Fish-in' the Food Web

Zoology Master: Fish

ZOOLOGY MASTER

Appropriate Ages 8-12

Expected Time: 45 min

This activity satisfies one of the required JNMN lessons needed to complete the Junior Zoology Master Badge.

Learning Objectives:
Students will be able to identify the different trophic levels as well as construct an aquatic food web using Nebraska organisms.

Students will understand the transfer of energy through an ecosystem.

NE Science Standards:
Grades 3,5,6
SC.5.8.2.A
SC.5.8.2.C

Did You Know...
Humans play an important role as the top predator in most aquatic food webs. It is our responsibility to ensure that our state's fisheries are healthy and sustainable through monitoring and conservation.

Nebraska is home to more than 100 species of fish!

BEFORE YOU TEACH

BACKGROUND KNOWLEDGE

Every organism on earth needs energy to survive. Organisms within an ecosystem depend on each other food as energy. The simplest of these links is referred to as a food chain. Food chains are a linear network of at least three organisms, starting from producer organisms and ending at consumer, illustrating how organisms are related to each other by the food they eat. Within an ecosystem, there are many food chains, which combined, create a food web.

MATERIALS AND PREP JNMN PROVIDED:

- #25 Aquatic Organism Necklaces
- Ball of Yarn
- Freshwater Food Web Worksheet
- Freshwater Food Web Answer Sheet
- Crappie and Fisherman ID Necklaces
- Small Cups
- Medium Cups
- 2 Buckets

NOT PROVIDED:

- Paper
- Scissors

Engage: 5 Minutes

To begin this lesson, have students identify plants and animals they can expect to find in a lake or river. On a whiteboard or posterboard, space out the organisms identified so they cover the entire board. Once the class has 15-20 organisms listed, ask the class if of the animals would eat another organism listed. If so, connect the two with a line or arrow. Ask students if they are familiar with the term's food chain and food web? Are they the same?

VOCABULARY

Trophic Level: The different levels in a food chain: producers and consumers.

Producer: Organisms that can produce their own food using the sun, water, and carbon dioxide.

Primary Consumer: Makes up the 2nd trophic level. Herbivorous organisms that consume producers.

Secondary Consumer: Makes up the 3rd trophic level. Carnivorous or omnivorous organisms that can consume both primary consumers and producers.

Tertiary Consumer: Makes up the 4th trophic level. Carnivorous organism that primarily consume secondary consumers.

Food Chain: The transfer of food energy from one organism to another as each consumes a lower member and in turn, is preyed upon by a higher member.

Food Web: An interlocking pattern of food chains.

Carrying Capacity: The maximum population size of a species an environment can support.

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Explore: 10 Minutes

The class will now construct an aquatic food web based off the organism necklace they are assigned. Pass out a necklace to each student and have the class create a circle so that each student is shoulder to shoulder. While assigning an organism, instruct the class to read a brief overview of their organism on the back of their necklace. Place the ball of yarn in the middle of the circle and ask the class where energy comes from? Energy comes from the sun, a burning ball over 94 million miles away! The student representing the sun will grab the yarn and return to the circle. Next, ask the class what organisms get their energy directly from the sun? Introduce the term producer. Producers are organisms that can produce its own food from inorganic sources such as sunlight, water, and carbon dioxide. There will be more than one organism that is a producer, select the student who identified themselves first as a producer and extend the yarn string to make a line connecting the sun to the producer. Next, have students ask if their organism would consume the selected chosen producer from the last round. Introduce the terms primary, secondary, and tertiary consumers. Repeat until you reach top of the food chain, each time connecting the yarn to the chain. Start over but keep the yarn connections from the previous rounds to make a food web, a collection of many food chains. Have the class select new examples of producers and consumers until everyone has had an opportunity to participate (there might be some organisms that are chosen more than once to make that happen).

Explain: 5 Minutes

After every organism has entered the food web, have the class lightly tug on their section of yarn. This represents the interconnectivity of the food web. Reinforce the message by selecting a student to drop their section of string, representing an organism that is no longer present in the ecosystem. Instruct students to also drop their yard on the floor if their organism is directly connected in the food web. Eventually, all the yarn should be laying loose on the floor. This represents the interconnectivity of the food web and how population loss and extinctions often negatively impact an entire ecosystem. Following, roll up the yarn and collect the organism necklaces.

Extend: 15 Minutes

Build upon the food web concept by illustrating carrying capacity and energy transfer in ecosystems by playing 'Fish Food Tag'. Instructions provided on pg. 4.

Evaluate: 10 Minutes

Distribute the Freshwater Food Web worksheet to the group. Using the background information on the back of the worksheet, students will try to create a complete food web utilizing all the organisms featured. Display the answer sheet, showing the true interconnectivity of the ecosystem.

Hands On Extension

In the Classroom:
Trout in the Classroom - Nebraska Game and ParksNebraska Game and Parks | outdoornebraska.gov Adopt a fish tank, and watch trout eggs begin their lifecycle.

OR

FiNS_tale-of-a-scale_04222016.pdf outdoornebraska.gov

OR

Research lead poisoning in both Nebraska's waterfowl and raptors as it relates to fishing, and what we as fishermen can do to eradicate it. To coordinate a speaker to present on the subject or to arrange a viewing of an educational video provided by Audubon Society of Omaha, contact your JNMN Coordinator

In the Field:
Aquariums and Fish Hatcheries are a great place to teach kids about fish where they can observe their behavior. Visit your local aquarium or hatchery to learn about freshwater fish, saltwater fish, and more! Each offers different programs and species so be sure to find one that fits your students and learning goals!

In the Community:
Have a clean up day at your local lake or pond! Pollution can be harmful to any ecosystem and we can do our part by heading out into the habitat and picking up fishing line, trash and litter left behind by other visitors. Visit a nearby public land with a water source and get started!

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IN THE LAB:
Focusing on plants and animals of the Platte River Basin, students test their food web knowledge by trying to complete the 4 challenges.
http://projects.plattebasintimelapse.com/prp_a/food_chain.html?game=food_chain_02

***COMPLETING ANY ACTIVITY FROM THIS SECTION WILL COUNT AS YOUR SECOND ACTIVITY REQUIREMENT FOR THE ZOOLOGY MASTER BADGE.**

RESEARCH AND RESOURCES

https://www.noaa.gov/education/resource-collections/marine-life/aquatic-food-webs

https://education.nationalgeographic.org/resource/food-web

https://www.sheppardsoftware.com/science/animals/games/food-chain/

Fish Food Tag

FISH FOOD TAG – Instructions:

Students will learn about the carrying capacity and energy transfer in ecosystems.

1) Split the class into three groups. These groups will not be uniform in size.
a. Zooplankton: 75% of the class - Primary Consumer
b. Crappie: 20% of class – Secondary Consumer
c. Fishermen: 1 student (2 if the group size exceeds 40)– Tertiary Consumer

2) Pass out small cups to the zooplankton, large cups to the crappie, and small bucket to the fisherman. For the crappie and fishermen groups, also hand out the associated necklaces to help identify them during the game. If you do not have the provided necklaces, a piece of colored scrap cloth or colored tape can be used in its place.

3) Define the playing area. The game is best played using half a basketball court for boundaries but could also be played outside (40'x40') or even in a classroom by moving desks to the corners of the room.

4) Disperse 200 poker chips around the playing area. The chips will represent energy during the game. To avoid collisions, instruct all groups that they may not run during any portion of the game (you will likely need to reiterate this between each round).

5) Give the Zooplankton group 1 minute to pick up as much algae (chips), as they can by placing them in their cup, representing their body. When 1 minute is up, have the zooplanktons sit down and count how much algae is in their cup.

6) Have students share how much algae they were able to collect. Due to varying class sizes and motiva tion to collect the chips, the amount collected can vary greatly. Make note of how many chips each student collected. You will need to decide on a number that allows roughly 75% of the zooplankton to survive. Inform the class of that number, any zooplankton that collected that or more survive, those that did not, unfortunately have died due to lack of food resources and will have to leave the playing area. This would be a good time to introduce the term, carrying capacity- the maximum population size of a species an environment can support.

7) Have the surviving zooplankton remain in the playing area. Instruct the crappie that their goal is to tag all the zooplankton. Allow the crappie to "hunt" the phytoplankton, transferring the eaten phyto plankton's chips into the crappie cups when they are tagged. The zooplankton will continue to collect the remaining chips while avoiding being tagged. When there are only 1 or 2 zooplankton remaining, stop play and have the crappie group sit down and count their chips.

8) Like the last groups, take note of how many chips each crappie collected and select a number that would allow for 75% of the crappie to remain alive. The crappie that perished have again succumbed to the limitations of what the habitat can support and must leave the playing area.

9) Lastly, have the fishermen join the playing area. Instruct the crappie to avoid the fishermen, if they are caught, they will empty the contents of their "stomach" (cup) into the fishermen's bucket. Stop the game when only 1 crappie remains.

10) Have the fisherman place all their chips in a pile. As energy moves up a food chain, on average, only 10% of the energy is stored and passed on to the next trophic level. Most of the energy is lost as waste, heat, breathing, movement, offspring, etc. During this activity, we have moved through three trophic levels, primary to tertiary consumer, so that means only 1% of the initial total energy remains for top predators. Therefore, there is rarely more than 5 trophic levels in a food chain.

Largemouth Bass

Background: One of the most popular sport fish due to their appetite and fight. Bass have a torpedo-shaped body with upper jaw extending beyond rear margin of eye and dorsal fin almost divided. The side of the fish has a broad, continuous stripe. It is an important predator, especially in small waters, and thrives in warm, moderately clear waters having little or no current.

Diet: Secondary Consumer. Young primarily feed on small crustaceans, insects, and small fish; whereas, adults primarily feed on fish, crayfish, and large insects, along with almost any other animal that swims or falls into the water.

Size: 18"

FRESHWATER FOOD WEB

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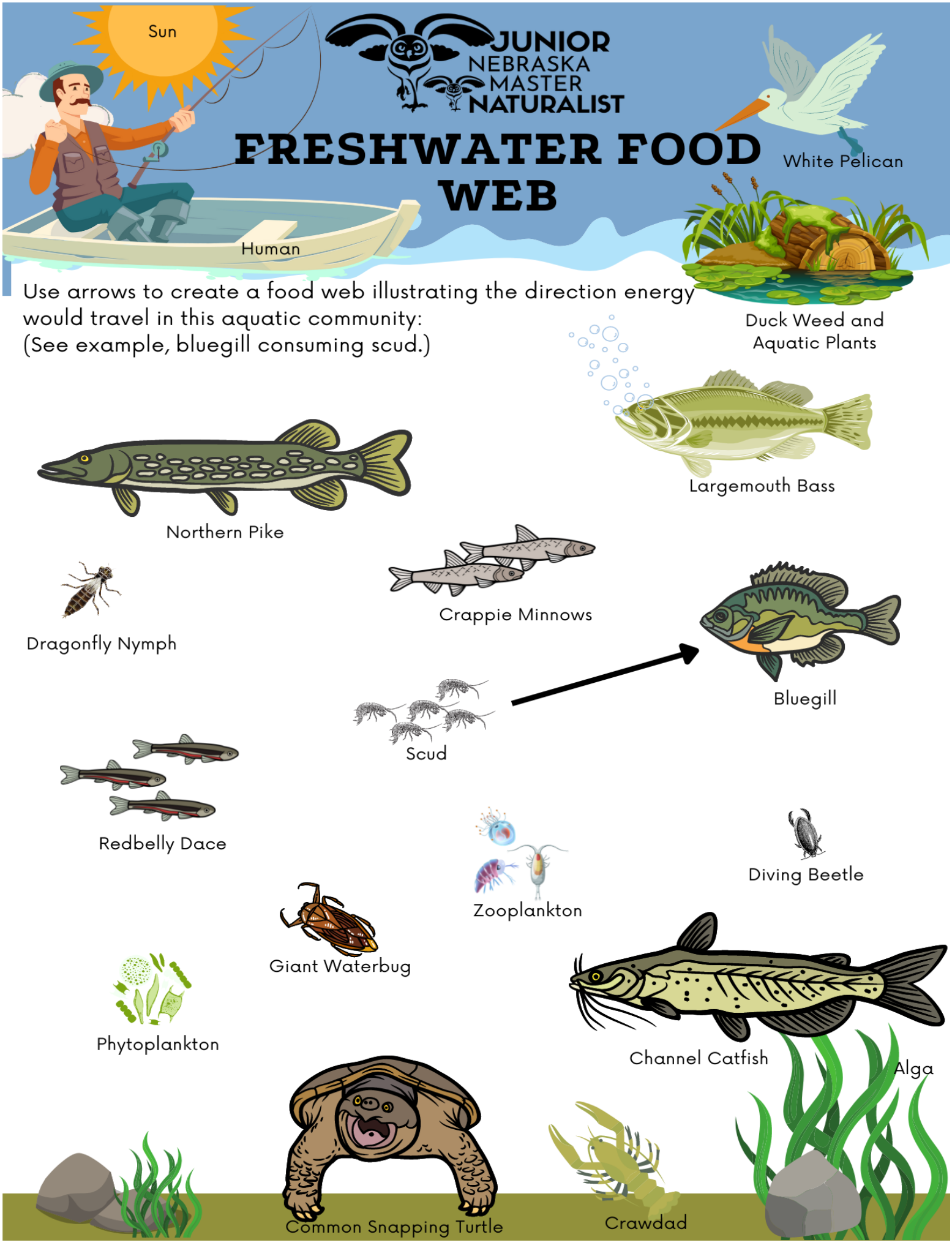
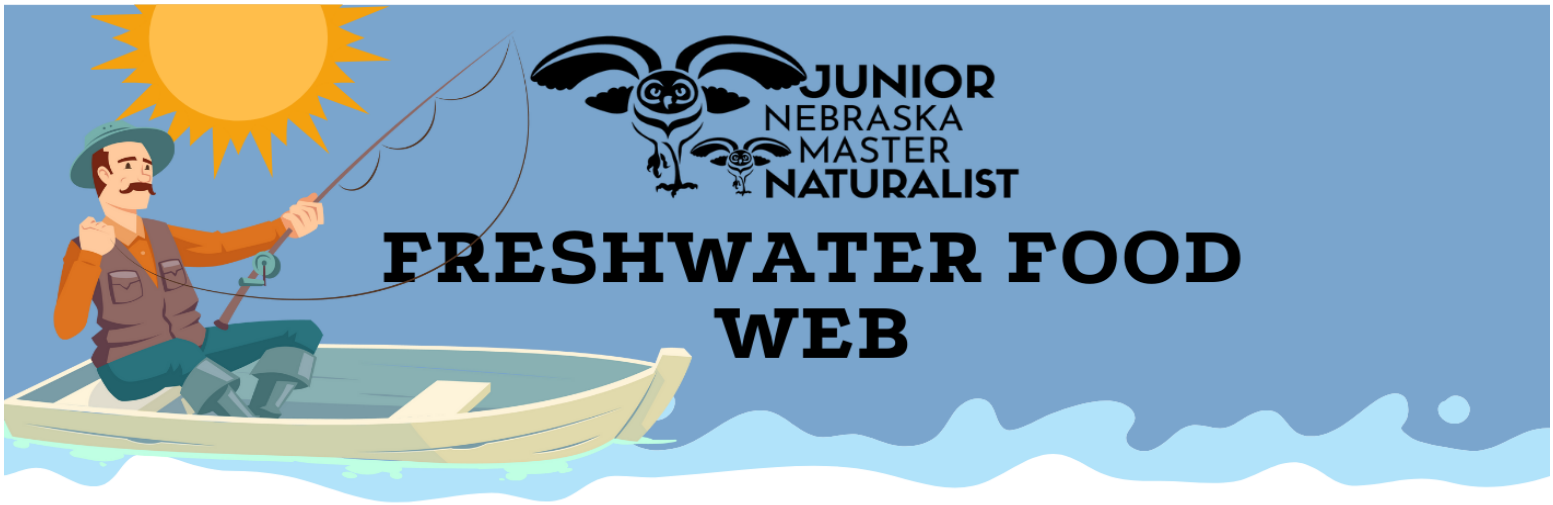
Use arrows to create a food web illustrating the direction energy would travel in this aquatic community:
(See example, bluegill consuming scud.)





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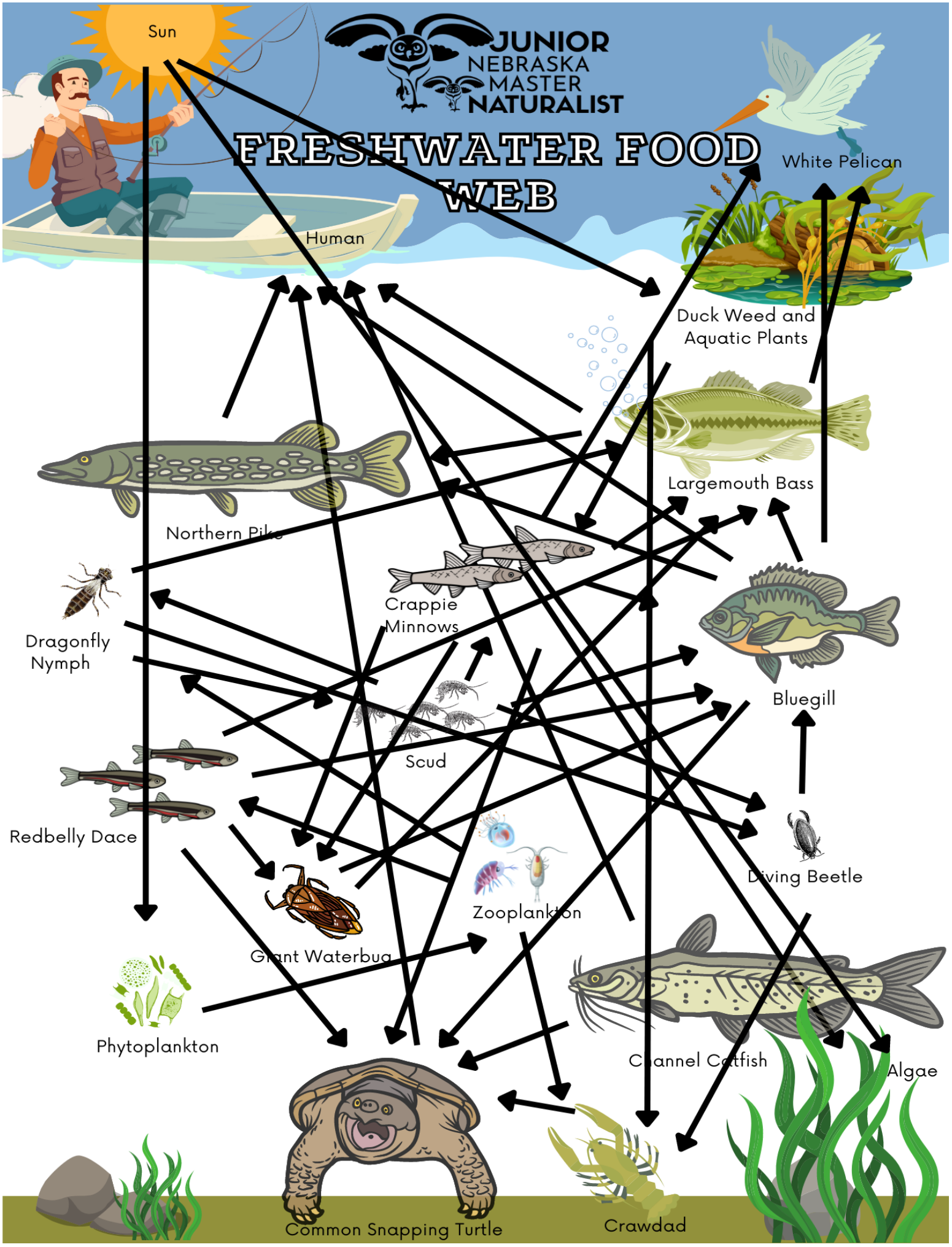
FRESHWATER FOOD WEB

Name three consumers in the food web above:

Name two producers in the food web above:

What is the difference between food chains and food webs?

Which animal would you consider the apex (top) predator in this food web?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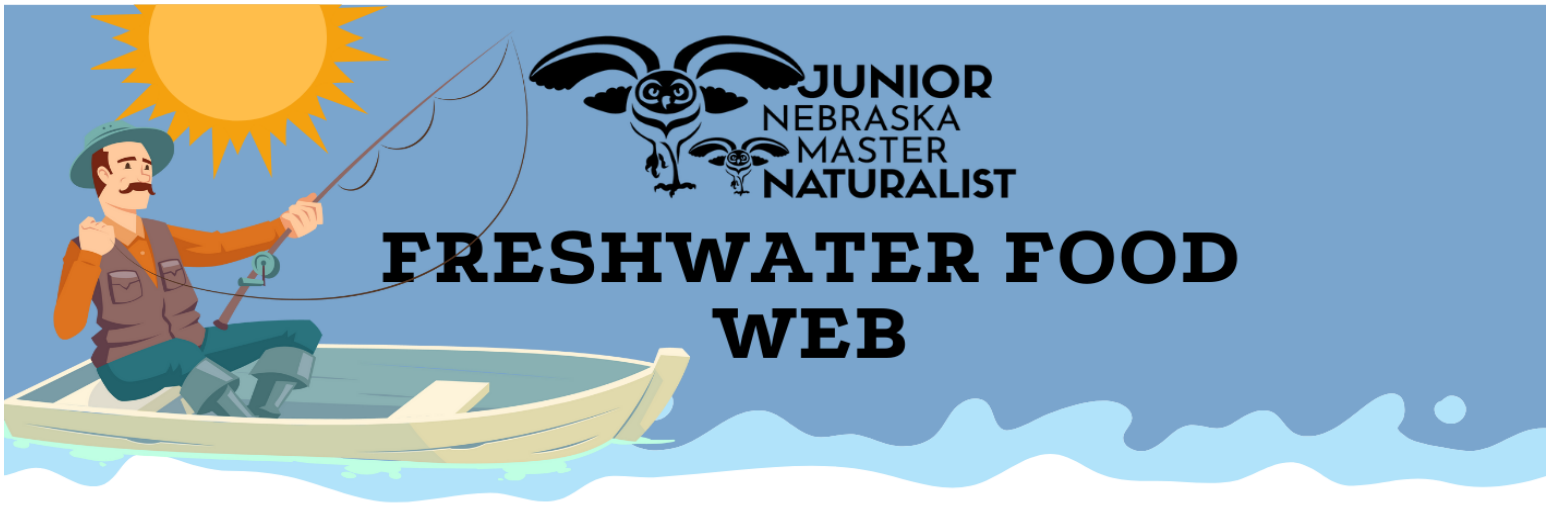
FRESHWATER FOOD WEB
Sun
Human
White Pelican
Duck Weed and Aquatic Plants
Largemouth Bass
Northern Pike
Crappie
Minnows
Dragonfly Nymph
Bluegill
Scud
Redbelly Dace
Diving Beetle
Zooplankton
Giant Waterbug
Phytoplankton
Channel Catfish
Algae
Common Snapping Turtle
Crawdad



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FRESHWATER FOOD WEB

Name three consumers in the food web above:

Potential Answers: Common Snapping Turtle, Crawdad, Channel Catfish, Giant Waterbug, Zooplankton, Diving Beetle, Scud, Redbelly Dace, Crappie Minnow, Bluegill, Dragonfly Nymph, Northern Pike, Largemouth Bass, White Pelican, Human

Name two producers in the food web above:

Potential Answers: Algae, Zooplankton, Duck Weed and Aquatic Plants

What is the difference between food chains and food webs?

Answer: A Food Chain shows the transfer of food energy from one organism to the next as each consumes a lower member in the chain and in turn, is preyed upon by members higher in the chain.
A Food Web is an interlocking pattern of multiple food chains, making a web of who eats who.

Which animal would you consider the apex (top) predator in this food web?

Answer: Human