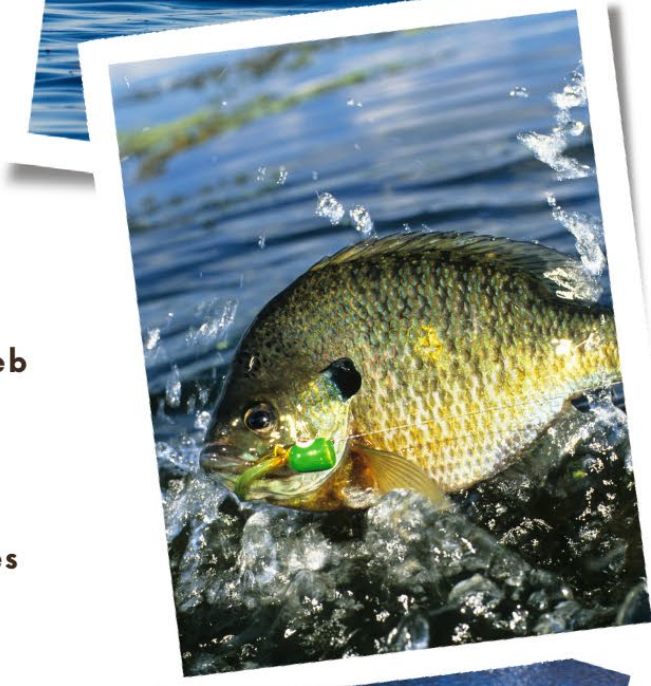
RIVER FOOD WEB
Lesson & Activity



PARTS OF THIS DOCUMENT:

Learn about Food Webs
- Define a Food Web
- Food Web Vocabulary
- Food Chain vs Food Web
- Energy Transfer

Food Web Activity
- Instructions & Tips for Efficiency
- Food Web Images for Activity
- Examples of Food Chains within the Web
- Who Eats/Does NOT Eat What

VA SOLs & Resources
- Local Waterway Food Pyramid Examples
- Examples of Virginia Standards Met
- Resources Used for Project

THE Harvest FOUNDATION

DAN RIVER BASIN ASSOCIATION

DCR
Virginia Department of Conservation & Recreation

Learn About Food Webs

What are food webs?

A food web is a system in which energy is transferred through multiple, intertwined trophic levels of various organisms – it is a way to show how different plants and animals are connected by what or whom they eat and who eats them.

Vocabulary

Organism – any living thing: plants, animals, algae, fungi, bacteria, etc.

Community – a group of organisms coexisting and interacting in a common area

Trophic (Level) – a level of organisms in an ecosystem that share food sources and have similar roles or functions in their community

Producer/Primary Producer – autotrophs that turn the sun's energy into "food" and do not eat other organisms; usually by photosynthesis

Consumer – any organism that eats another living thing

Primary Consumer – consumer who eats primary producers; herbivores

Secondary Consumer – eats primary consumers, some plants possible; carnivores or omnivores

Tertiary Consumer – eats secondary consumers; carnivores or omnivores

Apex Predator – consumers that do not have natural predators; carnivores

Autotroph – turns energy from the sun into chemical energy to make its own "food," usually through photosynthesis – does not eat

Heterotroph – cannot make its own food, must consume another organism

Herbivore – only eats plants/primary producers

Carnivore – only eats animals/meat

Omnivore – eats both animals/meat and plants; some have preferences but eat both

Insectivore – only eats insects

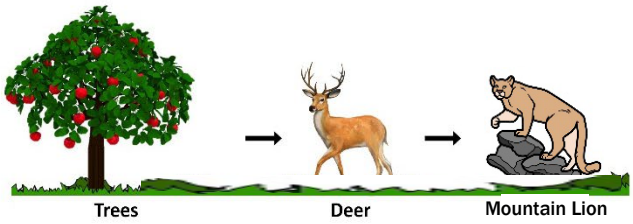
Scavenger – eats/consumes dead animal material

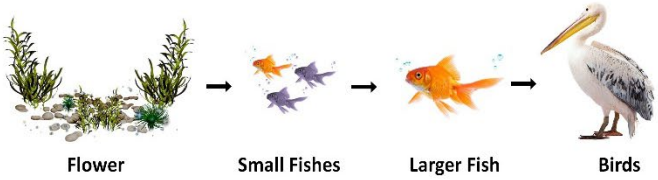
Detritivore – eats/consumes dead plant material (called "detritus")

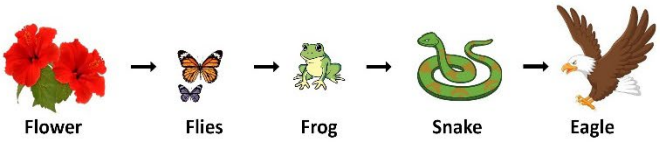
Decomposer – chemically breaks down dead plants and animals for energy

Opportunistic – willing to eat a wide variety of food, opportunity over preference

Food Chain

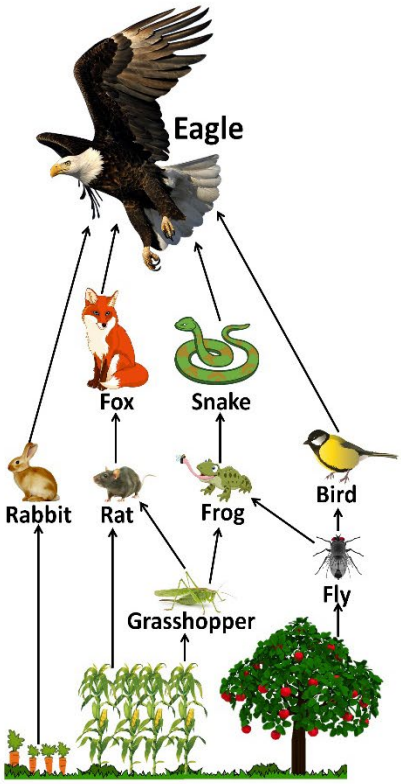






VS

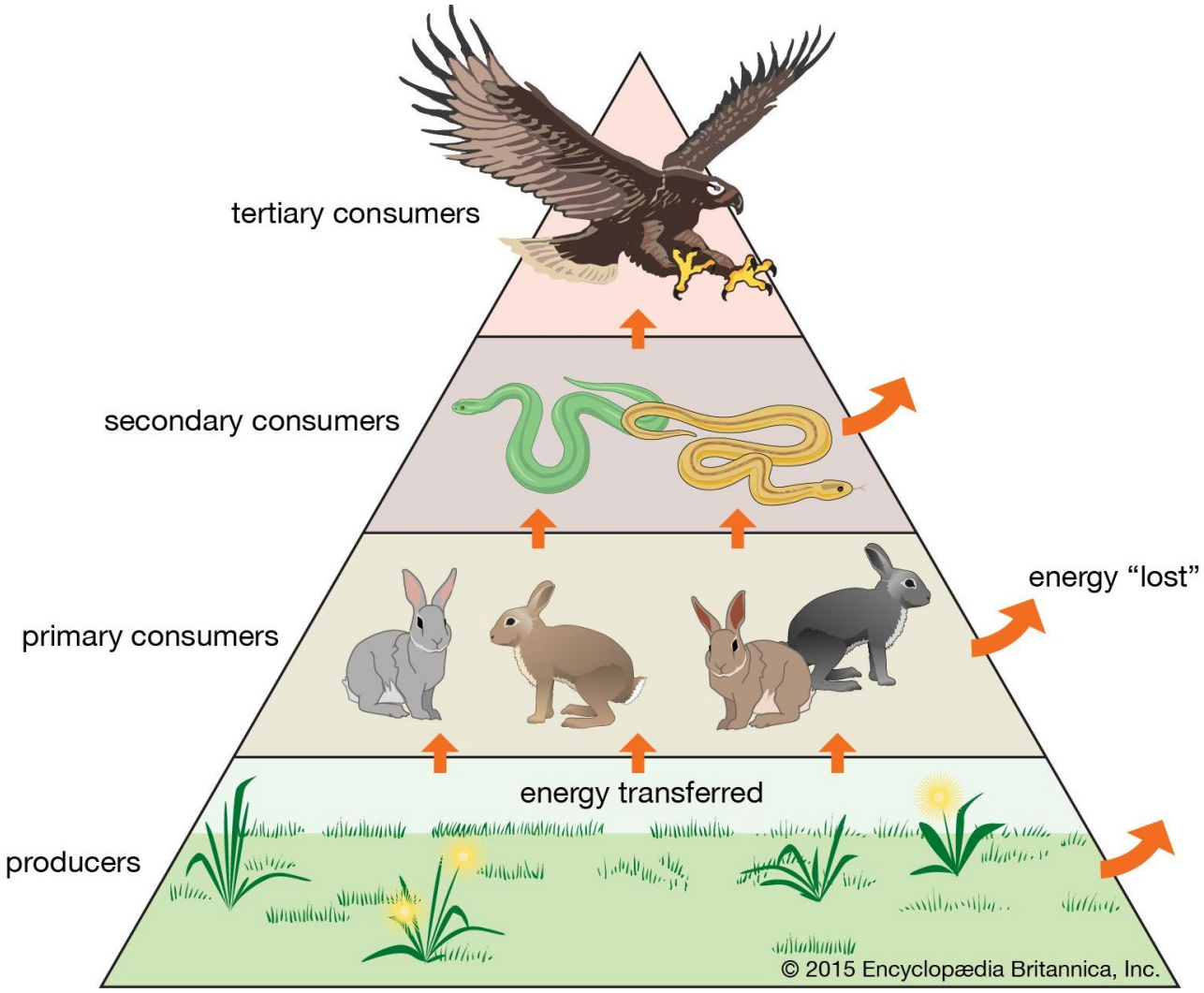
Food Web



Food Chains vs Food Webs

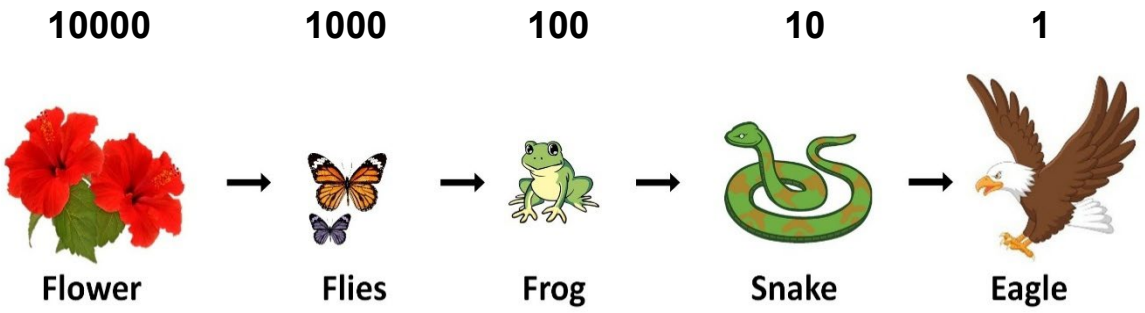
Food Chains follow a single path of energy transfer through multiple organisms, with one producer, one primary consumer, one secondary consumer, and so on, until the chain ends with the top predator.

Food webs follow multiple paths of energy flow through a more complex system of interconnected food chains, and can have *more than one* possible producer or consumer in each trophic level, until the end is reached at the top predator.



Energy Transfer

Each organism at each level of the “trophic pyramid” must obtain and use a certain amount of energy to maintain basic processes to stay alive. Only some of the energy moves through from one trophic level to the next, and the amount is based on how much is eaten and how much energy/heat is “lost” through metabolic processes being carried out. It is estimated and considered to be the general “rule” that about 10% of energy is passed through each trophic level. The higher the trophic level, the lesser amount of energy is available to them. Here is a simplified example:



Food Web Activity

Materials:

Sun and organism pictures

Ball of yarn

Scissors (optional)

This document

Instructions:

1. Begin by asking students questions about their background knowledge of the topic and relevant vocabulary, then introduce and teach the lesson
2. For the food web classroom activity, prepare different organisms of the river community by printing pictures of, cutting out, and (preferably) laminating them.
3. Distribute the organism pictures to students, along with one to represent the sun. Arrange the students in a circle surrounding the student holding the sun card.
4. Hand a ball of yarn to the “sun”
5. The sun will choose a producer – where it will send its energy – and pass the ball of yarn to that student while holding on to the end of the yarn
6. The producer will then choose a primary consumer that would eat the organism on their card, passing the yarn to that student, again, holding onto the yarn
7. The primary consumer will continue the chain and choose a secondary consumer, who will choose a tertiary consumer, and so on, until an apex predator or stopping point is reached
8. Once a single food chain is completed, pause and discuss the trophic levels with the class
9. Either cut the yarn to end that chain or begin again with the sun, making sure students continue to hold their section of the yarn
10. Repeat steps 4-9 to form multiple food chains, forming a food “web”
11. Choose one trophic level or one animal to declare “extinct.” That/those student(s) will drop their yarn, and everyone who relied on their organism(s) for food should also drop their yarn. Pause and discuss how this simulates the collapse or disturbance of the food web.

Tips:

It is very important that the activity is well-thought out and that you are able to make multiple food chains to connect into a web from the organisms handed out to students. Missing important links will make the activity difficult. You may use the animals from this document or come up with your own. If you wish to add more, be sure that they fit into the existing food web or branch out from it logically.

It is important to mention and discuss scavengers and decomposers, however, these cause complexities in the food web activity that may make it more difficult to execute efficiently and effectively. Essentially, everything dies and may become energy/nutrients for these scavengers and/or decomposers, so it could be confusing *ending* with *them* versus the apex predators. Detritivores such as aquatic macroinvertebrates can easily be used as primary consumers eating dead plant matter in this case, as they will not be terminating a food chain within the food web.

Many animals or plants may be used multiple times, some may only be used once. If a class is smaller, carefully choose which animals to exclude so that the activity can still go smoothly.

Aquatic Grass/Plants

Clover

Aquatic Macroinvertebrates

Eastern Cottontail Rabbit

Brook Trout

Painted Turtle


River Otter


Great Blue Heron


Bald Eagle


Black Willow Tree

White-tailed Deer


Coyote


The Sun


Northern Cardinal


Allegheny Blackberry (Bush)


North American Beaver


Tent Caterpillar


Great Horned Owl


Eastern Garter Snake

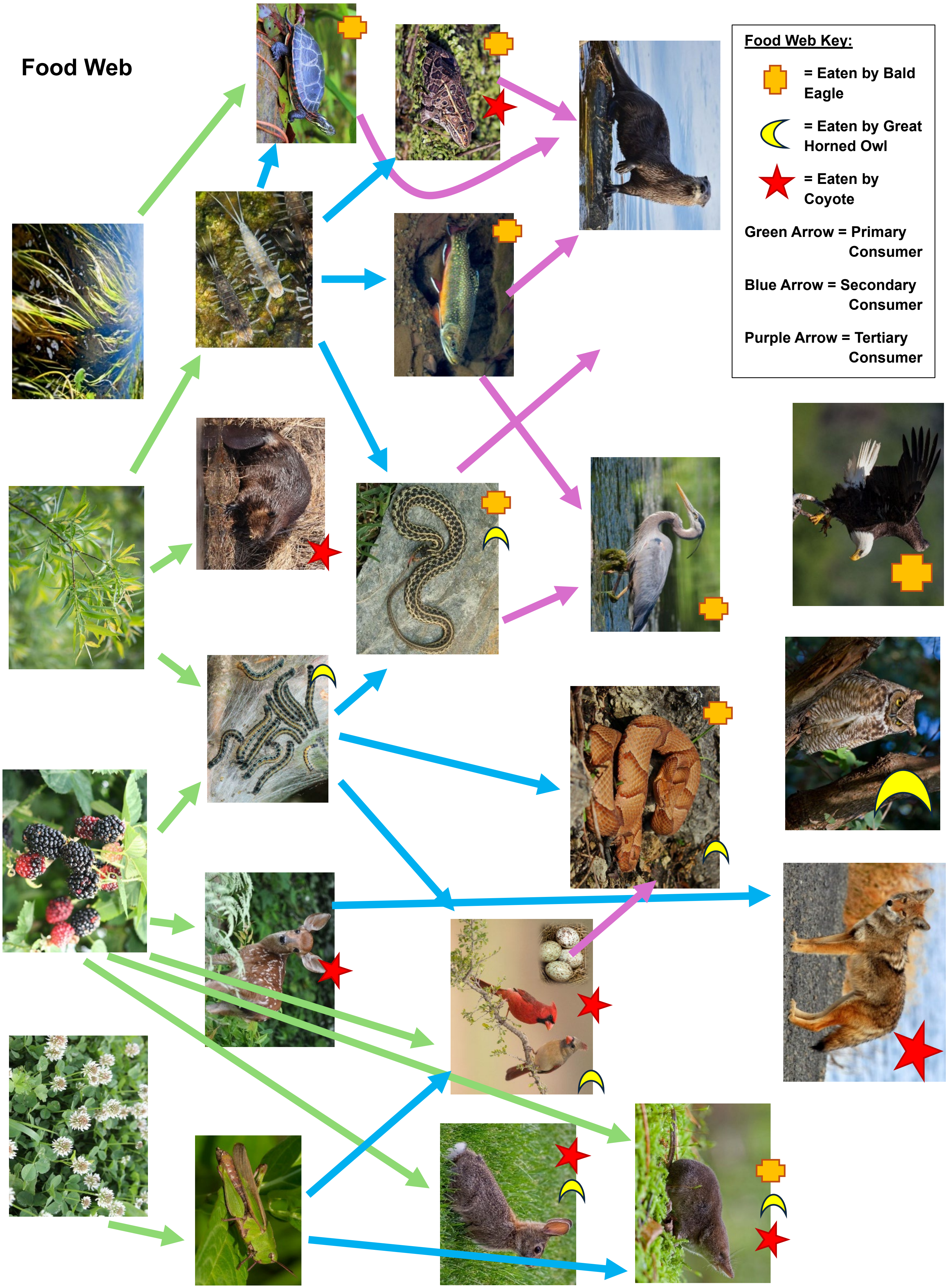

Least Shrew


Copperhead


Eastern Leopard Frog


Green Striped Grasshopper

Food Web


Food Web Key:
= Eaten by Bald Eagle
= Eaten by Great Horned Owl
= Eaten by Coyote
Green Arrow = Primary Consumer
Blue Arrow = Secondary Consumer
Purple Arrow = Tertiary Consumer

Organism	EATEN BY	DOES Eat	Does NOT Eat	Trophic Level(s)
Aquatic Grass/Plants	Macros, Turtles	Nothing	Anything	Primary Producer
Clover	Rabbit, Deer, Insects	Nothing	Anything	Primary Producer
Blackberry Bush	Songbirds	Nothing	Anything	Primary Producer
Black Willow Tree	Beaver, Macros, Tent Caterpillars, Deer	Nothing	Anything	Primary Producer
Macroinvertebrates (Macros)	Trout, Turtles, Heron	Aquatic Grass, Black Willow leaves as detritus	Anything else	Primary Consumer
White-tailed Deer	Coyote (eats young fawn)	Clover, Berries/Leaves, Black Willow ***	Anything else	Primary Consumer
Eastern Cottontail Rabbit	GH Owl, Coyotes	Clover, Black Willow (twigs/bark/shoots in winter), Blackberries	Anything else	Primary Consumer
North American Beaver	Coyote	Black Willow Trees	Other animals	Primary Consumer
Tent Caterpillars	Cardinal, Garter Snake, Copperhead	Black Willow	Anything else	Primary Consumer
Green Striped Grasshopper	Least Shrew, Cardinal, young Copperhead, Garter Snake	Clover (and other terrestrial grasses)	Anything else	Primary Consumer
Least Shrew	Otter, Garter Snake, Copperhead Eagle, Coyote, Owl	Clover, Blackberries, (2) Grasshopper, (2) Caterpillars	Anything else	Primary Consumer, (2) Secondary Consumer
Most Songbirds (Northern Cardinal as example)	Copperhead (eats eggs), Eagle	(1) Berries (2) Caterpillars, (2) Grasshoppers	Anything else	(1) Primary Consumer (2) Secondary Consumer
Brook Trout	River Otter, Heron, Garter Snake	Macroinvertebrates	Anything else	Secondary Consumer
Painted Turtle	River Otter, Heron, rarely Coyote, rarely G. Snake,	(1) Aquatic Plants (2) Macros	Anything else	(1) Primary Consumer (2) Secondary Consumer

****** Garter Snake***	GH Owl, Eagle, Otter, GB Heron	Macros, Caterpillars, Grasshoppers, Cardinal/ songbird eggs, Frogs	Anything Else	Secondary Consumer, sometimes Tertiary Consumer
****** Copperhead***	GH Owl	Trout, Turtles, Frogs, Shrew, (3) Songbirds, sometimes Macroinvertebrates	Herons, Deer, plants, anything above them on food chain	Secondary Consumer (3) Can be Tertiary Consumer if eating songbirds who eat caterpillars/insects
****** River Otter***	Eagles may eat young	Trout, Turtles, Frogs, Snakes, (2)Macroinvertebrates, rarely eat young Beaver***	Anything else	Tertiary Consumers (2) Secondary Consumer
****** Great Blue Heron***	Eagle, GH Owl	Trout, Turtles, Frogs, some Snakes, (2) Insects	Anything else	Tertiary Consumer (2) Secondary Consumer
****** Coyote***	Nothing	Rabbit, young Deer, Songbirds/eggs, rarely River Otter, Trout, Frogs, Snakes, Turtles***, sometimes insects ***	Other Apex Predators, Herons (typically)	Apex Predator
****** Bald Eagle***	Nothing	Great Blue Heron, River Otter, Trout, Frogs, Turtle, young Garter Snake, sometimes Rabbit, sometimes Songbirds, Insects	Other Apex Predators, Deer	Apex Predator
****** Great Horned Owl***	Nothing	Shrews (and other small rodents), Rabbit, Cardinal/songbirds, Garter Snake, Copperhead, Frogs, rarely insects	Otters, Herons, Beavers, Other Apex Predators, Deer, Plants	Apex Predator

<u>Producer/Consumer Chart (Above) Key:</u>

(#) = When an animal can exist on multiple trophic levels, both the "Trophic Level" and correlating food are labeled with a number.

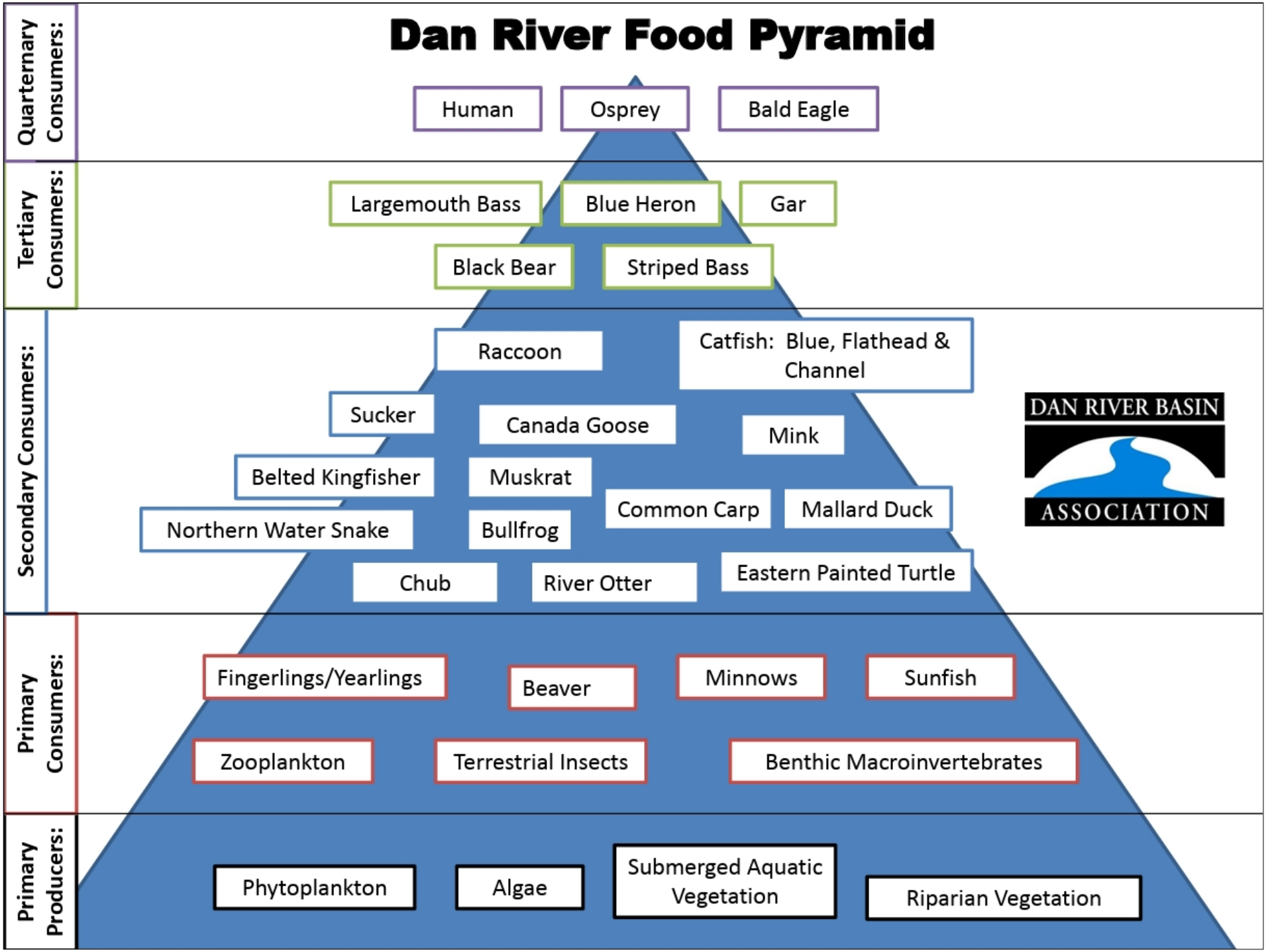
(1) = Primary Consumers
(2) = Secondary Consumers
(3) = Tertiary Consumers

*** = opportunistic predators – if the *** is with prey, it is eaten opportunistically, not typically

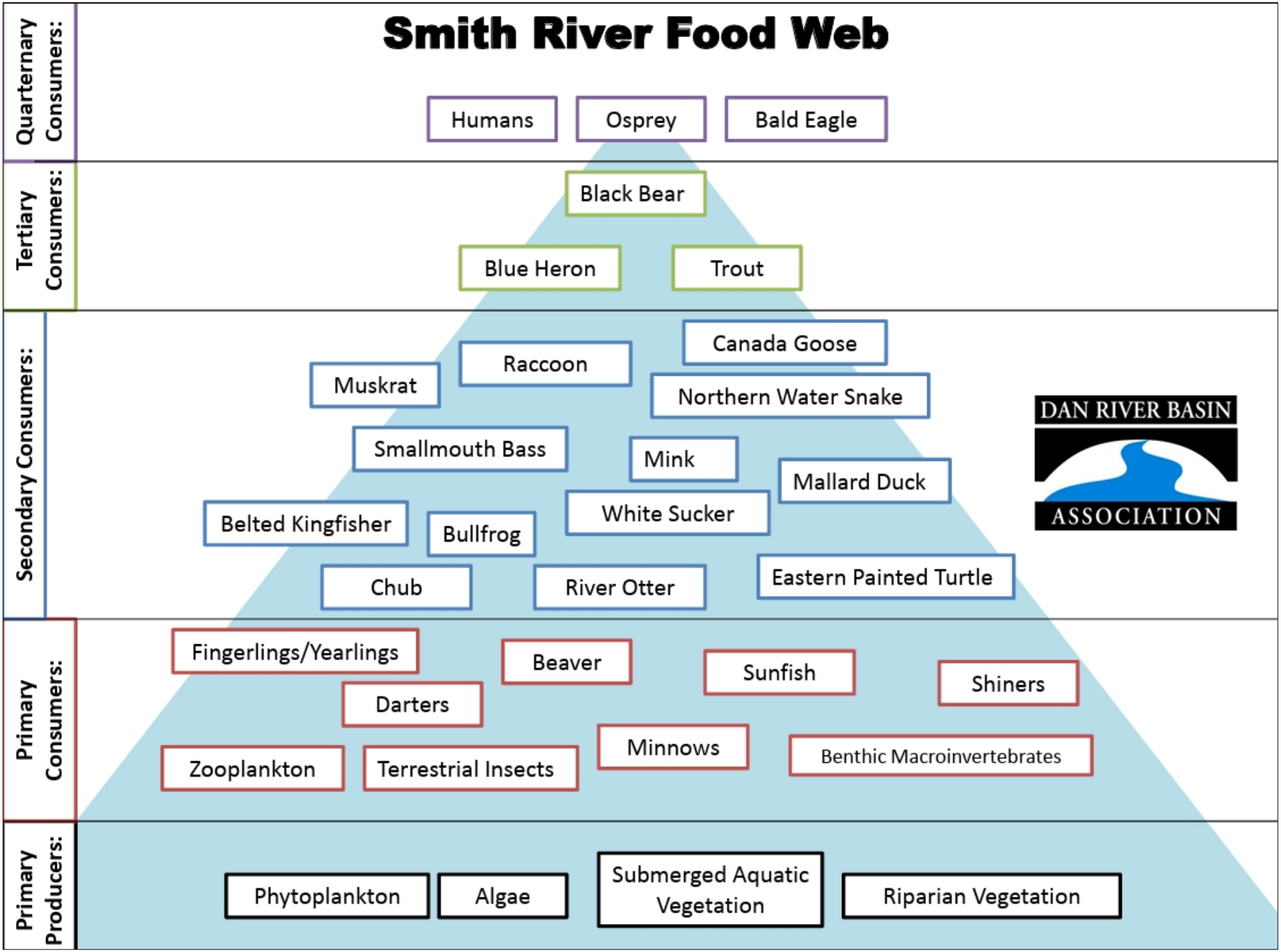
"<u>Anything Else</u>" refers to the specific options provided – they may have other food sources that are not mentioned.

Some connections are in the chart that may not be shown in the food web diagram. They are OK to include, but may not be the "best" choice to use as an example.

Dan River Food Pyramid



Smith River Food Web



Virginia Standards of Learning:

Fourth Grade

SCIENCE

Living Systems and Processes

4.2 The student will investigate and understand that plants and animals have structures that distinguish them from one another and play vital roles in their ability to survive. Key ideas include

a) the survival of plants and animals depends on photosynthesis;

b) plants and animals have different structures and processes for obtaining energy; and

4.3 The student will investigate and understand that organisms, including humans, interact with one another and with the nonliving components in the ecosystem. Key ideas include

a) interrelationships exist in populations, communities, and ecosystems;

b) food webs show the flow of energy within an ecosystem;

d) classification can be used to identify organisms.

Fifth Grade

SCIENCE – Transforming Matter & Energy

5.2 The student will investigate and understand that energy can take many forms. Key ideas include

a) energy is the ability to do work or to cause change;

b) there are many different forms of energy;

c) energy can be transformed; and

d) energy is conserved.

5.6 The student will investigate and understand that visible light has certain characteristics and behaves in predictable ways. Key ideas include

d) radiant energy can be transformed into thermal, mechanical, and electrical energy.

Sixth Grade

SCIENCE – Our World, Our Responsibility

6.4 The student will investigate and understand that there are basic sources of energy and that energy can be transformed. Key ideas include

a) the sun is important in the formation of most energy sources on Earth;

b) Earth's energy budget relates to living systems and Earth's processes;

c) radiation, conduction, and convection distribute energy; and

d) energy transformations are important in energy usage.

Seventh Grade

LIFE SCIENCE

LS.5 The student will investigate and understand that biotic and abiotic factors affect an ecosystem. Key ideas include

a) matter moves through ecosystems via the carbon, water, and nitrogen cycles;

b) energy flow is represented by food webs and energy pyramids; and

c) relationships exist among producers, consumers, and decomposers.

LS.9 The student will investigate and understand that relationships exist between ecosystem dynamics and human activity. Key ideas include

a) changes in habitat can disturb populations;

b) disruptions in ecosystems can change species competition; and

c) variations in biotic and abiotic factors can change ecosystems.

Resources

Food Chain/Web Graphics
https://geo.libretexts.org/Bookshelves/Oceanography/Oceanography_(Hill)/11%3A_Food_Webs_and_Ocean_Productivity/11.4%3A_Food_Chains_and_Food_Webs

Trophic Pyramid https://www.britannica.com/science/trophic-pyramid

4th Grade Science – Virginia DOE Standards of Learning 638043832167070000

5th Grade Science – Virginia DOE Standards of Learning 638043832173000000

6th Grade Science – Virginia DOE Standards of Learning 638043832178300000

7th Grade Life Science – Virginia DOE Standards of Learning 638043832178300000