



## USU 4-H Invasive Weeds Tote



### **BIG IDEA:**

An ecosystem is defined by its components and their interactions.

### **UNDERSTANDINGS:**

Small changes in components of an ecosystem can have large effects. Invasive species are often catalysts for these changes.

### **ESSENTIAL QUESTIONS:**

Why is it important to maintain balance in an ecosystem?

How can awareness of invasive species help enable people to work to maintain a balanced ecosystem?

### **THREE DIMENSIONS, UTAH SCIENCE STANDARDS, AND INTENDED LEARNING OUTCOMES:**

See pg. 13-17

### **Supplies**

- Paper\*
- Pencils\*

### **Invasive Weed Walk** p. 2

- Invasive Weed Booklets
- Invasive Weed Replicas
- Crayons\*

### **It's an Invasion!** p. 4

- Copies of the Native and Invasive Species Cards (found in activity outline)

### **Part of the Food Web** p. 9

- Paper and Pencil\*
- Markers, crayons, or colored pencils (optional)\*
- White board or poster board (optional)\*
- Yarn\*
- 3" by 5" cards (various colors are helpful)\*

\*Not included in tote



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**Activity 1: Invasive Weed Walk**

Time: 30 min

Grade Level: 3-12

Materials:

- Invasive Weed Booklets
- Invasive Weed Replicas
- Crayons
- Paper and Pencil

**To Do:**

1. Distribute Invasive Weed Booklets to students or teams of students.
2. As a class, discuss what invasive species are.
3. Split the class into a team for each invasive plant represented in the tote. Have each group learn about what characteristics of their plant make it a problem. Give each group their invasive weed replica. Students may use the information found in the weed booklets or research their plant more thoroughly on the internet or in book.
4. Have each group present their findings about their weed.
5. Take the students outside to do a field study. If possible, find an area that has one or some of the invasive species the students learned about. Alternatively, select a location with various types of vegetation and weeds. Let the students use the invasive weed booklets.
6. Have students record the types of plants they find in the area you have selected. Have students record where they found it, the type of soil, the landscape, if it is exposed to the sun, how many, and any other information they can find through observation. Have students take leaf rubbings of the plants they find using a crayon.
7. Ask students to show in groups or in front of the class all that they learned through their field study.

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**REFLECT:**

- What are some characteristics that make an invasive weed a problem?
- How does a field study help people learn about and take care of invasive plants?
- Did anyone find invasive weeds? Was it easy to identify them?
- What can people do to prevent the spread of invasive species? What are some ways as individuals we can keep invasive weeds from spreading?



## Invasive Weed Walk Continued

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### **APPLY:**

Invasive plants are good at adapting to new environments and often overpower native species. They have traits that help them thrive. Long roots, plant size, the number of seeds and seed dispersal are among some of the characteristics that enable invasive plants to survive so well. Through field studies, people can observe if there is healthy diversity of plants in the area, if the native species are doing well, or if there is an invasive plant that appears to be taking over. Learning how to identify which plants are introduced and invasive is important to being prepared to act early to prevent their spread and eradicate them in order to preserve a natural and diverse environment.

Invasive species often threaten native species because they do not have natural predators to keep their population in check. Some invasive plants pose fire dangers, some block waterways or make it difficult for people and animals to access waterfronts.

Controlling invasive plants, either through control or total removal takes a lot of time and money. Removing all invasive weeds by hand or spraying them with chemicals is difficult and expensive. However, if individuals work to do their own small part to prevent the spread of invasive plants the overall benefit can be huge. Some things that can be done include removing seeds from your clothes and pets, removing mud and seeds from vehicles, avoiding travel through areas with invasive weeds (people traffic and animal traffic), leaving plants where they are found, and reporting any sighting of invasive weeds to local land managers , rangers, etc.



## It's an Invasion!

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### Activity 2: It's an Invasion!

(From Michigan State University Extension "It's an Invasion")

Time: 30 min.

Grade Level: 4-12

Materials:

- Copies of the Native and Invasive Species Cards (found below)

#### To Do:

1. Ask students what invasive weeds are. Let them share their thoughts and knowledge. Invasive weeds are non-native, aggressive plants that do not have natural predators.
2. Before class, make two copies of the Native and Invasive Species Cards and cut them out. Keep the Native Species in one pile and the Invasive Species in a separate pile.
3. Introduce the game "It's an Invasion."
  - Each student will be given a card of a native species of plant. Someone else has a matching native species card.
  - Without showing their card, have students spread around the playing area.
  - Have students move around the room to look for their partner. No talking! Students may show their card. When they have found their partner, sit down.
  - One person has secretly been given an invasive species card, not a native species card. Anyone that encounters the invasive species while looking for their partner must sit down without finding their partner.
  - Once everyone has been invaded or has found their partner the game is over.
4. If desired, reshuffle and deal out the cards to play again. You may want to add additional invasive species and see how the game is affected.
5. After playing, gather students together to tell about the plant they represented and to reflect on the game.

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#### REFLECT:

- Do you think it was easier to be a player with a Native Species Card or an Invasive Species Card? Why?
- What do you think would happen if there were more players with Invasive Species Cards in the game?
- What happens when real native species are crowded out of their habitat by invasive species?
- Can you name one species we haven't talked about that has invaded Utah or the Western United States and what affect its presence has had on its new habitat?



## It's an Invasion! Continued

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- What can we do to prevent the spread of invasive species?

**APPLY:**

Invasive species do not have predators in their new environment so their population can go unchecked. Because of this, invasive species are more troublesome than weeds. Invasive species are a problem because they can crowd out native species, can cause fire problems, crowd out plants that are food sources, or are sometimes dangerous or poisonous. Invasive species are generally introduced by humans. This may be done on accident, as ornamental plants, or for another reason. As invasive weeds spread it increases its ability to spread even more.



**Native and Invasive Species**

<p>Columbine are flowers native to the Rocky Mountain region. These beautiful flowers live at elevations of 6,000 to 10,000 feet.</p> <p><b>Native Specie: Columbine</b></p>	<p>Sagebrush bushes are an important part of many Utah environments. It provides food and shelter as well as helps protect the ground from erosion.</p> <p><b>Native Specie: Sagebrush</b></p>
<p>Indian Paintbrush lives in both mountain and desert habitats. It is not a favorite plant for animals to eat.</p> <p><b>Native Specie: Indian Paintbrush</b></p>	<p>Evening Primrose grows in well drained rocky and sandy soils. They are not generally eaten by grazing animals.</p> <p><b>Native Specie: Evening Primrose</b></p>
<p>Lupine live across many elevations from valley floors to high mountain elevations. Deer and Elk eat them. Lupine is toxic, especially the seeds.</p> <p><b>Native Specie: Lupine</b></p>	<p>Scarlet Gilia is drought resistant and loves sunlight. Hummingbirds and hawk moths like to feed on the nectar of these flowers. People have used the plant for tea and medicine.</p> <p><b>Native Specie: Scarlet Gilia</b></p>



**Native and Invasive Species Continued**

<p>The Sego Lily tends to live in valleys and moderate elevation among sagebrush and junipers. Rodents will store and eat the bulbs.</p> <p><b>Native Specie: Sego Lily</b></p>	<p>Aspens live in climates that have cold winters and cool summers. Aspen groves are often all from the same root system that can survive for thousands of years. Many animals use Aspens for food or for shelter.</p> <p><b>Native Specie: Aspen</b></p>
<p>Pinyon Pine trees live throughout southern, central, and eastern Utah. They are an important source of food and shelter for other desert dwellers.</p> <p><b>Native Specie: Pinyon Pine</b></p>	<p>The Blue Spruce lives in higher elevation forests of Utah. Along with providing shelter and food for animals, they are often used as Christmas trees.</p> <p><b>Native Specie: Blue Spruce</b></p>
<p>Big Tooth Maples generally live in canyon bottoms and moist areas in central and northern Utah. It provides food and shelter for many types of animals.</p> <p><b>Native Specie: Big Tooth Maple</b></p>	<p><b>Invasive Specie: Garlic Mustard</b></p> <p>Garlic mustard is an invasive weed that grows faster than its neighbors, preventing them from getting the light that they need. Native animals tend not to eat this plant and eat native species instead, enabling the garlic mustard to even more effectively crowd out its neighbors.</p>



**Native and Invasive Species**

<p style="text-align: center;"><b>Invasive Specie: Leafy Spurge</b></p> <p>Leafy spurge is an extremely aggressive plant. It takes over native plant environments by using up the water and shading neighboring plants from the sun. It reproduces both by its many seeds and through its roots.</p>	<p style="text-align: center;"><b>Invasive Specie: Perennial Pepperweed</b></p> <p>Perennial pepperweed, also known as tall whitetop or perennial peppergrass, is found in the western and central United States. It harms pastures and leaves woody debris that negatively affects nesting and food resources.</p>
<p style="text-align: center;"><b>Invasive Specie: Saltcedar</b></p> <p>Saltcedar dominates areas around water, competing with native plants for resources. It extracts salt from the soil which could alter the soil chemistry.</p>	<p style="text-align: center;"><b>Invasive Specie: Spotted Knapweed</b></p> <p>This plant is a danger to plants around it by taking up water faster than its neighbors and spreading lots of seeds. Additionally, it is not as tasty to native animals as other plants.</p>
<p style="text-align: center;"><b>Invasive Specie: Yellow Starthistle</b></p> <p>Yellow Starthistle was introduced to California in the mid-19<sup>th</sup> century and has since spread across most of the U.S.A. It negatively impacts field crops, grazing, and natural habitats and ecosystems.</p>	<p style="text-align: center;"><b>Invasive Specie: Dalmatian Toadflax</b></p> <p>Dalmation Toadflax is a fast growing invasive weed that negatively affects grasslands and other environments where it grows.</p>



## Part of the Food Web

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### Activity 3: Part of the Food Web

(Adapted from “Aliens in the Web” by Mark Goddard)

Time: 30+ min

Grade Level: 4-12

Materials:

- Paper and Pencil
- Markers, crayons, or colored pencils (optional)
- White board or poster board (optional)
- Yarn
- 3” by 5” cards (various colors are helpful)

#### To Do:

1. Begin by having students create a food chain either on individual papers, as groups or as a class using poster board or a white board. Make sure that students understand that all life depends upon the sun for energy and requires water. An example of a food chain could be the sun to pine tree to pine seed to squirrel to great horned owl.
2. Talk about producers and consumers.
3. Before class, fill out, or have students fill out in class, 3”x5” cards with resources. (An example list is included at the end of this activity plan). You may want to color coordinate the cards based on whether it is a Producer or Consumer. Be sure that there are enough cards for each student in the class. Be sure to include the sun and water along with various producers and consumers. Create some introduced resources (or invasive species) to use in the game later.
4. Ask students to raise their hand if they depend on the sun for energy (all students should raise their hand). Ask who depends on water (again, everyone needs water). Have the sun begin with the yarn. Have students toss the yarn to other students that rely directly on them for nourishment until everyone is connected in the web. You may need to pass the yarn to some students multiple times (particularly the sun and water) in order to fit everyone into the web. Let students use their knowledge and creativity to solve problems of who depends on whom and to fit everyone in the food chain.
  - \*There is lots of room for creativity and variation in this activity. You could have multiple balls of yarn going out from the sun and limit the length of yarn that leaves the water or producers indicating its limitations. You can include soil and decomposers. Let students come up with variations that incorporate things they have learned or observed.



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## Part of the Food Web Continued

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5. Have students step apart from each other to make the web taut. Introduce some new species that will affect a specific resource by giving a student an “introduced species” card. Have students who are connected to that resource raise their hand to visualize how many animals and resources are affected by the presence of the introduced resource. Feel free to let students come up with introduced species and analyze what the effects of those resources are. If desired, trade or rewrite cards.

Variation: Instead of students raising their hands if they are affected by the invasive species, have them drop their yarn. Have everyone whose yarn went slack consider how they would be affected by the disappearance of that resource and what further affects could happen.

6. If desired, trade or rewrite cards and create a new web
7. Discuss what students learned and observed. Have students write, or draw about their experience with the food web activity.

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### REFLECT:

- What abiotic resources are important besides the sun?
- Decomposers are also an important part of the food web. Why are decomposers important?
- What were there some connections you did not initially think of? Why were those connections surprising?
- There are many ways resources affect one another that you may not have initially thought of. What if an introduced bug kills certain trees that serve as a windbreak? What if cows introduced overgraze an area? What if people kill all of a bothersome insect that is a certain bird’s primary source of food?
- How was the food web you created an accurate representation of an ecosystem? How was it inaccurate?

### APPLY:

Ecosystems are extremely dynamic. Not only do living plants and animals affect each other, abiotic resources like water, soil, and wind play important roles in how particular ecosystems function and parts of the ecosystem (particularly humans) can make a difference on what abiotic resources are available. As resources travel up the food chain, decomposers break down plants and animal resources, returning nutrients into the environment. People often think of the things around us as resources that are separate and independent of each other when in reality everything is tied together. By introducing or removing species, unintended



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## Part of the Food Web

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chain reactions can occur. It is difficult to make a perfectly accurate model of an ecosystem but working to create models helps to bring understanding and awareness.

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### Optional Producers and Consumers List:

Sun

Water

#### Producers:

Big Bluestem (grass)

Indiangrass

Purple Threeawn (grass)

Spike Bentgrass

Idaho Fescue (grass)

Sego Lily

Spruce Tree

Sagebrush

Cattails

Scrub Oak

Aspen Trees

Juniper Tree

Cottonwood Tree

#### Consumers:

Mosquito

Grasshopper

Lizard

Swallow

Mouse

Owl

Squirrel

Jack Rabbit

Mule Deer

Black Bear

Cougar



## Other Activities

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### Other Activities

- Call up your local county extension office or forest service to arrange to assist in eradication efforts
- Research about and plant some native plant species
- Design a way to clean clothes/shoes, animals, or farm equipment from weeds and seeds

## Contents of Invasive Weed Tote

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### Contents of Invasive Weed Tote

- Invasive Weed Replica
- 10 Invasive Weed Booklets
- 1 Poster



## Three Dimensions, Utah Science Standards, and Intended Learning Outcomes

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**Note:** These applications of National and State Science Standards are not comprehensive. They are meant to serve as suggestions. While only standards for elementary levels have been listed, standards for more advanced grade levels can also be applied. Additionally, this tote is an excellent tool to facilitate inquiry for any age group.

### THREE DIMENSIONS

#### **K-LS1-1. Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment** (Activity 1: Invasive Weed Walk, Activity 2: It's an Invasion!, Activity 3: Part of the Food Web)

**Use observations to describe patterns of what plants and animals (including humans) need to survive.**

##### **Science and Engineering Practices:**

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.
- Scientists look for patterns and order when making observations about the world.

##### **Disciplinary Core Ideas:**

- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.

##### **Crosscutting Concepts:**

- Patterns in the natural and human designed world can be observed and used as evidence.

#### **K-ESS3-1. Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment** (Activity 2: It's an Invasion!, Activity 3: Part of the Food Web)

**Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.**

##### **Science and Engineering Practices:**

- Use a model to represent relationships in the natural world.

##### **Disciplinary Core Ideas:**

- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

##### **Crosscutting Concepts:**

- Systems in the natural and designed world have parts that work together.

#### **K-ESS3-3. Interdependent Relationships in Ecosystems: Animals, Plants, and Their**



**Environment** (Activity 1: Invasive Weed Walk, Activity 2: It's an Invasion!)

**Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.**

**Science and Engineering Practices:**

- Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.

**Disciplinary Core Ideas:**

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

**Crosscutting Concepts:**

- Events have causes that generate observable patterns.

**2-LS4-1. Interdependent Relationships in Ecosystems** (Activity 1: Invasive Weed Walk, Activity 3: Part of the Food Web)

**Make observations of plants and animals to compare the diversity of life in different habitats.**

**Science and Engineering Practices:**

- Make observations (firsthand or from media) to collect data which can be used to make comparisons.
- Scientists look for patterns and order when making observations about the world

**Disciplinary Core Ideas:**

- There are many different kinds of living things in any area, and they exist in different places on land and in water.

**3-LS4-3. Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms** (Activity 1: Invasive Weed Walk, Activity 3: Part of the Food Web)

**Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.**

**Science and Engineering Practices:**

- Construct an argument with evidence.

**Disciplinary Core Ideas:**

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

**Crosscutting Concepts:**

- Cause and effect relationships are routinely identified and used to explain change.



### **3-LS4-4. Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms** (Activity 1: Invasive Weed Walk, Activity 2: It's an Invasion!, Activity 3: Part of the Food Web)

**Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.**

#### **Science and Engineering Practices:**

- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

#### **Disciplinary Core Ideas:**

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations yet others move into the transformed environment, and some die.
- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

#### **Crosscutting Concepts:**

- A system can be described in terms of its components and their interactions.
- Knowledge of relevant scientific concepts and research finding is important in engineering.

### **4-LS1-1. Structure, Function, and Information Processing** (Activity 1: Invasive Weed Walk, Activity 2: It's an Invasion!, Activity 3: Part of the Food Web)

**Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.**

#### **Science and Engineering Practices:**

- Construct an argument with evidence, data, and/or a model

#### **Disciplinary Core Ideas:**

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

#### **Crosscutting Concepts:**

- A system can be described in terms of its components and their interactions.

### **5-PS3-1. Matter and Energy in Organisms and Ecosystems** (Activity 3: Part of the Food Web)

**Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.**

#### **Science and Engineering Practices:**

- Use models to describe phenomena.

#### **Disciplinary Core Ideas:**

- The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).



- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.

**Crosscutting Concepts:**

- Energy can be transferred in various ways and between objects.

**5-LS1-1. Matter and Energy in Organisms and Ecosystems** (Activity 1: Invasive Weed Walk, Activity 2: It's an Invasion!, Activity 3: Part of the Food Web)

**Support an argument that plants get the materials they need for growth chiefly from air and water.**

**Science and Engineering Practices:**

- Support an argument with evidence, data, or a model.

**Disciplinary Core Ideas:**

- Plants acquire their material for growth chiefly from air and water.

**Crosscutting Concepts:**

- A system can be described in terms of its components and their interactions.

**5-LS2-1. Matter and Energy in Organisms and Ecosystems** (Activity 3: Part of the Food Web)

**Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.**

**Science and Engineering Practices:**

- Develop a model to describe phenomena.
- Science explanations describe the mechanisms for natural events.

**Disciplinary Core Ideas:**

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.
- Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.

**Crosscutting Concepts:**

- A system can be described in terms of its components and their interactions.



## UTAH SCIENCE STANDARDS

### K-Grade 2

**Standard 1** (Activity 1: Invasive Weed Walk, Activity 2: It's an Invasion!, Activity 3: Part of the Food Web):

- The Processes of Science, Communication of Science, and the Nature of Science. Students will be able to apply scientific processes, communicate scientific ideas effectively, and understand the nature of science.

**Standard 4** (Activity 1: Invasive Weed Walk, Activity 2: It's an Invasion!, Activity 3: Part of the Food Web):

- Life Science. Students will gain an understanding of Life Science through the study of changes in organisms over time and the nature of living things.

### Grade 3

**Standard 2** (Activity 1: Invasive Weed Walk, Activity 2: It's an Invasion!, Activity 3: Part of the Food Web)

- Students will understand that organisms depend on living and nonliving things within their environment.

**Standard 5** (Activity 3: Part of the Food Web):

- Students will understand that the sun is the main source of heat and light for things living on Earth. They will also understand that the motion of rubbing objects together may produce heat.

### Grade 4

**Standard 5** (Activity 1: Invasive Weed Walk, Activity 2: It's an Invasion!, Activity 3: Part of the Food Web)

- Students will understand the physical characteristics of Utah's wetlands, forests, and deserts and identify common organisms for each environment.

## INTENDED LEARNING OUTCOMES (ILO'S):

1. Use science process and thinking skills.
2. Manifest science interests and attitudes.
3. Understand important science concepts and principles.
4. Communicate effectively using science language and reasoning.
5. Demonstrate awareness of the social and historical aspects of science.
6. Understand the nature of science.