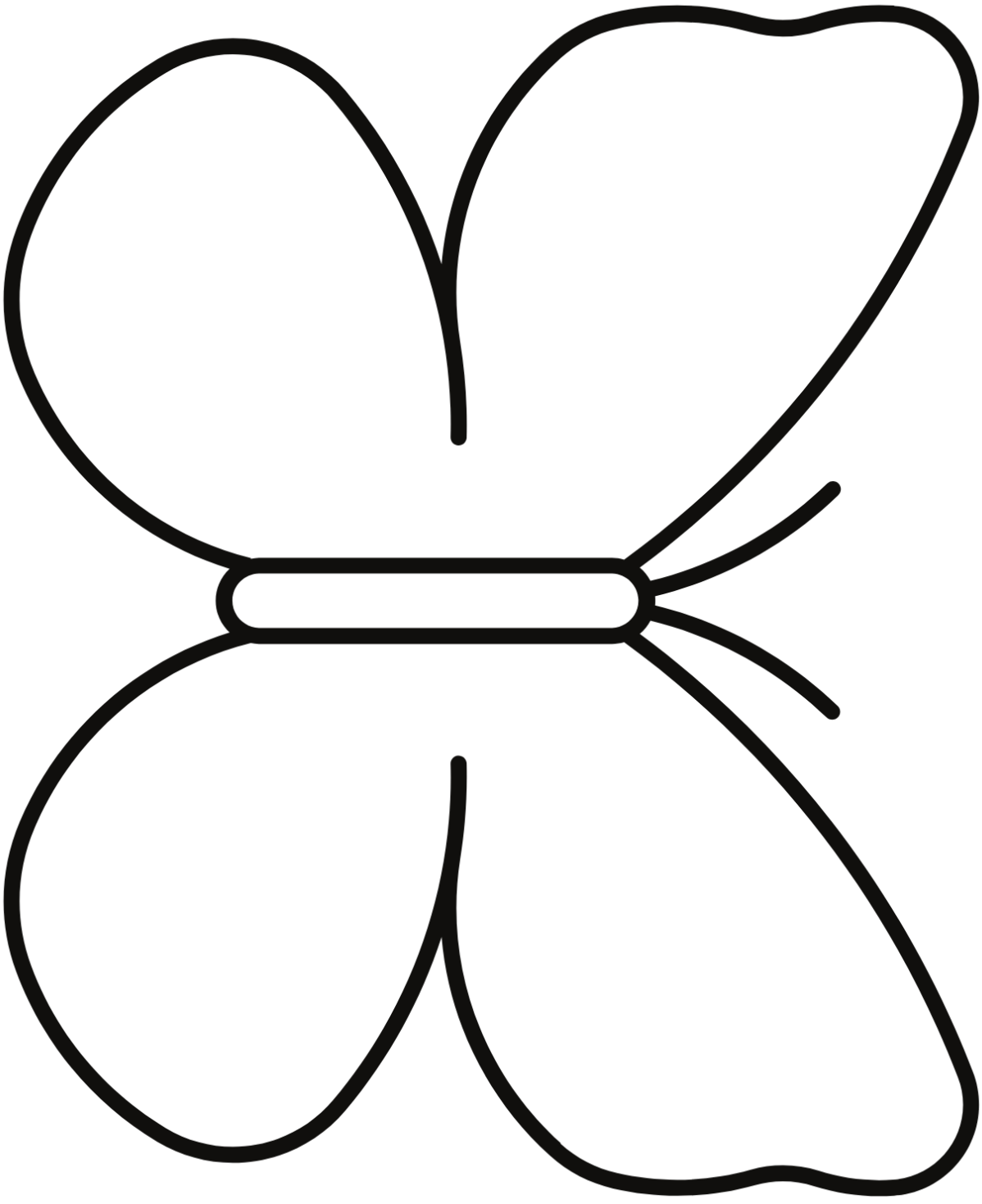
Angle Shades moth, *Phlogophora meticulosa*

Orange tip, *Anthocharis cardamines*

Brimstone, *Gonepteryx rhamni*

Skeletonized leafwing butterfly, *Zaretis itys*

Duke Farms



Extensions

Texture books to explore for very young learners:
Textures by Katie Wilson
Soft. Rough. Bumpy. Smooth
This book is for those just learning about textures and simple related vocabulary. The book offers simple text and physical examples. Often a best choice for toddlers.

How to Hide a Butterfly and Other Insects by Ruth Heller
The bright illustrations and rhyming text makes this a favorite for those just learning to explore nature. Throughout the pages, creatures like inchworms and bees and butterflies lie hidden in their environments for readers to find.

To hear the story read, click here.

Spiky, Slimy, Smooth: What Is Texture? by Jane Brocket
Soft, gooey, fluffy, prickly, lumpy, —textures are all around us. The book encourages inventive language descriptions like knobbly and slidy to describe the textures of common items.

To hear the book read aloud, click here.

DIY Sensory Book
To learn how to create a simple texture and sensory book for young children using commonly found items, you can explore this site.

Establishing a "texture" vocabulary links the learners' senses with that which is being described. Once established, young explorers can then imagine what animals in their natural environment may actually feel like and eventually understand the relationship between an organism's structure and its function.

Many vocabulary building games are on the market, but try making animal and plant Alphabet flashcards having your students only use texture words for each animal. Students can draw the animal and plant on one side of the card and then provide the texture descriptor on the flip side. This exercise can be for elementary and up!
For example:

- A is for ant. Ants are knobby.
- B is for bat and bat wings are leathery.
- C is for coreopsis and its leaves are papery and lacy.

Sample Learning Standards

The topic of texture can really be aligned with an assortment of Learning Standards, contingent upon your own learners' needs and the objectives you define. The following are just a few examples:

Next Generation Science Standards

• 2-LS2-1. Structure and Function: The shape and stability of structures of natural and designed objects are related to their function(s)

. • 2-LS4-1. Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence: Scientists look for patterns and order when making observations about the world. When looking at tree bark, students will note that the texture is specific to the species of tree. Observing and recording these textures, allows individuals to identify the tree.

• 2-LS4-1 K-2. Engineering Design K-2 - ETS1-2 Crosscutting Concepts Structure and Function: The shape and stability of structures of natural and designed objects are related to their function(s).

• 4-LS1-1. Construct an argument that plants, and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

A "Big Question" to pose to your students might be: Do the textures of plants and animals support their survival?

New Jersey Learning Standards ELA

RL.K.1 With prompting and support, ask and answer questions about key details in a text.

RL. K. Ask questions about unknown words in a text.

• LSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

• L.4.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

For more ideas on how you may incorporate the topic of textures in nature into your lessons, contact Kate Reilly, Manager of Education, Duke Farms at kreilly@dukefarms.org