

AP<sup>®</sup> Biology

# IMPACT OF INVASIVE SPECIES

Student Workbook



AP<sup>®</sup> with WE Service



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# Getting to Know the Topic

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## Impact of Invasive Species: Globally

When species live in their natural habitats, there is a natural balance that puts reasonable limits on all species within that habitat, such as predators or climate. When relocated out of those habitats, however, these limitations may no longer exist and species may thrive in a way that is detrimental to their new environment. For example, in its natural habitat, the European rabbit has predators and a controlled mating season due to the colder climate. When introduced to Australia, however, the combination of having no predators and the year-round warm climate allowed these rabbits to multiply to such great numbers that they have wiped out vegetation that is part of their diet, as well as the diet of other animals. Therefore, they are an invasive species to Australia.

## Fast Facts

- ▶ About 42% of endangered species are at risk because of invasive species.
- ▶ Invasive species threaten human health and devastate ecosystems, which costs an estimated \$1.4 trillion dollars on the world economy each year.
- ▶ The introduction of even one invasive animal, bacteria, fungi or plant is enough to devastatingly disrupt the balance of an entire ecosystem.

## Taking Action Globally

The best way to take action on the global spread of invasive species is prevention. As many of the invasive species introduced across the globe were caused by human spread, the more we learn and spread awareness about the human spread of invasive species, the more we can help. Here's how you can take action:

- ▶ Conduct research or work with global organizations to learn how humans spread invasive species and how you can help prevent the spread.
- ▶ Hold a fundraiser and contribute funds to a global invasive species organization.
- ▶ Create a social media campaign to spread awareness to others about the importance of preventing the global spread of invasive species.

# Getting to Know the Topic

## Impact of Invasive Species: Locally

Invasive species can be found across the country. From decorative plants that thrive too well in warm climates, to released pets with big appetites and few predators, many of the country's invasive species have been spread unintentionally by humans in the past decades and even centuries. While the spread may have been unintentional, these invasive species are causing damage to our ecosystems. Learning from our past mistakes in transporting and releasing invasive species can help prevent unintentional human spread of invasive species in the future.

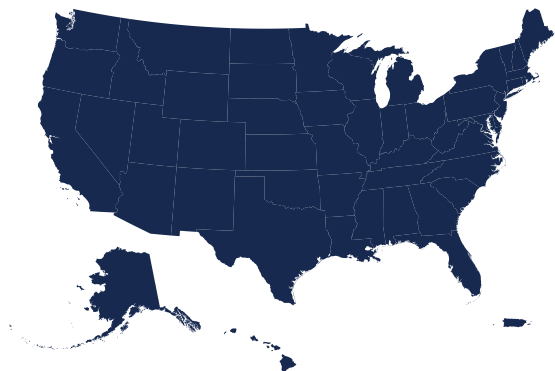
## Fast Facts

- ▶ One of the most infamous invasive species in the United States is the zebra mussel. Traveling on the bottoms of boats, the zebra mussel clogs pipes and invades the beaches of the Great Lakes.
- ▶ The Burmese python faces disease, parasites and predators in its native Asia, however these threats do not exist in the Florida Everglades. The Burmese python preys on many animals, even alligators, causing a declining native species populations of the Everglades.
- ▶ The kudzu vine is native to Asia, where it is fed on by insects and wiped out during the cold winter months. When introduced to the year-round warmth of the southern United States, however, it grew out of control and became known as the plant that ate the south.

## Taking Action Locally

You can help take action against the local spread of invasive species through gaining knowledge of what invasive species are living in your area. Some ways you can act are:

- ▶ Work with local organizations to request guest speakers to educate your peers about invasive species in your area.
- ▶ Organize an event to remove identified invasive plants in your area and replace with native plants.
- ▶ Create an awareness campaign informing the public of ways to prevent the local spread of invasive species.



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**An estimated 5,000 non-native plant species have been introduced, established and exist in US ecosystems.**

# Lesson 1-3 Worksheets

## Investigate and Learn:

### Impact of Invasive Species

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## Lesson 1: Activity 3

### Food Web Activity

#### Guiding Questions

What is a native species? How can native species be affected by the introduction of invasive species?

#### Real World Application

Invasive species can have a variety of impacts on native species in any given area. One major impact is food availability. In this activity, students will create “before and after” food webs depicting the impact of increased competition with invasive species for food resources.

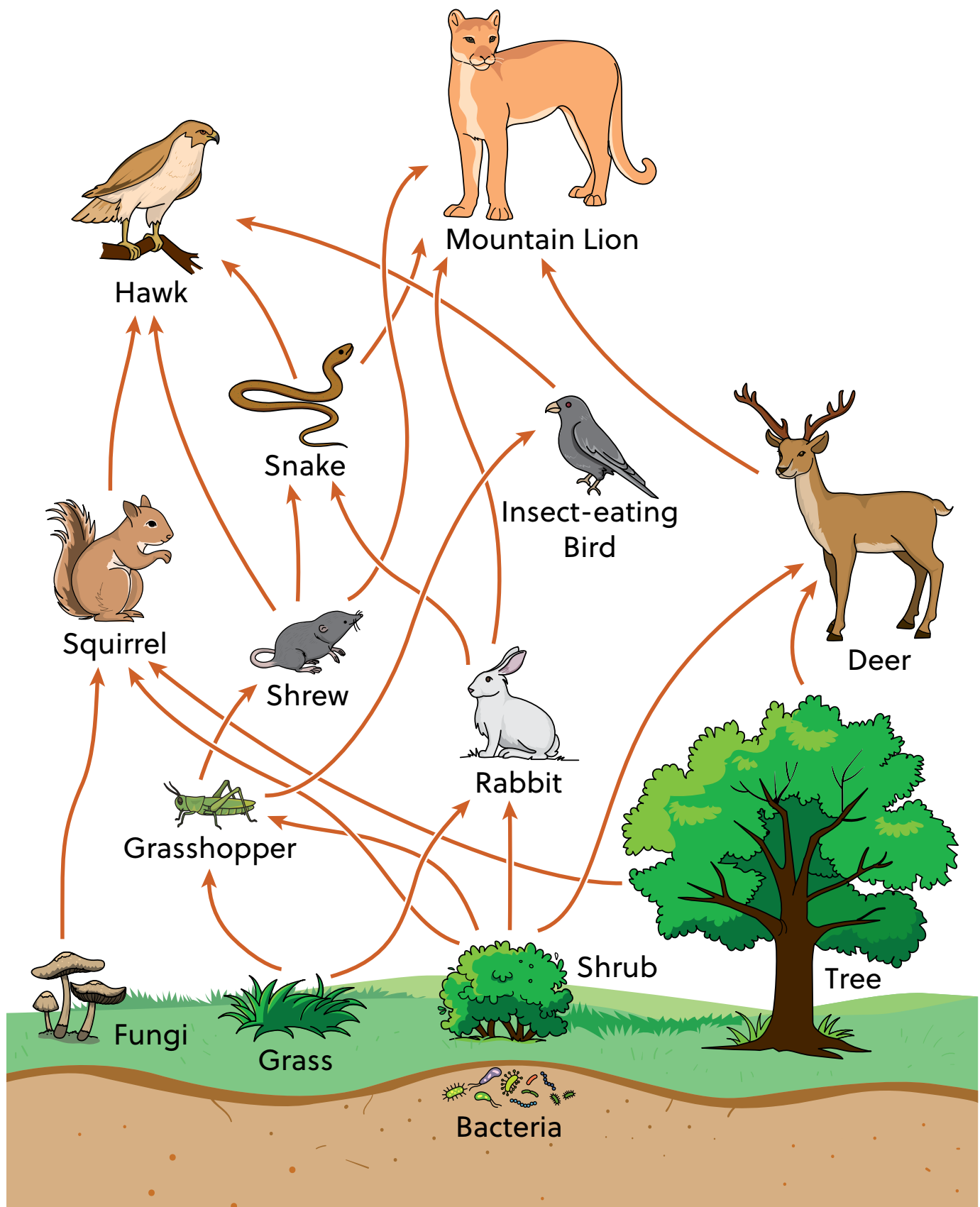
Please refer to the food webs provided on pages 8-11 in this module.

Your next steps are as follows:

- ▶ Research and find local or regional food webs that are relevant to your area.
- ▶ Next, find an invasive species that is impacting the depicted ecosystem.
- ▶ Draw an updated food web based several years after an invasive species was introduced into the ecosystem.

\*Students may also cut out the elements in the food web and manipulate them to show how relationships change after an invasive species is introduced.

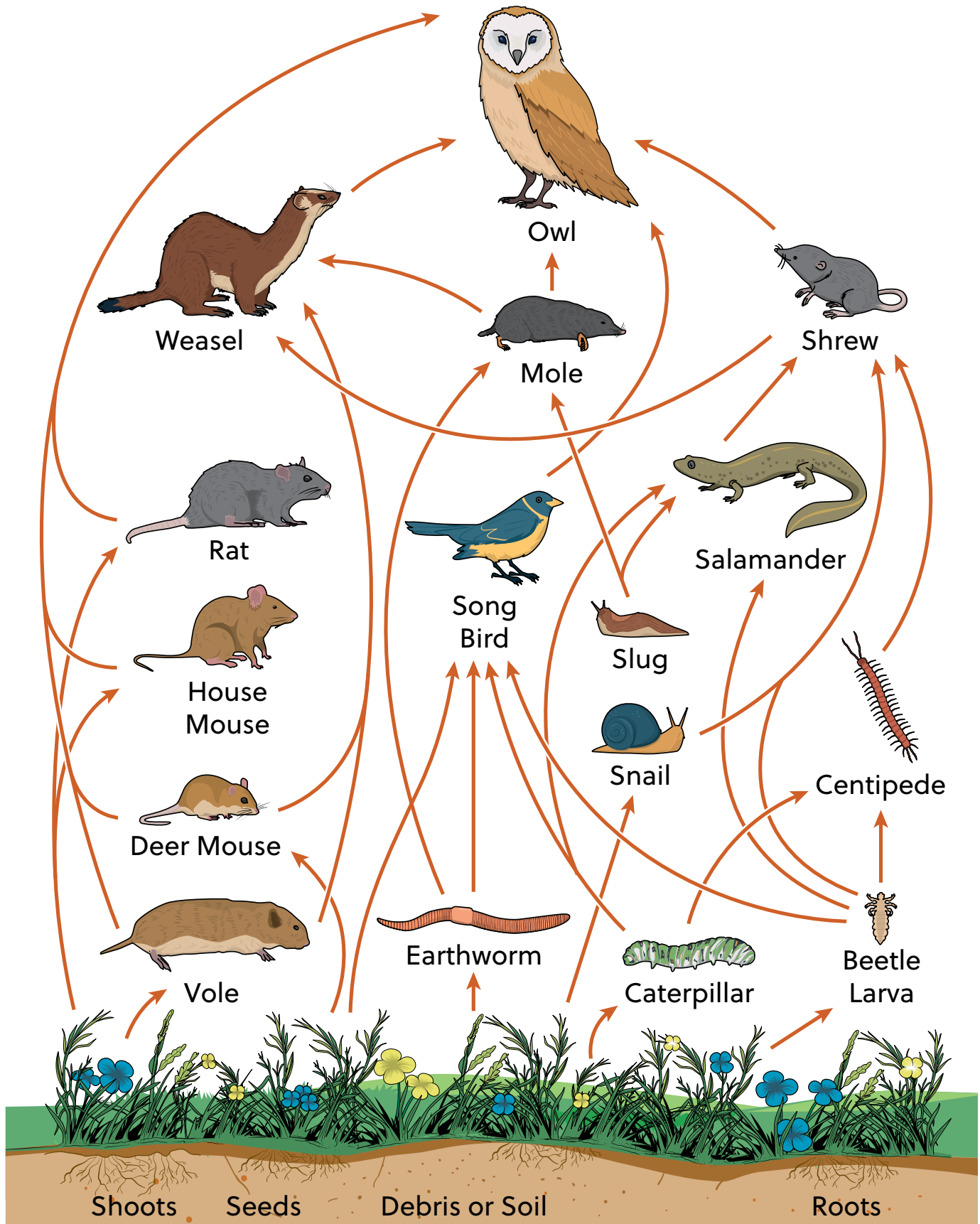
# Food Web Example - Handout 1



Note: Figure not drawn to scale.

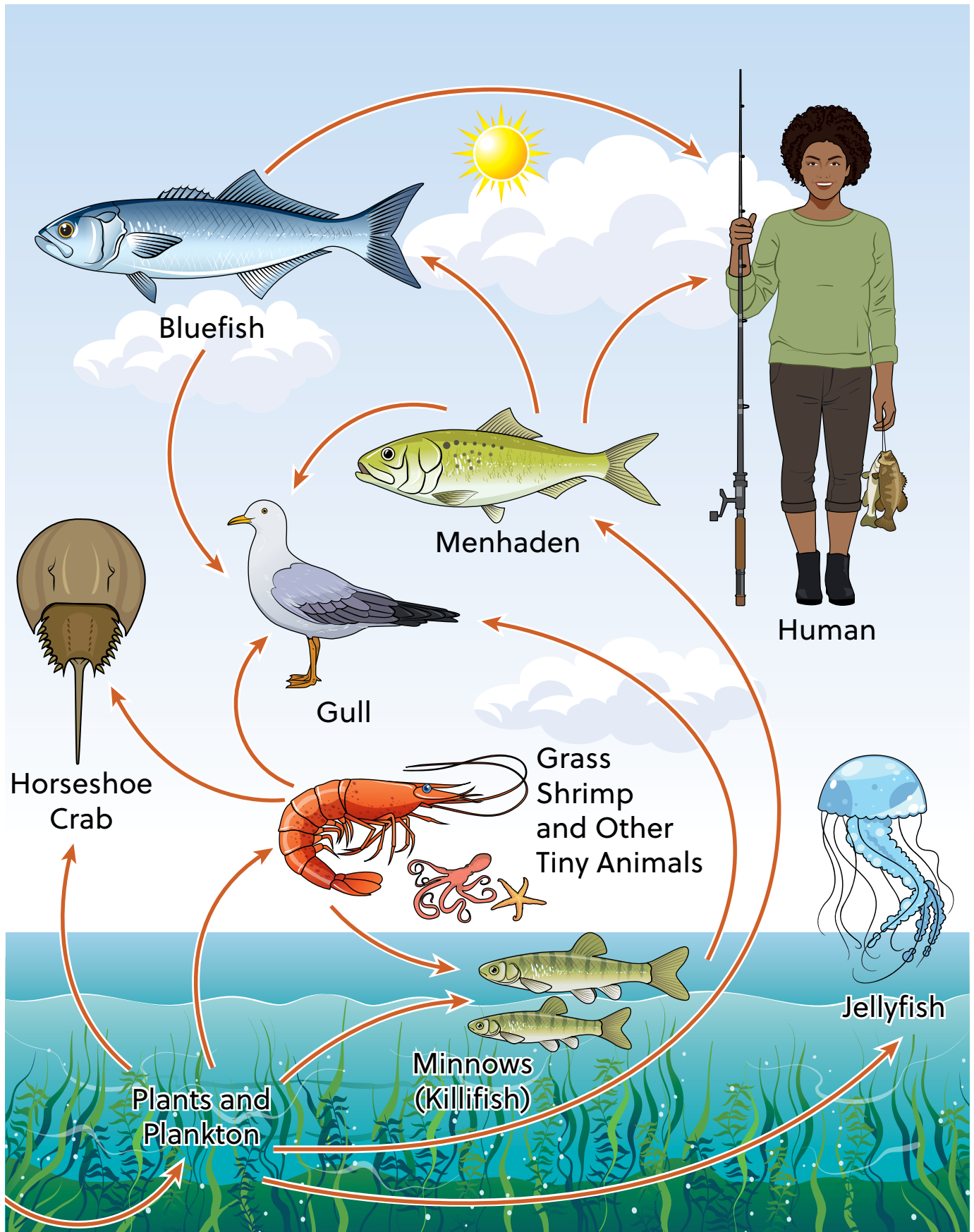


Food Web Example - Handout 2



Note: Figure not drawn to scale.

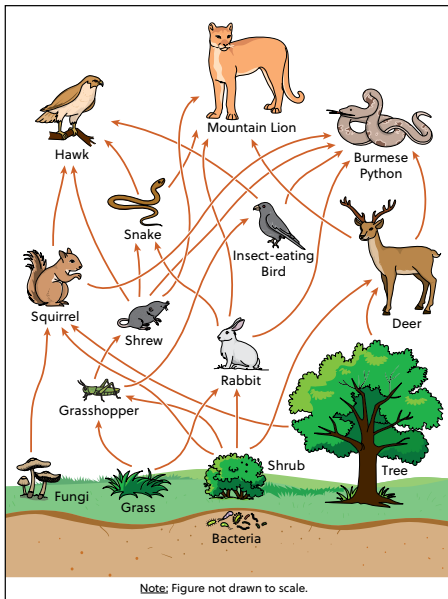
Food Web Example - Handout 3



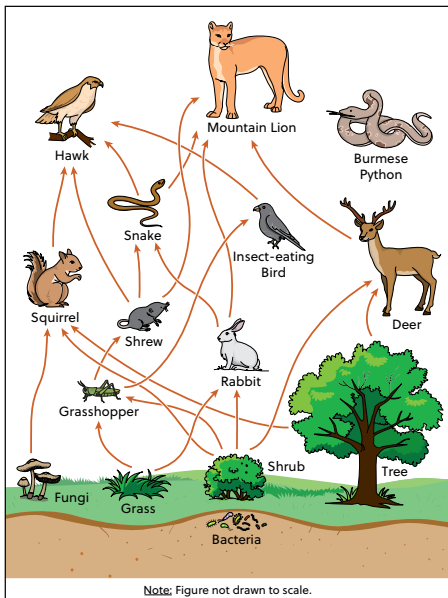
Note: Figure not drawn to scale.

# Food Web Example - Student Sample

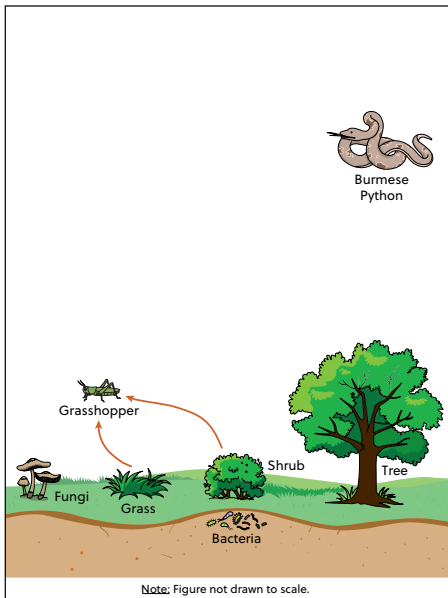
Original Food Web:



Introduction of the Burmese python:



After several years of Burmese python invasion:





NAME: \_\_\_\_\_

TEAM MEMBERS: \_\_\_\_\_

## Problem Tree

In your Problem Tree graphic organizer, start by writing the problem in the trunk of the tree, and then look at the causes and effects of an issue. Keep digging to go deeper on the issue to find its supporting and root causes.

### Leaves/branches: Effects

These are the results created by the problem. At first, this part of the issue appears easy to tackle, but when leaves and branches are trimmed, they grow back quickly. Consider the multi-layered effects, or “effects of effects,” that can arise when a problem goes unaddressed. Always ask: “Then what happens?”

Ex. Decline of native species population

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### Trunk: Problem

This is the key issue that is being studied. Because it is not as apparent as the leaves, the core problem itself sometimes takes a little longer to identify.

Ex. Introduction of Burmese python

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### Roots: Causes

These are the situations or factors that have led to the problem. When exploring the root causes of a problem, ask yourself “Why does this problem exist?” Dig deeper to consider the “causes of causes”—the multiple layers of factors that contribute to a problem.

Ex. Destruction of python breeding facility that release snakes into nearby swamps

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## Policy Brief Template

### POLICY BRIEF TEMPLATE (NO MORE THAN 4 PAGES)

#### Preparation

- Identify audience
- Decide on messaging approach
- Identify the strengths and weaknesses of your argument

#### Executive Summary

- Write one to two sentences in overview of the issue that will encourage your audience to continue reading

#### Introduction

- Why is the topic important? Why should people care?
- What are the goals of your research?

#### Approach and Results

- Summarize your facts into useful context
- Reduce details to relevant information
- Provide concrete examples that illustrate the impact of the issue

#### Conclusion

- Restate facts in conclusive ways
- Make all statements concrete

#### Implications and Recommendations

- What should happen next?
- Be clear and factual
- Make recommendations plausible and possible

## Policy Brief Template (Student Example)

### POLICY BRIEF TEMPLATE COUNTY FUNDED EDUCATION CAMPAIGN TO STOP THE SPREAD OF YELLOW TOADFLAX

#### Preparation

- Township County Commissioners
- Presentation at County Commissioner's Meeting
- Strengths of argument
- Loss of income to farmers
  - Loss of pasture lands
  - Reducing ecosystem biodiversity
- Weaknesses of argument
  - Cost
  - Lack of public concern

#### Executive Summary

- Yellow toadflax is an invasive plant native to Europe and Asia. Brought to the US because of its ornamental plant quality, it quickly became invasive in cultivated areas of the Midwest. Now, it is outcompeting crops and other native vegetation.

#### Introduction

- Without healthy pasture lands, farmers cannot have space to feed and house livestock. Invasion of the yellow toadflax is causing soil erosion and surface runoff. It is also aiding in the spread of cucumber mosaic virus.
- The goal of this presentation is to inform the City Commission about yellow toadflax in hopes they will fund a campaign to encourage prevention of spread of this plant.

#### Approach and Results

- In the words of the Idaho State Department of Agriculture: Know What You Grow.

#### Conclusion

- Yellow toadflax is an invasive species in our community and invading our farms.
- Learn to identify yellow toadflax and remove it when possible.

#### Implications and Recommendations

- If successful, a budget will be obtained to create and distribute a digital and paper version of a flyer that can be distributed throughout the community to inform citizens about the effects of yellow toadflax on our town.



NAME: \_\_\_\_\_

TEAM MEMBERS: \_\_\_\_\_

## Needs Assessment

The following series of questions helps you to analyze and identify ongoing areas of need within organizations addressing your issue.

1. Identify 3-5 organizations working on issues related to the issue your team is working on.

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2. What does each organization do well in response to the issue and/or related issues?

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3. What could each organization do better in its response?

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4. What areas of need related to access to your issue have you learned about that each organization is NOT addressing?

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5. Considering all 3-5 organizations, what are the ongoing needs that are not being adequately addressed?

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6. Considering all 3-5 organizations, what are the ongoing needs that are being addressed successfully, and to which you can add further efforts to support the issue?

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NAME: \_\_\_\_\_

TEAM MEMBERS: \_\_\_\_\_

## Solution Tree

In your Solution Tree graphic organizer, start by rewriting the problem from your Problem Tree, and reframing it as a goal at the trunk of the tree. Then consider the different solutions (the roots) and possible outcomes of the solutions (the branches).

### Leaves/branches: Outcomes

These are the results created by the solution. Results may appear as straightforward as having achieved goals, but when you consider the ripple effects and outcomes of sustainable results, the impact is far-reaching and long-lasting. Always ask: "Then what happens?"

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### Trunk: Problem

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### Trunk: Goal

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### Roots: Solutions

These are the actions needed to solve the problem and achieve the goal stated at the center of the Solution Tree. When exploring solutions, ask yourself "How will this solve the problem?" Dig deeper to think holistically, so that you are looking beyond the short-term and addressing not only the symptoms of the problem but the root causes as well.

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NAME: \_\_\_\_\_

TEAM MEMBERS: \_\_\_\_\_

## Reflect: Investigate and Learn

Now that you have investigated problems and potential solutions associated with the impact of invasive species, think back over what you've learned: How can what you are learning in your AP<sup>®</sup> Biology class support solutions that reduce the impact of invasive species locally and globally?

Record your thoughts on the lines below. If you run out of room on this page, use additional paper to write a lengthier response. As you write, think about the questions on the previous page to help shape your reflection.

- ▶ What are the social impacts related to invasive species, locally and globally?
- ▶ As you investigated existing programs addressing the impacts of invasive species, what did you feel these programs do well, and what did you feel they could do better?
- ▶ Who should be responsible for addressing invasive species, locally and globally?
- ▶ Based on what you learned about invasive species, and the actions that others are already taking, what are five areas of need that you could address?

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# Approaches to Taking Action Information Sheet

(1 of 1)

## DIRECT SERVICE

<b>WHAT IS IT?</b>	Personally engaging with and providing hands-on service to those in need (usually in conjunction with an organization).	
<b>EXAMPLE GOAL</b>	By the end of the semester, we will support a local food bank and shelter by packing and serving food to people in the community. We will also visit our neighboring elementary school and teach a lesson on food insecurity in our community.	
<b>ACTIONS</b>	<ul style="list-style-type: none"> <li>Reach out to local shelters and food banks to arrange a day for the class to visit and provide hands-on support</li> <li>Once a date has been decided, make sure students all have permission to travel to the food bank (if during school hours)</li> </ul>	<ul style="list-style-type: none"> <li>Connect with teachers/administration at local elementary school and arrange to visit a classroom to teach a lesson to young students on food insecurity</li> <li>Create and print worksheets to use with younger students</li> </ul>

## INDIRECT SERVICE

<b>WHAT IS IT?</b>	Channeling resources to the needs of a community—locally, nationally or internationally.	
<b>EXAMPLE GOAL</b>	By the end of the year, we will create a storage and donation system for local families in need, where they can access furniture and other household items. We will develop a system for donations, pick-ups and inventory.	
<b>ACTIONS</b>	<ul style="list-style-type: none"> <li>Conduct research into which items are most needed by community members (e.g., bed frames, dining tables, household goods, etc.)</li> <li>Reach out to local businesses to try to get a storage space donated</li> <li>Connect with school social workers/administration to gain their support</li> <li>Put up flyers around school and in the community, asking for donations (list specific items needed), including instructions on how/where to donate</li> </ul>	<ul style="list-style-type: none"> <li>Develop an online database for tracking donations and pick-ups and maintaining inventory</li> <li>Share pick-up information with local shelters, churches, community centers, etc.</li> <li>Share the donation system with school social workers, so that they can maintain the project in future years</li> </ul>

## ADVOCACY

<b>WHAT IS IT?</b>	Educating others about an issue to increase visibility and following up with an action that focuses on enacting change. Actions around advocacy often look like raising awareness, but without a strong call to action within the initiative as a whole. Educating others is not considered service in and of itself.	
<b>EXAMPLE GOAL</b>	Through an informative art piece, we will educate our school community about the waste created by single-use plastic water bottles, and the impact they have on the environment. Then, we will sell reusable water bottles at school, and the proceeds from the sale will go toward clean water projects in developing countries.	
<b>ACTIONS</b>	<ul style="list-style-type: none"> <li>Research the impact of single-use plastic water bottles around the school and in the local community</li> <li>Plan out and create a 3D sculpture that incorporates informative text on the issue of single-use plastics</li> <li>Seek permission from school administration to display the piece in a common area of the school</li> </ul>	<ul style="list-style-type: none"> <li>Design and order water bottles to sell at school</li> <li>Research and select an international organization that focuses on clean water projects</li> <li>Organize a selling schedule for the water bottles, donate profits</li> </ul>



NAME: \_\_\_\_\_

TEAM MEMBERS: \_\_\_\_\_

## Creating the Action Plan

This outline serves as a basic template for your action plan. Use additional space and resources to help you build out each part with the right amount of detail and flow to ensure you have the strongest action plan that you and your team can implement with ease. Remember, this is your road map for your service project!

### TEAM GOAL:

### MEASURES OF SUCCESS:

### Required Network and Resources

In order to complete this goal, our team will need to develop the following network and access the following resources:

#### NETWORK:

#### RESOURCES:

### ROLES AND RESPONSIBILITIES

Each team member will take on the following roles and associated responsibilities:

### TIMELINE

Our team will use the following timeline to complete tasks and successfully carry out the action to meet our goal(s):



NAME: \_\_\_\_\_

TEAM MEMBERS: \_\_\_\_\_

## Five Action Planning Pitfalls Tip Sheet

(1 OF 1)

Once your team has completed the major components of your action plan (creating your teams and setting goals, timeline and network), review the five action planning pitfalls provided below to ensure these have been avoided. Review your plans—individually first, then together as a team. After the review, rework your action plans, if necessary.

### 1. Setting an unclear goal

The first and most important part of any action plan is defining the goal, or what you want to achieve. It should be clear and easy to understand. For example, “We want to collect 500 cans of food,” or “We want 200 people to learn about WE Villages.” If the goal is not clearly defined, proper planning will be difficult if not impossible. As a best practice, have a peer from another team review your goal to ensure it is as clear as you hope.

### 2. Planning unrealistic actions

After the goal is set, begin planning the actions necessary to achieve it. It is important that the steps make sense and are achievable. Do not plan unrealistic actions, such as working at times that will interfere with schoolwork, overestimating how many people can help out, or planning to go to places that would be difficult for you to reach. Consider each team member’s school and community schedule, such as work and extracurricular activities. Before planning an action, ask yourself, “Is this action realistic?”

### 3. Rushing the process

Do not be too hasty in planning actions. While you may be excited to start, proper planning takes time. The better the planning and organization, the more

success you will achieve. Even if it means slowing down to figure out details, do not rush and leave out important steps.

### 4. Not asking for help

Do not be afraid to ask for help. When a network is created, bigger goals can be achieved faster. Reach out to friends, parents and mentors. People generally enjoy helping, especially if it is for a worthy cause.

### 5. Not learning from mistakes and giving up too quickly

We all make mistakes—it is normal and healthy. Mistakes allow us the opportunity to learn and grow. So, learn from the mistakes. Ask, “Why did this happen?” and “How can I avoid this problem next time?” Actively think about the mistakes and how it will be better the second time around. If something does not go as planned, do not stop!



NAME: \_\_\_\_\_

TEAM MEMBERS: \_\_\_\_\_

## Reflect: Action Plan

Your team now has a plan for taking action globally and locally. Think back over what you have learned: What problems associated with invasive species does your team's action plan address? How does your individual role in the plan support your team's action?

Record your thoughts on the lines below. If you run out of room on this page, use additional paper to write a lengthier response. As you write, think about the questions on the previous page to help shape your reflection.

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NAME: \_\_\_\_\_

TEAM MEMBERS: \_\_\_\_\_

## Student Log Sheet

DATE / TIME SPENT	ACTIVITY, DESCRIPTION AND REFLECTION	VERIFIED BY (NAME, ORGANIZATION)

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