Lesson Three: Food Web Frenzy

Grade Level: 5th Grade

Time: 2 Days: Day 1 - 45 minutes; Day 2 - 30 minutes (If you have a 75-minute block of time, it would be better to do all the lesson in one day.)

Essential Question: How can we be stewards of Wyoming's agriculture to benefit current and future generations?

Objectives: Students will:

- Learn about food webs and how to model them.
- Create a model of a food web.
- Use their knowledge of food web interactions to make a stewardship decision for a drought scenario.

Purpose: Students learn that, when one part of a food web changes, it impacts other parts of the web. Students learn that stewardship decisions impact the different components of food webs in different ways.

Required Materials/Resources:

- Picture-based Food Web (one to display)
- Hay Meadow Ecosystem Cards (one set per pair)
- Envelopes/plastic bags (one per group to hold the Ecosystem cards)
- Using the Scenarios document (one for the teacher)
- Scenario 1 card (one per student) - (Source 1)
- Student Recording Sheet - Scenario 1 (one copy per student). *You may want to copy all 4 recording sheets and make a book instead of having individual sheets.*

TEACHER NOTE: Required resources will be used again in Lesson 4.

Suggested Teacher Preparation:

- Review the Using the Scenarios document to familiarize yourself with the protocol for facilitating the work with scenarios throughout the unit.
- Prepare Hay Meadow Ecosystem Cards and arrows for each group.

Standards:

Science: 5-LS2-1, 5-ESS3-1 (Explicit), 3-5-ETS1-2 (DCI, SEP) - (Practiced/Encountered)

ELA: 5.W.8 (Practiced/Encountered)

Vocabulary:

- **Consumer** - those organisms within an environment that are nutritionally dependent upon other organisms or their products
- **Decomposer** - organism that breaks down dead organic material
- **Drought** - a period of below average precipitation resulting in shortages of water supply and/or soil moisture and could result in shortage of grass/forage
- **Food chain** - what-eats-what in an ecological community, typically a graphic representation
- **Food web** - the natural interconnection of food chains and generally a graphical representation (usually an image) of what-eats-what in an ecological community
- **Model** - a simplified representation of a system that can explain and help make predictions regarding a phenomenon
- **Producer** - organism on the food chain that can produce its own energy and nutrients

Instructional Procedure/Steps:

<u>Day 1: Overview of food webs</u>

1. Begin by reviewing definitions of system and ecosystem from previous lesson.

2. Say: **"Today, we will be looking at another science concept that will help inform our stewardship decisions. We will be discussing food webs. Our food webs will be webs of an agricultural ecosystem. What do you know about food webs?"** Have students share and provide some examples. Discuss how a food web is a type of system. Be sure students understand the difference between a food **web** and a food **chain**. Show students the picture-based Food Web pointing out that it is not an agricultural ecosystem but can serve to help the class better understand how food webs work. It's not necessary to spend lots of time examining the example, but it is beneficial to make sure students understand the gist of the model before moving on.

3. Next, students will create a model of an agricultural food web. If students have not had much experience with modeling prior to this lesson, explain that a model is a simplified representation of a system that can explain and help make predictions regarding a phenomenon. Refer again to the example Food Web model. Put students into pairs and pass out the Hay Meadow Ecosystem Cards and arrows. Say: **"Today, we're going create a model to help us visualize food webs. A model helps scientists and engineers to quickly represent ideas."**

4. In pairs, have students build a food web using components from the ecosystem (food web cards and arrows) that they have been given. Say: **"This is the criteria for your food webs:**
    - **The food webs should include arrows to show the directionality of the relationships. In a food web, the arrow should go from food source to consumer.**
    - **The food webs should show connections between multiple organisms."**

In this task, students will be engaged in the higher order thinking skill of application.

TEACHER NOTE: It is a disciplinary convention that the arrows point from the food source to the consumer. Therefore, it is important to attend to this, so students develop an understanding of this convention.

5. When pairs have finished their models, have them discuss/identify which organisms are producers, consumers, decomposers, herbivores, carnivores, and omnivores. Award a game point to any students who were actively engaged in creating their web and participated in the discussion in a thoughtful manner.

6. Say: **"We made a food web of an agricultural ecosystem. Now, we're going to look back at the example food web from the beginning of the lesson. Remember the elements in the first web will be different than the ones we included in our hay meadow model."** Draw students' attention to the picture-based food web. Say: **"We are going to study how changes in one part of the food web impact other parts of the web."** Circle the meadowlark on the web, and say: **"This season, there has been a sickness that has been killing large numbers of the meadowlark. They've been nearly wiped out from this particular area. Our model will help us make some predictions about what the effects of that will be. Let's think about the impacts on the food web of the meadowlark disappearing."** Have students share some of the likely effects. Draw their attention to the directionality of the arrows and how that can help in the process of making predictions. *Responses should include the following: an increase in the grasshopper population, less grain being eaten, and a loss of a major diet source for the fox.*

7. Students will practice using the model as a way to predict or conceptualize effects by a student removing one card from their hay meadow food web. Their partner will then need to explain the effects on the food web if that component was threatened or removed from the system.

8. As an assessment/check for understanding, listen to each pair as they are working on step 7, and check for accurate mapping of the effects of a given component on the larger food web. Ensure that all of the students are approximating appropriate cause/effect relationships among the components of the web. If students are struggling to identify those relationships, provide scaffolding before moving onto part two. Award a point to

all students/pairs who are successfully naming effects on the food web. Each student can earn one point.

Day 2: Stewardship Scenario 1 - Drought

1. Say: **"Now, we will be moving on to a problem-solving scenario involving a food web. This will be the first of your challenge scenarios where you will be applying your science knowledge and your problem-solving skills in order to earn points to move forward on the Master Stewards Board Game."** Follow the Using the Scenarios document to facilitate this work. This protocol should be used for each of the 4 scenarios students will explore.

2. After students finish completing their Scenario 1 recording sheets, review the sheets, and award students/pairs points based on the criteria below. Allow students to move their game piece at the end of the lesson.

   Scenario 1 - Drought:
   - **1 point -** Student accurately responds to: **How does your choice change the ecosystem described in the scenario positively?**
   - **1 point -** Student accurately responds to: **How does your choice change the ecosystem described in the scenario negatively?**
   - **1 point -** Student accurately responds to: **How does it show good stewardship of the agricultural resources?**

In this task, students will be engaged in the higher order thinking skill of evaluation by solving, judging, and recommending outcomes of agriculture-related scenarios.

Assessment: See Day 1: Step 8 and Day 2: Step 2.

Credits/Sources:

1. University of Wyoming, Department of Plant Science, Dr. Andrew Kniss.