**Big Idea/ Topic**

Energy Flow in Ecosystems

**Standards Alignment**

S4L1. Obtain, evaluate, and communicate information about the roles of organisms and the flow of energy within an ecosystem.

c. Design a scenario to demonstrate the effect of a change on an ecosystem. *(Clarification statement: Include living and non-living factors in the scenario.)*
d. Use printed and digital data to develop a model illustrating and describing changes to the flow of energy in an ecosystem when plants or animals become scarce, extinct or overabundant.

**Teacher Note:** This learning plan should be introduced to students after they have engaged with S4La and S4Lb.

**Other Content Areas:**

ELAGSE5R14. Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 4 topic or subject area.

ELAGSE4W2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

ELAGSE4W4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

ELAGSE4SL1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others’ ideas and expressing their own clearly.

a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
b. Follow agreed-upon rules for discussions and carry out assigned roles.
c. Pose and respond to specific questions to clarify or follow up on information and make comments that contribute to the discussion and link to the remarks of others.
d. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

ELAGSE4SL4 Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

ELAGSE4L6 Acquire and use accurately grade-appropriate general academic and domain-specific vocabulary, including words and phrases that signal precise actions, emotions,
states of being (e.g., quizzed, whined, stammered) and words and phrases basic to a particular topic (e.g. wildlife, conservation, and endangered when discussing animal preservation).

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**Instructional Design**

Teacher Notes: This instructional segment focuses on the practices of students designing a scenario and developing models based on research and data. The segment is geared to the concept that the flow of energy in an ecosystem is impacted if there are changes to the environment. Students will use background knowledge of the needs of plants and animals to relate how changes in water, food, light, soil, etc. can cause problems. If an animal or plant must compete for these resources with invasive species or human impact such as construction, the ecosystem can become unbalanced. Organisms are displaced, moved, weakened, or die.

Consider sharing the **Dear Family/Caregiver letter** prior to beginning this segment.

**DISCLAIMER**
The books used as examples for the Georgia Home Classroom’s Digital Learning Plans were selected by Georgia teachers to reinforce skills and knowledge found within the Georgia Standards of Excellence. The Georgia Department of Education (GaDOE) cannot and does not endorse or promote any commercial products, including books. Therefore, the books that were selected serve as examples and are not endorsed or recommended by the GaDOE. Please remember that when selecting books to support instruction, Georgia’s public school teachers and leaders should consult their local school district’s policy for determining age and content appropriateness for their students.

**Phenomenon:** **Kudzu Monsters: The Vine that Ate the South** (PowerPoint slides)

**Engage**
Show students pictures of kudzu vines and how the vines have impacted the environment. Have students write questions about kudzu. They might ask about where it came from, how to get rid of it, how fast does it grow, etc.

Formative questions: What do plants eat? What eats plants? What do you know about plants? Having students write their answers will allow students to share their thinking privately about how plants get food and are food. Look for **misconceptions** such as:

- plants eat soil
- plants eat other plants
- plants do not go extinct
- plants breathe like animals breathe
- leaves soak in water
- plants need plant food or fertilizer to grow
- flowers produce pollen for bees to eat
- trees are not plants
- mushrooms are plants
• all plants are edible
• bushes grow into trees

If you find out that there are misconceptions present in student(s) thinking, plan to include research, questions, reading, or investigating that will help students question their original thinking and search for a better understanding.

Plants get their energy by using sunlight to convert oxygen and water into sugar. Understanding the chemistry of photosynthesis is not expected at this grade level. Fourth graders just need to know that a plant’s food comes from the sunlight, air, and water. It is difficult to see a tall tree filled with branches and leaves and realize that it lives from these three things so allowing students to review this concept throughout the unit will help. A good reminder is making sure all food chains the students draw, model, and discuss begin with the sun. It is also a good reminder that the plants receive their energy from the sun so the arrow in the food chain always goes from the sun to the green plant.

If a plant gets energy from sunlight, air, and water, have them recognize that a large vine that grows rapidly over the existing plants will take away access to what the other plants need to grow.

Plants cannot move away from their home. Some plants need shelter from bright sunlight and thrive in the shade. Some plants need shelter from the wind. Plants can only live where conditions are right for them: light, water, air, and space/shelter.

Ask: How does kudzu impact the environment? Let’s find out more about this invasive plant.
Handout “Kudzu Facts” and Power point slides “Kudzu Monsters: The Vine that Ate the South” Challenge students to design a storyboard about the life of kudzu using the Power Point Kudzu Monsters. Have them ask a family member to tell them what they know about kudzu. Ask them to tell you if there are other plants that cause problems to the yard or garden and what steps they have tried to solve the problem. Have them record the information on the handout, Talking about Weeds.

What are invasive and introduced species? How do they impact the environment? (They compete for the resources: space, light, food, water.)

Research how an ecosystem is impacted when a new species is introduced or removed. Explain that sometimes people move a plant or animal to a new location (ecosystem). There may be incredibly good reasons: solve a problem, add beauty, eradicate a pest, etc. The plant or animal that wasn’t originally living there can compete for the resources of the animals that were already established. If they overrun the ecosystem, they invade the space and take away the resources. They are called invasive.

Have students read the article “INVASIVE SPECIES FOUND IN PET STORE PRODUCT: WE NEED YOUR HELP!” The article says that the zebra mussel can cause major economic and ecological damage. How can something so small (the size of a fingernail) cause such a big problem? What happens to the ecosystem if a zebra mussel is introduced? Students can research or you can lead a discussion using the following facts:
• They use small threads to attach to a hard surface such as water pipes, boat propellers and hulls, rocks, ropes, fishing gear, etc. People must scrub them off and wash where they attached.
• The zebra mussel will clog the pipes of water treatment plants and dams until scraped out.
• Mussels eat algae. Other fish, baby fish, and shellfish that eat algae must compete with them for this resource.
• The zebra mussel will attach to the hard surface of other hard-shelled mollusks such as mussels, clams, and scallops and consume the surrounding food. Mussels, clams, and scallops are food sources for people and restaurants.
• The zebra mussel’s waste is toxic and gives the surrounding water a strong odor and foul taste.
• Some birds who eat the zebra mussel can become sick.

Have students develop a food chain or food web that shows the impact of the addition of a zebra mussel. What animals are affected?

Have students research other invasive species to Georgia to find out how they impact the ecosystem. Students can do a presentation of how the overabundance of an invasive species can lead to the scarcity of resources for the natural food webs of Georgia.

Ideas include
• Kudzu
• Common water hyacinth
• Mimosa
• Asian silver carp
• Boll weevil
• Japanese beetle
• Coyote

An animal may be removed or added to an ecosystem to control the prey population, to eat, or as pets.
• Gray wolves in Yellowstone National Park (removed and returned)
• Rats and possums in New Zealand
• Pythons in the Everglades
• European rabbits in Australia

Provide students with the handouts suggested and have them explain the consequences of introducing new plants or animals to an established ecosystem. Perhaps they know family members, neighbors, farmers, fishermen, etc. who can share stories about having to take steps to protect their land or water system. Their explanations can take the form of a graphic strip, an illustrated booklet, a before-during-after story, etc. Collect their explanations and share with the rest of the class.
**Plugged:** Challenge students to research an invasive or introduced plant or animal. Have them locate a chart or graph that models how the ecosystem was impacted by the organism. Have them use the research and models to present a summary of how the ecosystem changed and why.

**Unplugged:** Challenge students to design a storyboard about the life of kudzu using the Power point *Kudzu Monsters*. Have them ask a family member to tell them what they know about kudzu. Ask them to tell you if there are other plants that cause problems to the yard or garden and what steps they have tried to solve the problem. Record the information on the handout, *Talking about Weeds*.

**Explore**
Missing Links in the Food Web is a common activity to show how the ecosystem is interrelated. Here are some links to this game:

- [Weaving the Web](#)
- [Weave a Marine Food Web](#)
- [Food Web Yarn Activities](#)

Other limiting factors for an animal is a particular diet. Unlike humans, if the food source is missing, the animal does not choose to eat something different.

- Pandas only eat bamboo.
- Koala bears only eat eucalyptus leaves.
- Monarch caterpillars only eat milkweed.

**Handout:** [Handout: Scarcity of Habitat and Food Can Harm the Populations of Other Plants and Animals](#).

**Literature Links:** *What If There Were No Bees* by Suzanne Slade. This book series includes other What If There Were No Gray Wolves; Otters; Sharks. These books are about Keystone Species. These animals will make a big impact on an ecosystem if they are no longer there.

**Limited food source Handouts:**

- [Giant Pandas and Bamboo](#)
- [Koalas and Eucalyptus Trees](#)
- [Monarch Butterflies: Journeynorth.org/Monarchs](#)
- [Milkweeds of the Southeast](#)

Monarch butterflies have an interesting life cycle. Talk about an easy food chain! The caterpillars (larvae) only eat milkweed so the adult butterfly must lay her eggs only on a milkweed plant. What will happen if there are not enough milkweed plants? What other factors can impact the life of a monarch butterfly?

**Resources:**
Monarchs Across Georgia (MAG) is a committee of the Environmental Education Alliance. MAG works together with teachers, students, families, communities, businesses, and others to
study monarchs and restore butterfly habitat across the state. Its mission is to inspire caretakers of the natural environment through monarch and pollinator education.

**Monarchs Across Georgia**
- Student booklets
- Backyard Butterfly Gardens
- Information about the Monarch migration and planning guides

There are other creatures that live in the milkweed patch. How do they make a living? There are carnivores, herbivores, nectivores, and scavengers. There are predators and parasites, too. See these clue cards to read about the role each creature plays. Then check the answer page to find out who's who: [Who's Who in the Milkweed Patch?](#)

**Plugged:** Have students use the Kids tab at the top of the Journey North website on Monarch Butterflies to find out about this animal that migrates, goes through a life cycle, and only eats milkweed leaves. Have students watch the path of the Monarch through the year as it migrates south.

**Unplugged:** Provide students a copy of the Journey North information about Monarch butterflies. A handout is included [Monarch Butterflies](#).

**Explain**
Mice are prevalent in children’s literature: **Ralph S. Mouse, Stuart Little, Mrs. Frisby and The Rats of NIMH, If You Give a Mouse a Cookie, The Tales of Despereaux, Mickey Mouse, The Mouse and the Motorcycle, The Cricket in Times Square,** etc. These stories of fiction sometimes interfere with the realities of mice being considered as pests.

Other pests that can invade the home ecosystem and compete for food, space, damage structure or clothes, etc. include
- Cockroaches
- Ants
- Ladybugs
- Spiders
- Weevils or mealworms
- Flies (house flies and fruit flies)
- Termites
- Moths

Why do people write books about these household pests? Have students choose one and find a book about it. Challenge them to compare the book characters to the real animals. Handout [Book List](#) gives some ideas of children’s literature. Students can use the handout [Comparing Real and Fictional Animals](#) and write how the character in the book is different from the real animal. This handout is in the form of a book report.

Have students use what they know about survival in an ecosystem to limit the invasion of household pests. See Handout “[Pesky Problems](#)."
What steps can they take to help make your home safe from pests? Invite them to talk with their family about chores they are willing to do to help with this. (crumb removal: wiping tables, sweeping floors, storing food after opening containers; removing weeds and debris against the foundation of the home; putting outdoor toys and equipment in a designated place, etc.) Have them share their plan with their family and let the class know what is working.

Students can write their own fictional stories using these themes or have students develop a scenario: Changes to Home Ecosystems. They can use any of these subjects to talk about how ecosystems can become balanced or unbalanced.

- Weeds
- Household pests
- Human Impact

**Plugged/Unplugged:** Have students get books from the library or include books in their packets and provide them with the handouts for the comparison of book characters and actual pests. Have students share their plans about how to help keep their homes safe from pests. Plugged students can show videos or photos of them doing chores.

**Elaborate**

Ask: Where can you see an example of human impact on an ecosystem?

Here are some examples if students are slow to respond:

- Construction site
- Flooded area
- Road construction
- Tree removal
- Planting a garden

Help students understand that Zoos and other agencies work to help preserve habitats, plants and animals that are threatened. Handout: [Manatees at the Zoo](#)

Investigate how a small change can have an impact. Locate a place outside that has a rotting log, flat rock, or other place where organisms can shelter. Sketch, photo, or describe the area in detail. Challenge students to list the living and nonliving parts they can see on the surface. Carefully move the object to see the living/nonliving things under the object. Have them look for signs of burrowing by small insects, egg cases, etc.

Ask: How are the conditions here different from the surface? (The ground is probably moist, and less light is available.) If this log or rock is not returned, what will happen to the organisms living here?

Have students find a rock, tree branch, pan lid, board or something that they can use to cover up a small patch in the school yard or yard at home. Make sure it is a place that will be undisturbed for a week. Instruct students to describe, sketch, or take a picture of the space before they do anything to it. Tell them to get close and count insects, leaves, pebbles, etc. Then have them leave the small solid object to cover that place for one week. When they remove the solid object, have them check to see what has changed. Sketch, photo, or describe in detail what has changed.
Did something move in or leave? Did the plants under the solid surface change? Explain how the change in the environment has impacted the living/nonliving parts and why. Now that you have modeled how to design a scenario to change an ecosystem, challenge your students to design a plan to help the ecological balance of an area in their own yard or schoolyard. They may decide to work to clear debris and weeds.

Handouts
- What Is a Weed?
- Weeding Out the Facts (Also available as a Power Point)
- design a plan to deter a pest in or around their homes.
- Pesky Problems
- Make a Food Web Game
- Garden Habitat Tips

Teacher Note: A free website for gardening ideas, lesson plans, and information: kidsgardening.org

Activities
- Design a plan to deter a pest in or around their homes.
- Join the citizen science of monitoring and/or tagging butterflies. Information is available on Monarchs at Journeynorth.org or Monarchs Across Georgia.
- Write an illustrated booklet about an endangered or vulnerable plant or animal explaining ways people are working to save those populations.
- Make a Food Web Game to play with others.
- plant or provide food/water for local wildlife such as butterflies, hummingbirds, songbirds, etc. Handout

Evaluate
Have students write a summary of what they have learned in this segment. Self-evaluation gives students a chance to recognize that they are in charge of their learning and needs.

Have students keep a page in their science journal or notebook for new to them science words and how they are used. This is not a page of vocabulary and definitions. It is a page they can refer to for helping them remember. Provide time for them to work on this page periodically. A science word wall or class chart of vocabulary with pictures will help students with spelling and give them clues. Set aside time for letting them compare their entries and discuss what they think they know with you.

Modeling Rabbits and the Movement of Matter is a short performance assessment. It is based on a true story of the introduction of the European rabbit to the grasslands of Australia and how that impacted the ecosystem there. In this task, students will develop a model that will help them describe the relationships between parts of an ecosystem. They will read a story about this ecosystem. The assessment started a model of the ecosystem for students on the separate model sheet. Each time they read a new part of the story they will add new information to the model. Then, they will use the model to help answer questions.
Other performance assessments, multiple choice format items, and constructed response format items are included in the handout **Assessment Ideas**.

**Lesson Goals Checklist**

- Identify changes to an ecosystem
- Design a scenario to show how changes affect an ecosystem
- Develop a model that shows how energy flows in an ecosystem
- Develop a model to show how energy flow changes in an ecosystem when the organisms become scarce, extinct or overabundant

**Handouts** (in order)
- Dear Parent
- Kudzu Facts
- Talking about Weeds
- Invasive Species Found in Pet Store Product
- Scarcity of Habitat and Food Can Harm the Populations of Other Plants and Animals
- Giant Pandas and Bamboo
- Koalas and Eucalyptus Trees
- Monarch Butterflies
- Book List
- Comparing Real and Fictional Animals
- Pesky Problems
- Manatees at the Zoo
- What Is a Weed?
- Weeding Out the Facts
- Make a Food Web Game
- Garden Habitat Tips
- Assessment Ideas
- Sample Rubric

**Power Point Slides**
- Kudzu Monsters
- Weeding Out the Facts
# Student Learning Supports

The goal for science education in the state of Georgia is as follows: All Students, over multiple years of school, actively engage in science and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields. The learning experiences provided for students should engage them with fundamental questions about the world and with how scientists have investigated and found answers to those questions. This lesson includes the disciplinary core ideas, science and engineering practices and crosscutting concepts to actively engage students in exploring science concepts with real world topics. As part of the vision, we must support the inclusion of all students in science learning.

Some **general** strategies to include all students in the learning process of science are as follows:

- Provide consistent and positive feedback.
- Keep directions brief and clear.
- Make sure parents and students know schedules, due dates, requirements, expectations, and how assignments/tests are going to be collected.
- Share evaluation results in a timely manner to students and parents.
- Package assignments in a way that students know the sequence, what is required, when it is required, what is available as choice and what is for fun.
- Provide/encourage organizational strategies such as where to work, store work, when and where to turn in assignments, graphic organizers, etc.
- Provide reminders of important dates and requirements.
- Go over notebook and journal ideas and share your entries with students so they can see what you expect.
- Allow dictation and/or text to speech software programs and tools.
- Check in with students by phone or online to answer questions, give reminders, and check progress.
- Provide parents with updates on progress and upcoming assignments. Communicate often.
- Provide resources that students can access offline.
- Allow students to give information orally or in drawings.
- Model expectations and demonstrations in video/online(phone).
- The teacher should have students match letter prior to reading or writing to remind them of the alphabet.
- The teacher can have students identify words that they know in any text that they are reading.
- The teacher can provide students with sentence frames to assist students frames to help students get started writing.
- Provide students with the opportunity to interact with numbers.
- The teacher should provide multiple ways for students to gain and show their knowledge.
Some strategies **specific** to this lesson are as follows:

- Ask students if they have seen kudzu before. If they have then ask them what they noticed about kudzu.
- The teacher should consider providing students with a graphic organizer to keep their ideas, thoughts, research, and questions organized.
- The teacher should consider providing students images and videos to help them observe organisms that they might not otherwise see.
- The teacher should consider providing students sources to help them find information on different organisms and environment.
- The teacher should consider student needs when choosing a game from the list.
- The teacher should consider asking students to think about what animals live around their home and what those animals eat. Then have them compare to other organisms that they are looking at in this lesson.
- The teacher should consider asking students if they have seen monarch butterflies before. The teacher may need to show an image to help students know what the monarch butterfly looks like.
- The teacher should consider providing students with read aloud and video options to help them find information.
- The teacher may need to consider using caution when speaking about pests in homes. Children have different home lives and will have different experiences that can impact their feelings on this topic.
- The teacher may need to consider giving students ideas of different ecosystems to explore.
- The teacher may need to consider where students live. Some students may have difficulty finding places outside to observe organisms such as those that live in the city. The teacher may want to consider images for those students.
- The teacher may want to consider writing prompts for the science journal.
- The teacher should consider providing an example and a rubric of the project at the end.

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**Engaging Families**

- Connect to [Georgia Home Classroom](#) resources.
- [Dear Family/Caregiver Letter](#)
Dear Family or Caregiver,

This instructional segment will lead your child to a better understanding of the environment/ecosystems and the plants and animals that live in those ecosystems. Last year in third grade your child learned to compare the different Georgia habitats and the plants and animals that lived in each region. This year students will build on that understanding to look more closely at the relationships of plants and animals and their needs for food, water, and shelter to help those organisms thrive. The study will challenge students to research invasive species such as kudzu that have impacted ecosystems.

Students will learn how to model the energy needs of living things by drawing, labeling, and interpreting food chains and food webs. They need to remember that all energy begins with the sunlight plants use to make their own food. Plants are labeled as producers for that reason—They produce their own food using sunlight, air, and water. Animals consume those plants, and those animals are consumed by other animals. Animals are labeled as consumers for that reason. Decomposers absorb nutrients from decaying plants and animals.

Your child will ask you about weeds that invade gardens and yards. They will study other pests that invade our home ecosystems such as insects, spiders, field mice, etc. They will read about real and fictional animals that we label as pests.

The study will engage students in learning what happens to a plant or animal if a need such as food, water, or shelter is scarce, overabundant, or missing.

It will help for your child to keep a journal or notebook of information, research, and news about ecosystems, labeled diagrams, charts, and how those ecosystems are impacted by scarcity, overabundance, or extinction.

The work will allow your child to find out about why some plants are weeds and how those weeds compete with wanted plants in yards and gardens. Yards, gardens or neighborhood parks will provide spaces for students to observe how changes can impact the ecosystems there.

You might plan a visit to the zoo, farm, or a garden so that your child can find out more about the needs of plants and animals.

Your child can do active research by choosing a project or planning a project with you and their teacher such as:

- working to clear debris and weeds.
  - Handouts available: What Is a Weed? and Weeding out the Facts
- designing a plan to deter a pest in or around their homes.
  - Handout available: Pesky Problems
- joining the citizen science of monitoring and/or tagging butterflies. Information is available on Monarchs at Journynorth.org or Monarchs Across Georgia at https://www.eealliance.org/mag-resources.html
- writing an illustrated booklet about an endangered or vulnerable plant or animal explaining ways people are working to save those populations.
• making a Food Web Game to play with others.
  ○ Handout provided: Make a Food Web Game
• planting or providing food/water for local wildlife such as butterflies, hummingbirds, songbirds, etc.
  ○ Handout available: Garden Habitat Tips
  ○ A free website for gardening ideas, lesson plans, and information:
    www.kidsgardening.org
Kudzu Facts

Kudzu is a vine from Japan and China. It was introduced into the United States in the 1800s to give farmers a cover plant to help control soil erosion. It was also sold as a shade plant for homes and porches. The problem happened when the plant grew out of control and began to grow on vacant land and spread over most of the southeast.

Kudzu is a member of the peas and beans family. It can survive in poor soils, is not affected by drought, and the vine grows up to a foot a day! It grows to get the most exposure to the sun and will grow over plants already in place. It will grow over trees, telephone poles, and unkempt buildings to get closer to the light it needs.

It has been known to break branches, power lines, and uproot trees with its weight. One root can produce 30 hairy stem vines. It blooms in June and July, and the fruit contains seeds.

Goats and sheep will eat kudzu, but the vine grows so rapidly that it would take herds of them to control its growth.

It is now classified as a weed by the U. S. government and is illegal to grow in many states.
Talking about Weeds

Find someone to ask about weeds. Who did you ask?

Common Weeds in Georgia

<table>
<thead>
<tr>
<th>Crabgrass</th>
<th>Sand burs</th>
<th>Ragweed</th>
<th>Plantain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dandelion</td>
<td>Stinging nettles</td>
<td>Clover</td>
<td>Jimsonweed</td>
</tr>
<tr>
<td>Morning glory</td>
<td>chickweed</td>
<td>Kudzu</td>
<td></td>
</tr>
</tbody>
</table>

1. What is a weed?

2. We are talking about kudzu and other weeds in our class at school. Do you think kudzu is a weed? What do you think about kudzu?

3. How do you know what plants are weeds? What do you look for?

4. Why are some plants unwanted and removed? Are they bad plants?

5. What would happen if you didn’t kill or remove a weed?

6. Do you have a story about weeding or pulling up the wrong plants?

7. Your story makes me think of other questions. (List them here.)
INVASIVE SPECIES FOUND IN PET STORE PRODUCT: WE NEED YOUR HELP!
The Georgia Dept. of Natural Resources' Wildlife Resources Division (WRD), along with wildlife agencies across the U.S., is urging both pet and aquarium stores and aquarium owners to remove and safely dispose of any moss ball plant designed for aquariums after invasive zebra mussels were discovered inside the product. Zebra mussels pose a significant risk to our state, so we urge anyone that may have purchased this type of product in the last month or has them on store shelves to remove it immediately. But don’t just throw it away anywhere! The concern with this specific mussel is that its’ release into the wild via septic systems or from being discarded in nearby ditches, creeks, or other waterbodies could result in establishment of the species in our state and lead to major ecological and economic damage.

Safely dispose of the product by freezing (for 24 hours) or boiling (for at least 10 seconds) before disposing of it in the trash. Aquarium owners who may have infected aquariums are urged to remove the fish from their aquarium and thoroughly clean their tanks, applying household bleach (one cup of bleach per gallon of water) and letting it set for 10 minutes before disposing of the water down a sink or toilet. Additionally, owners should disinfect filters, gravel and structures with a solution of bleach before disposing of the water down the toilet. Consumers may also contact their local WRD office for additional information on proper discarding techniques. Most importantly, DO NOT flush this product, or the mussels, down the toilet and DO NOT discard them outside.

Contact a WRD office: www.georgiawildlife.com/about/contact
Full press release: https://georgiawildlife.com/invasive-species-found-pet...

Photo credit: Georgia DNR
Scarcity of Habitat and Food Can Harm the Populations of Other Plants and Animals.

Food chains and food webs are models of where energy flows in an ecosystem. In other words where do plants and animals get their food? It is important to realize that if there is a break in the chain or a missing link in the web, there is a major problem. The animals that were eaten can become overabundant. They then eat the food that others would have eaten. The animals that feed on those animals or plants can become scarce since they no longer have that food source. To keep an ecosystem balanced, scientist and interested groups monitor animal and plant populations worldwide.

When a plant or animal population’s numbers drop, they become vulnerable and steps to keep the population thriving are necessary. If the numbers continue to dwindle, the plant or animal is in danger of disappearing from existence or endangered. Animals and plants that are no longer found anywhere on Earth are extinct.

Extinction: If the last animal of a species has died, the species is extinct. There are no more of these animals.

Wooly Mammoth

Tasmanian Tiger

Dinosaurs

Passenger Pigeon

The Great Auk
Endangered: Animal populations that are close to extinction are listed as endangered. These populations may be at risk due to habitat loss, illegal hunting or poaching, or invasive species competing for resources.

Tiger

Black Rhinoceros

Red Panda

Mountain Gorilla

Sea Lion
Vulnerable: Animal populations that are at risk of extinction are vulnerable.

Giant Panda

Koala

Asiatic Elephant

Giant Tortoise

Black Spider Monkey
Giant Pandas and Bamboo

Pandas live in the forests of China. Their species is vulnerable because they only eat bamboo. Lots of bamboo! The 200-pound adult Giant Panda must eat around 26 to 84 pounds of it every day, depending on what part of the bamboo they are eating.

Bamboo is an evergreen perennial flowering grass and is hollow in the middle. It is a fast growing and like kudzu, can grow up to 36 inches in a day. Bamboo grows tall not as a vine. It has many uses: food for people and livestock, paper, building materials, buckets and pipes, fishing poles, fuels, kitchen utensils, fabrics, musical instruments, as well as panda food.

Because of the uses of bamboo, the panda must compete with the economy for its food. Many organizations are working to protect the less than 2000 Giant Pandas by making sure their habitat of the bamboo forests is protected.

Zoo Atlanta has a website with a Panda Cam: [https://zooatlanta.org/panda-cam/](https://zooatlanta.org/panda-cam/)

Zoo Atlanta is one of the zoos with a conservation focus to help threatened wildlife. The giant pandas may be seen year-round at virtually any time of day. Because they are native to high-elevation cool mountain forests, in the warmer months they will generally be in their climate-controlled dayroom habitats. In the cooler months here in Atlanta, they may be either indoors or in their outdoor habitats. And, of course, panda fans all around the world can watch them on Panda Cam.

The giant pandas at Zoo Atlanta are on loan from China. The Zoo pays an annual loan fee for the pandas, and this money is used for giant panda conservation. Zoo Atlanta has contributed over $10 million for conservation of giant pandas in China, making giant pandas the Zoo’s most significant long-term financial investment in wildlife conservation. The majority of these funds are used for projects for wild giant pandas, and eight different nature reserves have been supported with these funds.
Koalas and Eucalyptus

Koalas live in Australia. They are vulnerable because they only dine on the leaves of the eucalyptus tree. The 30-pound adult koala will eat up to 3 pounds of leaves a day. Because of their limited diet, they can strip a forest of the tree leaves and run out of food. The koala population is also hindered by habitat loss due to construction, drought, and bushfires.
Monarch Butterflies

Monarch butterflies go through a life cycle: the butterfly lays eggs on a milkweed leaf. The caterpillar hatches in 3 to 5 days. The larva (caterpillar) eats the milkweed leaves and grows for 11 to 18 days. The caterpillar then becomes a chrysalis that is bright green and hangs down from the milkweed leaf. The butterfly emerges from the chrysalis in about 8 to 14 days.

Monarch butterflies live from 4 to 6 weeks unless they migrate to Mexico in the spring. If they migrate to Mexico, they can live up to 6 months.

Most Monarch butterflies born in the fall migrate to Mexico. They spend the winter in Mexico and migrate north in the spring. (See map on next page.)

Female monarchs lay hundreds of eggs across the southern United States. Then they die. It takes about one month for their children to develop (egg, larva, chrysalis, adult). The children migrate north and spread throughout their range. This life cycle continues every year.
Book List: This is a list of some children’s fiction about common pests. There are others. Enjoy searching!

**Bug Soup** Vince Cleghorn  
**The Very Hungry Caterpillar** Eric Carle  
**Mealworm Diaries** Anna Kerz  
**Leo the Cockroach** Kevin O’Malley  
**Termite Trouble** Kathy Caple  

**Ants**  
- **The Tiny Baker** Hayley Barrett  
- **Hey Little Ant** Phillip M. Hoose  
- **The Ant and the Grasshopper** Aesop  
- **Henry’s Awful Mistake** Robert Quackenbush  
- **On Hundred Hungry Ants** Elinor Pinczes  
- **Two Bad Ants** Chris Van Allsburg  
- **The Life and Times of the Ant** Charles Micucci  

**Crickets**  
- **The Very Quiet Cricket** Eric Carle  
- **The Cricket in Times Square** George Seider  
- **Cricket in the Thicket** Carol Murray  

**Lady Bugs**  
- **The Grouchy Ladybug** Eric Carle  
- **What the Ladybug Heard** Julia Donaldson  
- **Ten Little Ladybugs** Melanie Gerch  
- **Yoo Hoo, Ladybug** Mem Fox  

**Spiders**  
- **Itsy Bitsy Spider** Iya Trapau  
- **The Very Busy Spider** Eric Carle  
- **Charlotte’s Web** E.B. White  
- **Diary of a Spider** Doreen Cronin  
- **Be Nice to Spiders** Margaret Graham  

**Flies**  
- **When the Fly Flew in** Lisa Peters  
- **Diary of a Fly** Doreen Cronin  
- **The Fly** Petr Horacek  
- **Old Black Fly** Jim Aylesworth  
- **Shoo Fly** Iza Trapani  
- **Ride Fly Guy Ride** Tedd Arnold  
- **There Was an Old Lady Who Swallowed a Fly** Sims Taback, Pam Adams, Lucille Colandro, Kate Toms
Comparing Real and Fictional Animals

Your Name ____________________________

Title of Book ____________________________

The animal character in the book ____________________________

The behavior of the character in the book

Why is this character sometimes called a pest? The behavior of the character in real life

Did you enjoy this book? Give your reasons.

How did this book change the way you think about this character/pest?
Pesky Problems

Bugs like a nice home for the same basic reasons you do. They want food, water, and shelter. If they can find these in your house, they will move in. Bugs commonly found inside homes include ants, cockroaches, earwigs, firebrats, flies, house centipedes, silverfish, and spiders. Pet owners sometimes must deal with fleas and ticks in the house. Each of these pests can show up at different times of the year, and some are more problematic in certain parts of the countries than others.

Don’t Let Bugs Feel at Home

Tiny gaps around the front door and tears in the window screens—these are giant “welcome!” signs inviting bugs into your home. While it seems nearly impossible to keep bugs out all the time, here are some easy ways to help make them scarce.

Seal Up Cracks & Openings

Take a close look at your screens, windows, and doors. If you see any cracks or holes, caulk them or repair them. Add new weather stripping around your door to not only keep out cold drafts but also pesky bugs. Little cracks and openings are like wide-open doors for bugs.

Clean Up the Kitchen

Not only do you peruse the kitchen counter and pantry for a late-night snack, so do bugs, and different bugs like different foods, including flour, cereals, baking mixes, crackers, dried pasta, dried fruits, nuts, popcorn, and even spices. Ants go after the sweet stuff. Indian meal moths (a.k.a. “grain moths”) love rice, flour, cereal, and nuts. Flour beetles prefer a broad range of food including flour, cake mixes, dried fruits, nuts, chocolate, and spices. Make sure your food is stored in tightly sealed containers and purchase small packages that can be used up in a shorter period of time. Keep your floors and counters clean and clear of food crumbs. To keep bugs out of your flour, you can store it in the freezer. And don’t forget about your pet’s food; bugs, like the Indian meal moth, will eat that as well.

Dry Up Damp Areas

Bugs are not only seeking food, but they are also searching for water. And some home invading pests, such as silverfish, springtails and house centipedes, prefer to hang out in damp places. Fix any leaky faucets, drains, or pipes. Make sure your air conditioner, washing machine, and dryer are all working properly. In areas of your house that are always damp, like the basement, run a dehumidifier. And don’t forget to check the attic to make sure it’s dry.

Clean & Sweep Regularly

Good housekeeping helps keep bugs away, especially in the kitchen where food crumbs can accumulate. Empty trash cans regularly, and vacuum weekly. Don't forget to clean your kitchen-sink and bathtub drains; drain flies will live in there and fly out to look for food. Use a drain cleaner on a regular basis to keep these pests from becoming a problem. Avoid stacks of magazines, newspapers, and boxes—cockroaches love to hang out in them.

Keep the Outside Free of Debris

Firewood stacks, compost bins, and yard waste are good hiding places for bugs that might move indoors. Make sure these places are away from the house. Before you bring in firewood, check it for bugs hitching a free ride. Remove areas of standing water in your yard which can be breeding areas for mosquitoes. Keep landscape beds free of weeds and plant debris which can harbor insect pests and keep plant branches pruned away from the foundation of your house.
Manatees at the Zoo

Manatees are back in Manatee Springs at the Cincinnati Zoo! Three young manatees arrived in Cincinnati early this morning and can be seen by guests starting this Sunday, March 28, 2021. The orphaned males will be rehabilitated until they are ready to return to their native Florida waters. Cincinnati Zoo has been participating in the U.S. Fish & Wildlife Service’s Manatee Rescue and Rehabilitation Partnership for the past two decades and has cared for 23 manatees, including the newest residents, Alby, Manhattan & SwimShady!

Manatees don’t live naturally in Cincinnati, Ohio. The Zoo provides a place for scientists to monitor and help threatened and endangered animals. The manatee is a threatened species.

Human-related impacts such as boat/ barge collisions, loss of habitat, pollution and ingestion of fishhooks and lines threaten the continued existence of the manatee here in the United States.

Manatees are most frequently sighted in Georgia waters from April through October in the waters of Camden, Glynn and McIntosh counties, during which time wildlife biologists with the Nongame-Endangered Wildlife Program monitor their activities.
What is a Weed?  

Why are some plants called weeds? What is it about that plant that people don’t want it to grow in their yards or gardens?

A weed is a wild plant growing where it is not wanted and in competition with cultivated (someone planted it there) plants.

1. What does it mean that it is in competition with other plants?

It is a plant that is growing in the wrong place.

2. Why are weeds harmful to an ecosystem such as a yard, farm, or garden?
Weeding out the Facts

Weeds cause problems to gardens, yards, and pastures. What is a weed and why is it a problem?

- Weeds are plants that are using the resources of sunlight, water, or air and blocking those resources for other plants.
- We have found information about kudzu.
- Kudzu grows over trees, bushes, and other plants so that they can't get sunlight or air to grow.
- Let's find out more about common weeds in Georgia.

Some common Georgia weeds include

- Crabgrass
- Sand burs
- Ragweed
- Plantain
- Dandelion
- Stinging nettle
- Clover
- Jimsonweed
- Morning glory
- Chickweed

Caution: Poisonous Plants

Leaves of three; let it be! Do not get near poison ivy, poison sumac, Virginia creeper, poison oak. They are common poisonous plants that when touched, causes an allergic reaction that results in an itchy rash.

Pulling Weeds

- Always get an adult to point out unwanted plants.
- Protect your hands by wearing gloves if you have some.
- Wash your hands after weeding.
- Be sure you pull up weeds by their roots, and don't just yank out the leaves. They can re-grow if even small pieces of their roots remain. Sometimes you have to dig up the roots.
Make a Food Web Game

Use this game board or make one of your own. Write scenarios of what eats what on the game board so that you show your understanding of how energy travels in a food chain and food web. Rules to play the game could include the use of dice, taking turns, spinners, and/or game cards.

For Example: Card 1: The eagle caught a field mouse and gained lots of energy. Move ahead 2 spaces.

OR

Card 1: What is the beginning of all energy in a food chain or food web? (Sun is the answer.) Move ahead 2 spaces if you give a good answer.
Garden Habitat Tips

To keep your yard and garden ecosystem healthy remember what keeps an ecosystem in balance. When you add or take away something, the ecosystem changes. Observe how your actions make a difference and take steps to make healthy choices.

- Remove debris and ask an adult for help.
- **Plants that Repel Pests:** Gardeners have long held that some plants are repugnant to certain pests. Lots of pests find their way to favorite crops through their sense of smell. Herbs often exude strong fragrances (from their essential oils) that are believed to repel insects or confound them by disguising the smell of neighboring plants. These aromatic plants include tansy, mint, basil, thyme, and santolina. Gardeners often tuck garlic and onion plants between other vegetables for the same purpose. Some uses:
  - onions for carrot rust flies.
  - tansy for Colorado potato beetles.
  - marigolds and basil for flea beetles on eggplant.
  - marigolds for Mexican bean beetles.
  - nasturtiums for squash bugs.
  - marigolds, mint, or thyme for cabbage moths.
- Plant native flowering plants, weed and water as needed
  - Pay attention to light needs and place them in full sun or shade as directed.
  - Give them space to grow. Do not overcrowd the plants.
  - Break up the soil so that it is not compacted and hard.
  - Pay attention to how much water the plants need. Don’t over water or allow them to dry out.
- Provide a small container of clean water during hot dry months of the year
  - Keep it fresh by replacing the water each week so it won’t be a place for mosquitoes and other insect pests to lay eggs.
- Planting a wide range of nectar and host plants is the best strategy for attracting the largest number of butterfly species. Butterflies may be attracted to the garden by a large patch of bright flowers, but they will linger longer if there are also areas that provide shelter, water, sun and a diverse group of plants that imitate the way plants grow in the wild.
- Attract birds by providing seeds and grains during winter months
  - Do not put these near the foundation of your home. Rodents and insects also like these foods.
- If you can’t grow the plants, consider providing nectar for butterflies, hummingbirds and honeybees in a feeder:
  - 1 part water and 4 parts sugar
Assessment Ideas for S4L1 a- d

Multiple choice

1. Look at the partial wetland food web.

Which statement correctly describes the transfer of energy in a food chain in this wetland?
A. Energy is transferred from fox to squirrel to plants
B. Energy is transferred from plants to squirrel to fox
C. Energy is transferred from plants to mouse to frog to rabbit
D. Energy is transferred from snake to frog to grasshopper to plants

2. Look at the partial food web in #1. How many types of organisms in this food web obtain energy directly from producers?
   a. Two
   b. Three
   c. Four
   d. Five

3. The table lists the characteristics of four types of animals.

<table>
<thead>
<tr>
<th>Type of Animal</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muskrat</td>
<td>Small mammal; body that is about 32 cm long; long, scaly tail; back feet that are partially webbed</td>
</tr>
<tr>
<td>Mallard</td>
<td>Migratory bird; flat, webbed feet; males and females have different colored feathers</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mink</td>
<td>Small mammal; about 62 cm long; thick fur; eats small mammals, birds, and fish</td>
</tr>
<tr>
<td>Western Grebe</td>
<td>Migratory bird; black and white feathers; hunts by diving and spearing fish</td>
</tr>
</tbody>
</table>

What features do the ecosystems in which these animals live most likely have in common?

a. Dry, rocky mountains  
b. Forests of pine trees  
c. Tall, spiny cacti  
d. Lakes and rivers

4. Monarch butterflies use the milkweed plant as a host for the eggs and caterpillars. It is their only food. What happens if milkweed becomes scarce?
   a. Caterpillars will eat other plants.  
   b. Butterflies will find other milkweed plants somewhere else.  
   c. The monarch butterflies will not survive.

5. Which list below best shows how energy moves in a food chain?
   a. Grass → Cows → Humans → Sun  
   b. Sun → Grass → Cows → Humans  
   c. Humans → Cows → Grass → Sun  
   d. Cows → Grass → Sun → Humans

6. If the green plants died, would foxes survive?
   a. Yes, foxes do not eat green plants.  
   b. Yes, foxes would still eat other animals.  
   c. No, the animals that foxes eat need to eat green plants.  
   d. All of the above

7. A food chain is shown below.

   Sun → Plants → Mice → Snakes → Hawks

   Which population would most likely decrease if the number of mice greatly increased?

   a. Plants  
   b. Mice  
   c. Snakes  
   d. Hawks

8. Organisms that absorb nutrients from dead plants and animals are called

   a. Producers  
   b. Consumers  
   c. Decomposers
9. What is the role of a producer in a food chain?
   a. Preys on animals
   b. Eats decayed animals
   c. Makes food
   d. Eats plants

10. According to the food web, which would most likely happen if the weather caused the grass to grow well?

```
   raccoon → mountain lion
   mouse → deer → mountain lion
   grass
```

   a. The number of raccoons would decrease.
   b. All of the animals would have plenty of food to eat.
   c. Only the mountain lion population would increase.
   d. None of the animals would have enough to eat.

11. A strip of land is cleared of trees and bushes to make a space for a power line. What impact might this have on the birds living in the area?
   a. The natural enemies of birds will be eliminated.
   b. Weather conditions may change.
   c. The rate of erosion will decrease.
   d. There will be less food and shelter.

12. Which human activity is responsible for endangering the greatest number of land animal species?
   a. Hunting for food and for sport
   b. Destruction of habitats
   c. Accidental starting of forest fires
   d. Cutting wildflowers in national parks

13. Bison are large grazing animals. They travel across a prairie eating grass. If there were too many bison in an area, there would probably be
   a. Less grass and more bare soil.
b. Many other large grazing animals.
c. Tall shrubs and many trees.
d. Fewer predators of bison.

14. If an environment is missing food, water, or protection, what might happen to the organisms living there?
   a. Nothing will happen.
   b. Some may become extinct.
   c. They will have more young.
   d. Plant will grow larger.

**Other items that are not multiple choice:**

1. Tell whether each living thing below is a Producer, Consumer, or Decomposer.
   - Apple Tree
   - Mushroom
   - Milkweed
   - Mountain Lion
   - Rose bush
   - Snake
   - Hawk
   - Carrot
   - Bamboo
   - Bacteria
   - Panda
   - Kudzu

2. Sketch an ecosystem and label the organisms as producers, consumers, or decomposers.
3. Finish a diagram of a food web in a pond. The food web shows what eats what in the pond system. Draw arrows from each living thing to the things that eat it.
Performance Assessment Ideas

1. Plot a square meter outside and record the living and nonliving things that are found there. Keep a tally chart of the population information. (For example, estimate the number of ants in an ant colony instead of trying to count all of the ants or estimate instead of counting all of the blades of grass.) Pictures will help document.
   a. Sort populations by roles: producers, consumers, decomposers.
   b. Make a poster of a food chain or web in your plot.
   c. Make a presentation of your findings: brochure, multimedia, or booklet.
   d. Share your information.

2. Research a region and the organisms that live there. Create a visual food chain or food web showing the interrelationships of organisms in the selected ecosystem.
   a. Choose one major producer, consumer, or decomposer in the ecosystem and organize their food chain or web so that it shows how this organism is connected to other organisms.
   b. Imagine how the selected organism has suddenly disappeared from the ecosystem.
      i. How might the other organisms be affected?
      ii. Can the food chain/web continue without this organism? Explain.
      iii. How would you describe the relationships among the organisms in food chains and food webs?
   c. Present a visual, written, oral, or multimedia presentation to present to others.

Sample Rubric

<table>
<thead>
<tr>
<th></th>
<th>1 Poor</th>
<th>2 Fair</th>
<th>3 Good</th>
<th>4 Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td>Refused/did not join in task</td>
<td>Watched others work on task</td>
<td>Worked on task part of the time</td>
<td>Stayed on task until completion</td>
</tr>
<tr>
<td>Cooperation</td>
<td>Would not share with or listen to others (caused a disturbance)</td>
<td>Did not participate in discussions</td>
<td>Shared/listened part of the time</td>
<td>Listened and shared with others</td>
</tr>
<tr>
<td>Science knowledge</td>
<td>Did not show any concept of understanding</td>
<td>Tried but did not show correct understanding</td>
<td>Showed partial understanding of concept</td>
<td>Demonstrated an understanding of the concept</td>
</tr>
<tr>
<td>Science language</td>
<td>Did not use any science vocabulary</td>
<td>Used vocabulary incorrectly</td>
<td>Used some of the vocabulary correctly</td>
<td>Demonstrated an understanding of the vocabulary</td>
</tr>
<tr>
<td>Productivity</td>
<td>Did not accomplish goal</td>
<td>Barely accomplished task</td>
<td>Just did what was required</td>
<td>Was highly productive</td>
</tr>
<tr>
<td>Effective Use of Time</td>
<td>Time without purpose</td>
<td>Got off track frequently</td>
<td>Did well once ideas were clear</td>
<td>No wasted effort—stayed on target</td>
</tr>
</tbody>
</table>