Part 3 Symbiosis, Exotic Species

Name:

Part 3 Lesson 1

Symbiosis: A long term _____ between _____ or more different species.

Three types of symbiosis

- _____
- _____
- _____

Parasitism: One organism _____ while the other is _____.

The three major groups of Parasites:

Parasitic _____

Parasitic helminths (_____)

Arthropods that directly cause _____ or act as vectors of various pathogens.

Most parasites have very complicated life cycles, often going through a number of different species before finding a host. Complete the diagram below about the Zombie Snail after watching the video. http://www.youtube.com/watch?v=Go_LIz7kTok

Parasites damage their host by consuming tissues and releasing _____.

Two general types of parasites

_____parasites: Inside your body.

_____parasites: Outside your body.

Which is ectoparasite and which is the endoparasite?

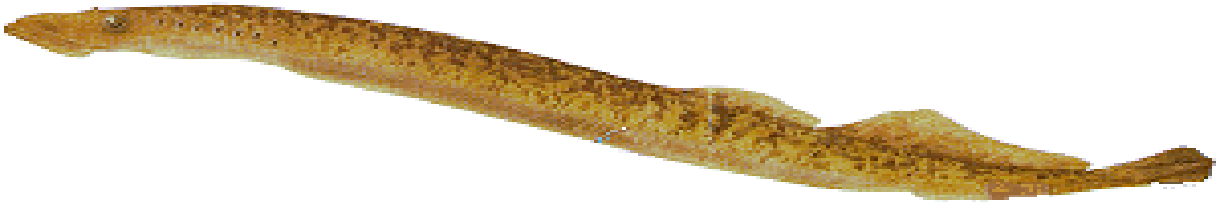
Describe and sketch some parasites in the notebook below

Parasites

Part 3 Lesson 2 Parasite Project

Sea Lamprey

(scientific name in latin): *Petromyzon marinus*; other aliases: great sea lamprey, lake



lamprey, lamprey, lamprey eel
Home Land (origination): Coastal regions of Atlantic Ocean. Locally found on east coast of United States and Canada.
Arrival Date: 1936 they were discovered in Lake Michigan.
How to Identify: Sea lampreys are members of an ancient family of Agnatha or "jawless fishes" that were around before the time of the dinosaurs. They are 12-20 inches long and eel-like. They have dark brown to black backs and light yellow to pale brown bellies. Look for a feathery fin from their midsection down and under the tail. Their mouth is circular with circular rows of teeth. They have large reddish eyes.
Sea lampreys are parasites as adults and use their raspy disc-shaped mouth full of teeth to strike and hold fast to fish. They make holes in the sides of their victims and feed on blood and body fluids. They stay attached for hours, days, or even weeks. Large fish will most likely survive a lamprey attack with just a circular scar left on their side. Small fish may die immediately from the attack or will die from an infection from the large sucking wound.

Evidence: Lampreys attach themselves to other fish and suck on their blood and body fluids. They leave rounded scars on the fish. When they first arrived on the Great Lakes scene, they killed large numbers of predatory sport fish. People began to notice the lack of large fish and the scars on others. Lampreys preyed on whitefish, lake trout and chub populations in lakes Superior and Michigan. The lamprey invasion made it hard on the people who fished the Great Lakes to make a living.
One sea lamprey can upset an ecosystem and food chain by eating an estimated 40 pounds of fish or more in its lifetime. Multiply that times 22,000 lamprey found in just one river and you have a lot of dead fish. Because of lower large fish populations, small fish, like the alewife, were able to increase in numbers. Alewives are also invader species which compete with native fish for food and habitat.

Invaded Territory: The Great Lakes and clear, cold streams throughout the Great Lakes region. Construction and improvements on the Erie and Welland Canal (between Lake Ontario and Lake Erie) around 1921 allowed sea lampreys to get through the canal to the next lake.
Here's a list of their arrival dates in each lake:

- Lake Erie, 1921
- Lake Huron, 1932
- Lake Ontario, 1935
- Lake Michigan, 1936

- Lake Superior, 1938

Sea lampreys will lay over 100,000 eggs when spawning, much more than the native lamprey species.

Extermination Techniques: Lampricides (poison) was first used in the late 1950s to kill larval lampreys. The chemical was not harmful to humans and didn't effect many plants, invertebrates, fish or waterfowl populations. The chemical worked, but it was costly and did kill some young fish. In 1958 biologists estimated that the Brule River in Wisconsin produced over 22,000 lampreys each year. The Great Lakes Fishery Commission said that this population made up 30-50 percent of all the lampreys captured on American tributaries. Something had to be done!

In 1986, DNR fish managers, technicians and engineers designed a new lamprey barrier which let fish migrate through to spawn, but captured the lamprey. On that first day, 2,000 lamprey were caught! The new barrier was expected to reduce the number of lamprey above the barrier to nearly zero. Today, biologists are still looking for ways to stop the spread of lampreys in lakes, streams, and rivers. The lamprey population is under control, but they are still a threat to aquatic ecosystems. Several million dollars are spent each year on these control methods. Native predatory fish, like the whitefish and lake trout, have been restocked by fisheries professionals to help maintain a healthy level of these species.

1) Why is the Sea Lamprey bad for the Great Lakes?

2) How did the Sea Lamprey make it to the Great Lakes?

3) Why are Sea Lampreys bad for people?

4) Why is the Sea Lamprey a difficult species to control?

5) What is being done to control the spread of the Sea Lamprey?

The **P**erfect **P**arasite **P**ower**P**oint **P**reparation **P**age

Please investigate three parasites. Make a quick sketch and add a description in the boxes below.

Common Name of parasite chosen:_____
Science Name of parasite chosen:_____

How is this parasite transmitted? / How do you get it?_____

_____

_____

_____

_____ Website:

_____ Author: _____ Year: _____

What are the health effects / symptoms?_____

_____

_____

_____

_____

_____

_____

Website: _____ Author: _____ Year: _____

What treatments are available?_____

_____

_____

_____

_____

_____

Website: _____ Author: _____ Year: _____

What is the life cycle of this parasite?_____

_____

_____

_____

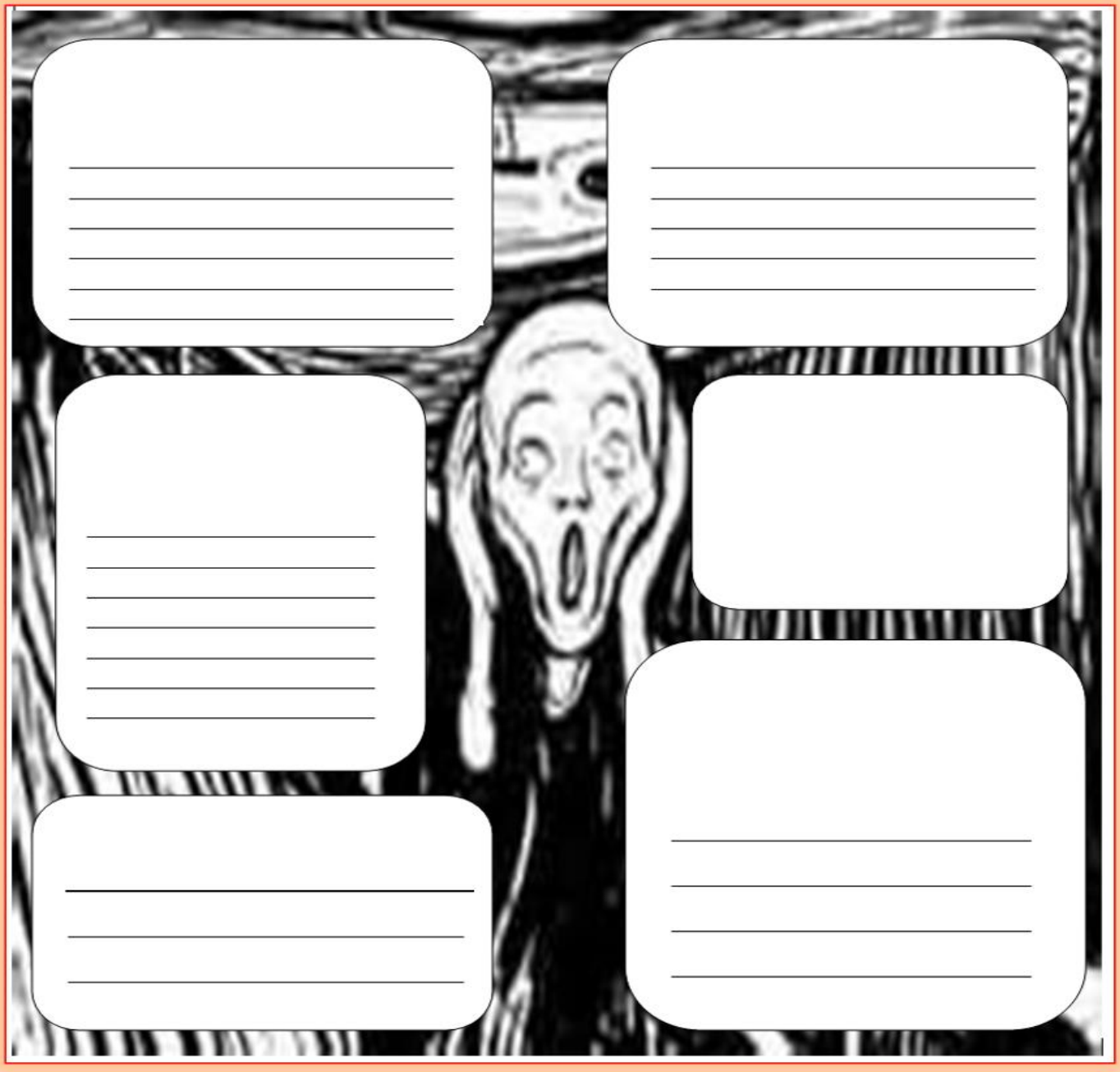
_____

_____

Website: _____ Author: _____ Year: _____

Other Notes:

Please draw and describe some info about parasites from the student PowerPoint presentations or teacher slideshow.



Part 3 Lesson 3 Symbiosis

Coevolution: The evolution of two or more species, each _____to changes in the other.

These ecological relationships include:
- Predator/prey and parasite/host
- Competitive species
- Mutualistic species

Mutualism: Both organism's _____

Types of mutualisms
- Trophic mutualism: Both species help _____ each other.
  - Usually nutrient related.
- Cleaning symbiosis: One species gets _____and shelter, the other has _____ removed.
- Defensive mutualisms: One species _____ the other and gets some benefits for its help.
- Dispersive mutualisms: One species receives _____in exchange for moving the _____or seeds of its partner.

Describe each type of mutualism next to the picture. Give me some details if you can.

Type of Symbiosis
Commensalism: One organism benefits while the other doesn't benefit, or _____

Please describe how the picture on the right is commensalism? Make sure to include the definition of commensalism in your response.

How are bacteria all three types of symbiosis. Describe below.

Each group must report to the class about a marine symbiosis. You should act it out!

- Imperial Shrimp and Sea Cucumbers
- Clownfish and Anemones
- Sharks and Remoras
- Green Turtles and Cleaning Fish

Notes:

Part 3 Lesson 4 Plant and Animal Interactions "Animal Offenses"

Herbivory: The consumption of _____ by _____.

-Herbivores are animals adapted to eat plants.

-In predator-prey interactions, _____ occur in both the herbivore and plant species it eats.

Plants and animals are always coevolving. Plants are creating defenses so they don't get eaten, and animals are evolving ways to get around these defenses and eat the plant.

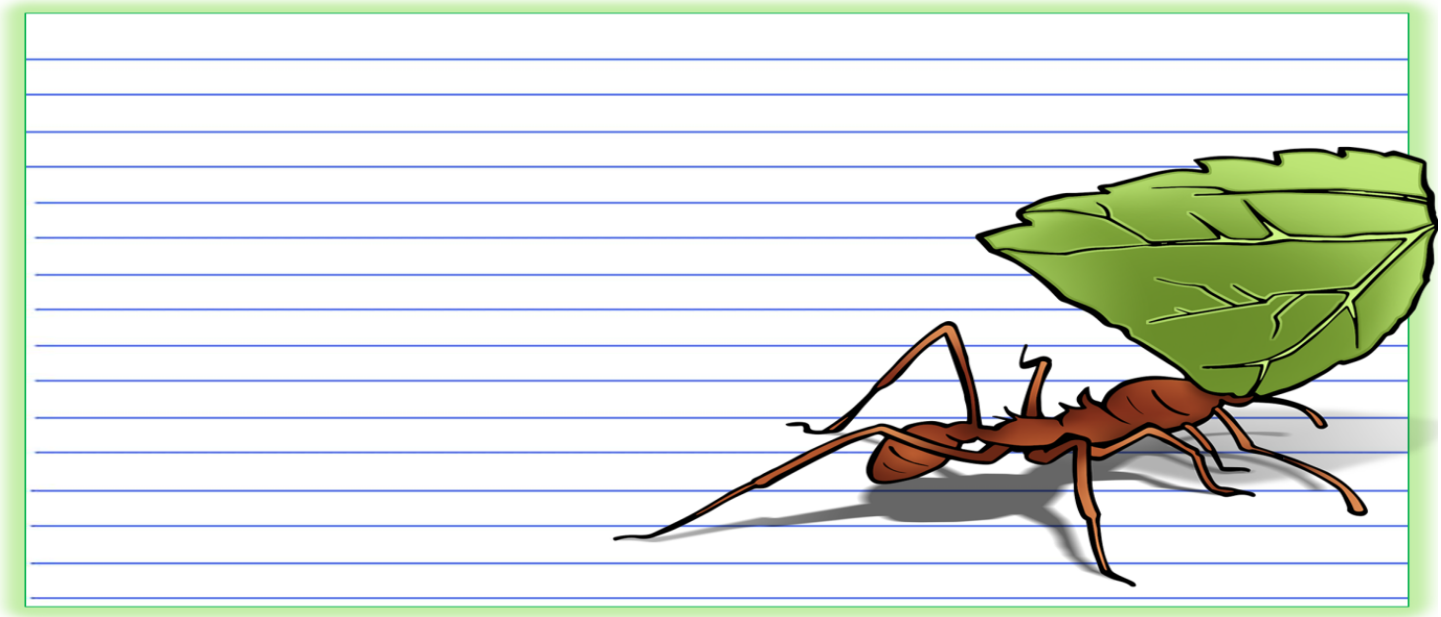
Evolution: The gradual _____in a species over time.

Coevolution: When two or more species influence each others evolution.

Animals Strategies to eat plants

Animals have special _____ and _____ parts to eat plants.

They use microbe farms (_____).



Four chambered stomachs (many herbivores)

Uses bacteria to break down difficult plant matter.

Take in plant toxins: You are able to eat poisonous plants.

Bugged Out

Please create an animal with many strategies to feed on plants and survive.

Insects: Give them specialized mandilbles (teeth-like) or piercing mouth parts, ability to sequester (absorb) toxins, microbe farms.

Mammals: Four chambered stomach with gut bacteria, and grinding teeth.

Birds: Crushing Mouth Parts, gizzard stones

Camouflage or give it a form of mimicry

Batesian Mimicry (Looks like an object or other organism)

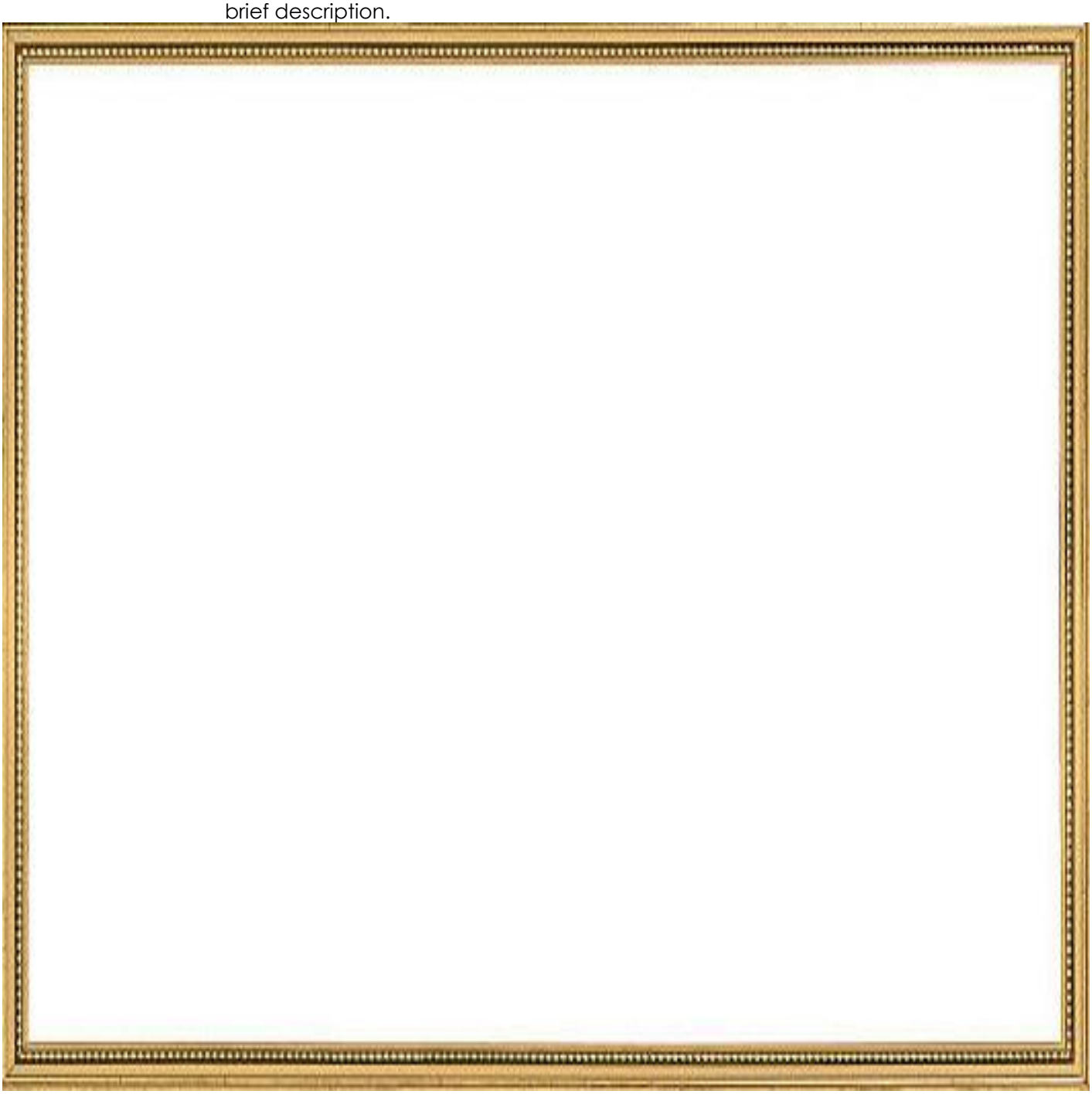
Mullerian Mimicry (Warning Coloration)

A symbiosis with another organisms

Ex. Cleaning symbiosis, Ex. Protective / defensive symbiosis

Give it a cool common and science name; Ex) The Super Ant (*Anticus killericus*)

- The animal should be well drawn and all of the strategies should be labeled neatly with a brief description.



Part 3 Lesson 5 Plant Defenses

Plant defense mechanisms against herbivory.

Grow in a place _____ to be eaten.

Be _____

Repair _____ and let them eat the non-essential parts of you.

Mechanical Defenses: Hairs, _____, prickles, and serrated edges, and _____.

A prickle is sharp-pointed outgrowth on the bark or epidermis.

A thorn is woody.

Chemical Defenses such as _____: Plants become poisonous (nicotine, mustard, caffeine).

Be extremely hard to _____.

Cellulose is a complex sugar.

You have _____ insects, birds, or mammals that attack predators.

You feed your friends a bit (mutualism).

Name this plant?

Poison Ivy: A North American _____ plant of the cashew family that secretes an irritant _____ from its leaves, which can cause _____.

Please describe Poison Ivy in the Spring, Summer, Fall, and Winter. Sketches work as well.

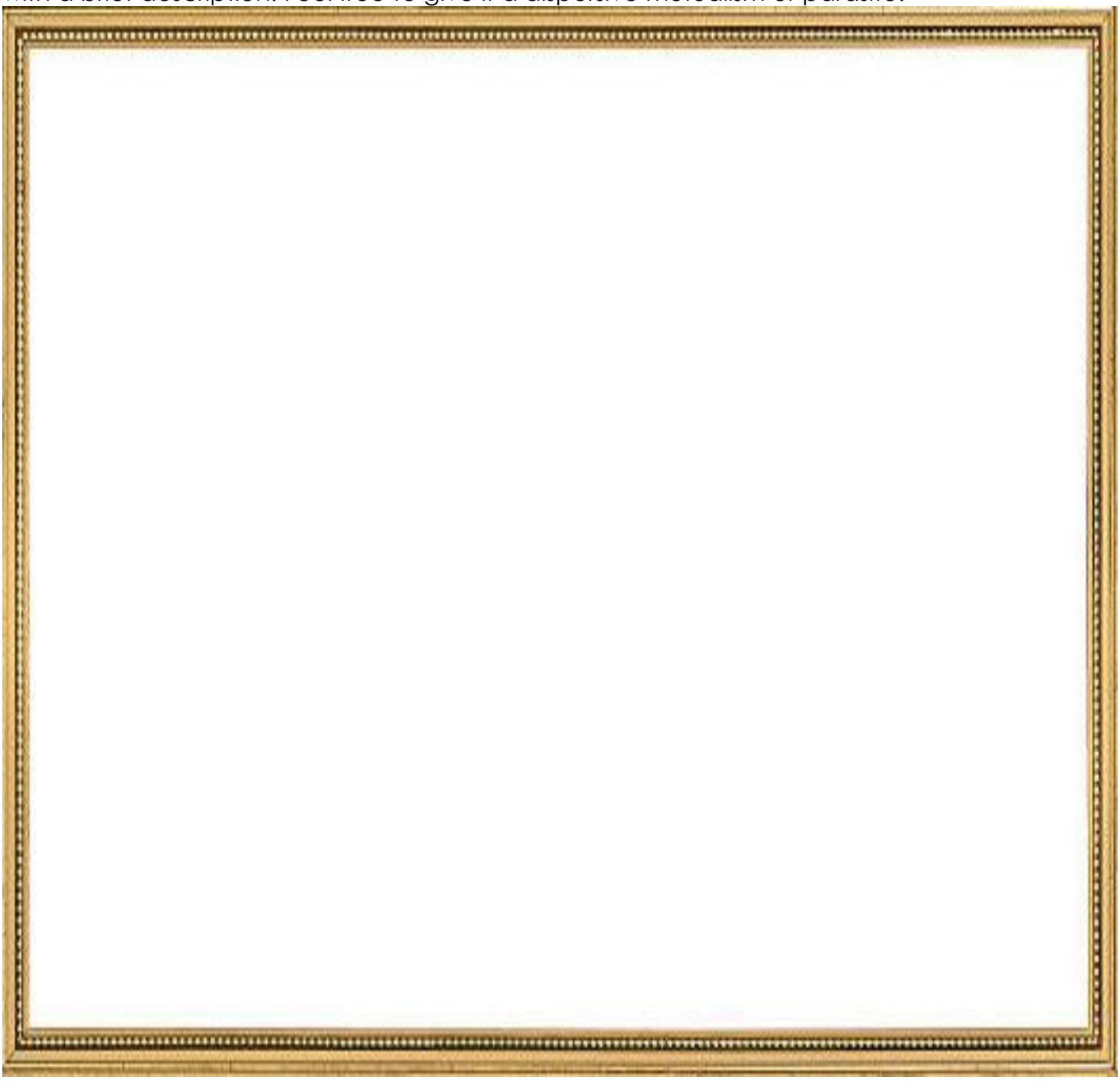
Spring	Summer	Fall	Winter

Quiz Wiz –Poison Ivy Identification. 1-10, Write Poison Ivy for the slides that are, and Not Ivy for the others.

1)	2)	3)
4)	5)	6)
7)	8)	9)
10)	*11)	

Plant Defenses Drawing

Please create a unique plant with many defenses. Give it a cool name, Science and Common. The plant should be well drawn and all of the strategies should be labeled neatly with a brief description. Feel free to give it a dispersive mutualism or parasite.



Part 3 Lesson 7 Invasive Exotic Species

Exotic species: A species that has been _____to an ecosystem that is not native to the area. Invasive Exotic Species are ones that cause damage.

Endemic: Has lived in the area for a_____. (Native)

Human activities (globalization) have greatly increased the _____ of exotic species.

Exotic species travel by…	Other ways exotic species are spread.
Ballast water	Domestic animals become feral
Boat hulls	Disposal of waste water (has seeds in it)
Aquaculture escape	Science laboratory escape
Intentional introductions	Sea food packaging disposal
Aquarium releases	Past government programs.
Live food industry (escapes)	Moving fill (has seeds)
Driving vehicles	Land and water alterations
Escaped ornamental plants	Biological control introductions
Fishing bait release	Introduce and exotic to control an exotic.
Illegal stockings	

Negative impacts of invasive exotic species.

- Increased _____
- Increased _____
- Spread _____
- Habitat _____
- Cause the extinction of _____
- Damage the _____
- Damage to human _____

Biological control: The _____ introduction of natural enemies to control exotic species.

Name of the Invasive Exotic Species you group will research? Name_____
Group members _____

Notes on Exotic Species

Who?
(The Exotic)

What Harm?

Where?

When?
(Introduced)

Why?
(How Introduced)

Works cited

Record some information about the invasive exotic species below from the student projects.

Part 3 Lesson 8 WANTED Poster and Wrap Up

Activity! Creating a **WANTED** poster for an invasive exotic species.

- One page, should have WANTED in bold print.
- Use the internet to research from a list of exotics.
- Requires picture of the specimen and name.
- Information about exotic.
- Describes the negative impacts of the exotic.
- What is being done to control the exotic?
- How did the exotic arrive?

WANTED Exotic Species Poster Name:

Please record the name and a quick sketch of three exotic species and then choose one by circling it.

Please record general information about the species:

Author: Year: Title:

Website URL:

How did it get here and where does it live in the US or abroad?

Author: Year: Title:

Website URL:

What damage does it cause to people and the ecosystem?

Author: Year: Title:

Website URL:

What is being done to prevent its spread?

Author: Year: Title:

Website URL:

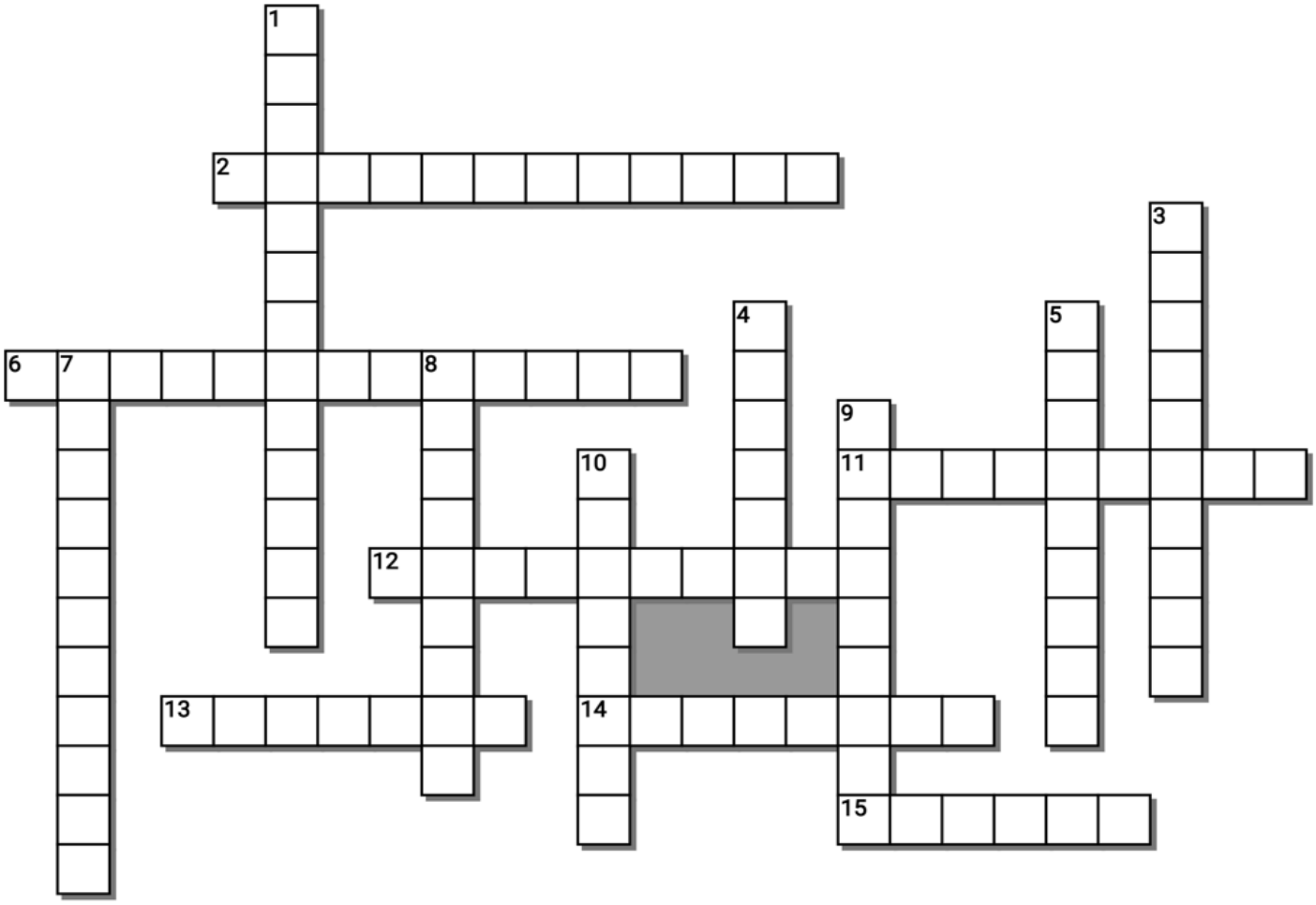
Please describe some of the negative impacts and other information about some invasive exotic species. Provide a sketch under the WANTED Posters created by classmates with the name

Invasive Exotic Species

What can you tell me about each of the pictures below? Provide an example from the unit.

Unit Notes



Across

2. One organism benefits while the other doesn't benefit, or suffer harm.
6. Two general types of parasites :_____ live Outside your body.
11. The gradual change in a species over time.
12. _____mutualisms: One species receives food in exchange for moving the pollen or seeds of its partner.
13. Has lived in the area for a considerable amount of time. (Native)
14. _____ Exotic Species: Exotic Species that cause damge
15. _____ species: A species that has been introduced to an ecosystem that is not native to the area.

Down

1. Two general types of parasites _____: Inside your body.
3. One organism benefits while the other is harmed.
4. _____ mutualism: Both species help feed each other.
5. Both organism's benefit.
7. The evolution of two or more species, each adapting to changes in the other.
8. A long term relationship between two or more different species.
9. _____ mutualisms: One species protects the other and gets some benefits for its help.
10. _____ symbiosis: One species gets food and shelter, the other has parasites removed.

----------teacher can remove this word bank to make puzzle more challenging----------

Possible Answers

CLEANING, COEVOLUTION, COMMENSALISM, DEFENSIVE, DISPERSIVE, ECTOPARASITES, ENDEMIC, ENDOPARASITES, EVOLUTION, EXOTIC, INVASIVE, MUTUALISM, PARASITISM, SYMBIOSIS, TROPHIC

Part 2 Review Game Lesson 11

Name:

1-10 = 5 pts * = Bonus + 1 pt,
(Secretly write owl in correct space +1 pt)
Final Question = 5 pt wager

Due: Today
Score ____ / 100

GET OFF ME	BY MY SIDE	STRANGE PETS	NOT FROM HERE	FOREIGN FILMS Bonus round 1 pt each
1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)

Final Question Wager ___ /5 Answer: _____

Part 3 Symbiosis, Exotic Species

Name:

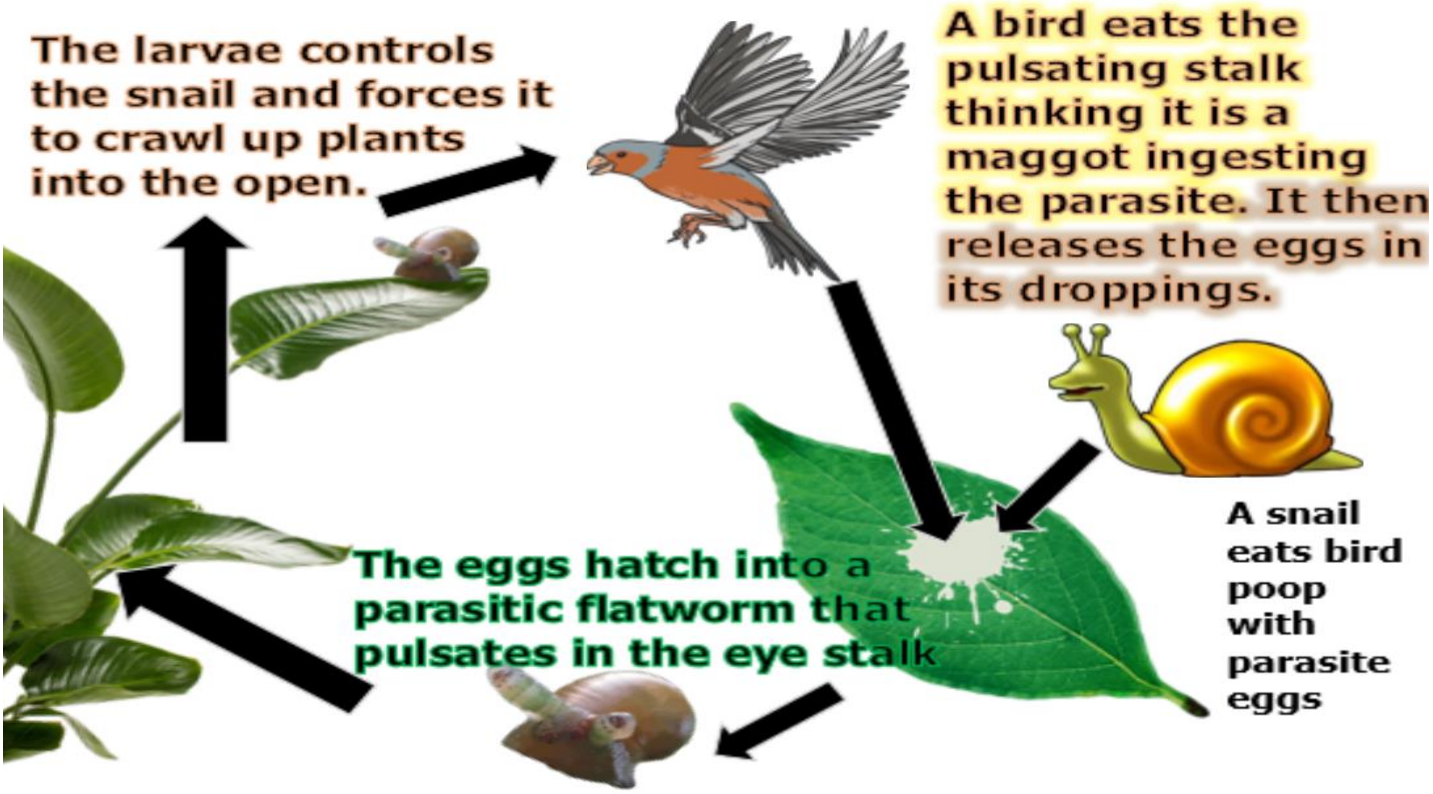
Part 3 Lesson 1

Symbiosis: A long term relationship between two or more different species.

Three types of symbiosis
- Parasitism
- Mutualism
- Commensalism

Parasitism: One organism benefits while the other is harmed.

Most parasites have very complicated life cycles, often going through a number of different species before finding a host. Complete the diagram below as shown in slideshow.



Parasites damage their host by consuming tissues, and releasing toxins.

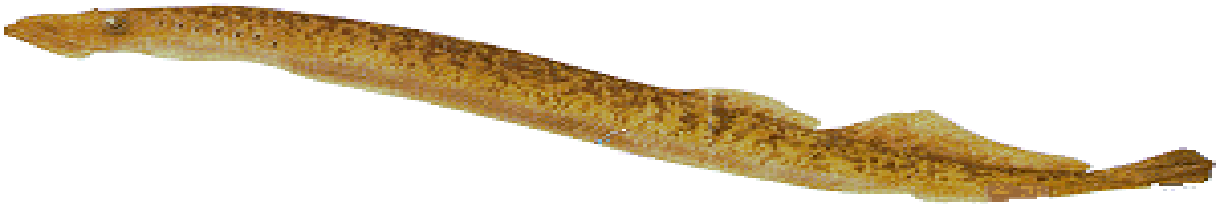
Two general types of parasites
- Endoparasites: Inside your body.
- Ectoparasites: Outside your body.

Which is ectoparasite and which is the endoparasite?

Describe and sketch some parasites in the notebook below

Part 3 Lesson 2 Parasite Project

Sea Lamprey



(scientific name in latin): *Petromyzon marinus*; other aliases: great sea lamprey, lake lamprey, lamprey, lamprey eel
Home Land (origination): Coastal regions of Atlantic Ocean. Locally found on east coast of United States and Canada.
Arrival Date: 1936 they were discovered in Lake Michigan.
How to Identify: Sea lampreys are members of an ancient family of Agnatha or "jawless fishes" that were around before the time of the dinosaurs. They are 12-20 inches long and eel-like. They have dark brown to black backs and light yellow to pale brown bellies. Look for a feathery fin from their midsection down and under the tail. Their mouth is circular with circular rows of teeth. They have large reddish eyes.
Sea lampreys are parasites as adults and use their raspy disc-shaped mouth full of teeth to strike and hold fast to fish. They make holes in the sides of their victims and feed on blood and body fluids. They stay attached for hours, days, or even weeks. Large fish will most likely survive a lamprey attack with just a circular scar left on their side. Small fish may die immediately from the attack or will die from an infection from the large sucking wound. Freshwater eels, native to our Great Lakes and the Eastern United States, look like lampreys, but they're not. Eels measure 2-3 feet with long, slender bodies. They are brown with a white underside. They have dorsal and anal fins that begin at the mid-section of the body and are continuous around the tail. Their mouth is large, with a jaw similar to a fish, unlike the jawless sea lamprey. Freshwater eels are not parasitic and won't attach to fish or suck their blood.

Evidence: Lampreys attach themselves to other fish and suck on their blood and body fluids. They leave rounded scars on the fish. When they first arrived on the Great Lakes scene, they killed large numbers of predatory sport fish. People began to notice the lack of large fish and the scars on others. Lampreys preyed on whitefish, lake trout and chub populations in lakes Superior and Michigan. The lamprey invasion made it hard on the people who fished the Great Lakes to make a living.
One sea lamprey can upset an ecosystem and food chain by eating an estimated 40 pounds of fish or more in its lifetime. Multiply that times 22,000 lamprey found in just one river and you have a lot of dead fish. Because of lower large fish populations, small fish, like the alewife, were able to increase in numbers. Alewives are also invader species which compete with native fish for food and habitat.

Invaded Territory: The Great Lakes and clear, cold streams throughout the Great Lakes region. Construction and improvements on the Erie and Welland Canal (between Lake Ontario and Lake Erie) around 1921 allowed sea lampreys to get through the canal to the next lake.

Here's a list of their arrival dates in each lake:

- Lake Erie, 1921
- Lake Huron, 1932
- Lake Ontario, 1935
- Lake Michigan, 1936
- Lake Superior, 1938

Sea lampreys will lay over 100,000 eggs when spawning, much more than the native lamprey species.

Extermination Techniques: Lampricides (poison) was first used in the late 1950s to kill larval lampreys. The chemical was not harmful to humans and didn't effect many plants, invertebrates, fish or waterfowl populations. The chemical worked, but it was costly and did kill some young fish. In 1958 biologists estimated that the Brule River in Wisconsin produced over 22,000 lampreys each year. The Great Lakes Fishery Commission said that this population made up 30-50 percent of all the lampreys captured on American tributaries. Something had to be done!

In 1986, DNR fish managers, technicians and engineers designed a new lamprey barrier which let fish migrate through to spawn, but captured the lamprey. On that first day, 2,000 lamprey were caught! The new barrier was expected to reduce the number of lamprey above the barrier to nearly zero. Today, biologists are still looking for ways to stop the spread of lampreys in lakes, streams, and rivers. The lamprey population is under control, but they are still a threat to aquatic ecosystems. Several million dollars are spent each year on these control methods. Native predatory fish, like the whitefish and lake trout, have been restocked by fisheries professionals to help maintain a healthy level of these species.

6) Why is the Sea Lamprey bad for the Great Lakes?

They can eat an estimated 40 pounds or more of fish in their lifetime, which upsets the ecosystem by killing off large fish and allows smaller fish, including Alewives, to thrive. Alewives are an invasive species that compete with native fish for food and resources.

7) How did the Sea Lamprey make it to the Great Lakes?

Sea Lampreys got to the Great Lakes through the Erie and Welland Canals, which were going through construction improvements.

8) Why are Sea Lampreys bad for people?

Sea Lampreys are bad for people because their feeding habits (an estimated 40+ pounds of fish in their lifetime) were making it hard for fishermen to make a living on the Great Lakes. The Sea Lampreys were decreasing the large sport fish populations.

9) Why is the Sea Lamprey a difficult species to control?

It's a difficult species to control because there are many, many Sea Lampreys—scientists estimated that a certain river in Wisconsin produced over 22,000 every year. In addition, lampricides, first used in the 1950's, was an effective but costly chemical that killed some young fish, so it wasn't the best solution.

10) What is being done to control the spread of the Sea Lamprey?

Scientists first tried using lampricides, an effective but costly chemical, but in 1986 a new method was revealed: a lamprey barrier, which allowed fish to swim through to spawn but caught lamprey. The barrier has been effective and the population of Sea Lamprey is under control.

Perfect Parasite PowerPoint Preparation Page

Please investigate three parasites. Make a quick sketch and add a description in the boxes below.

Common Name of parasite chosen:_____

Science Name of parasite chosen:_____

How is this parasite transmitted? / How do you get it?_____

_____

_____

_____

_____ Website:

_____ Author: _____ Year: _____

What are the health effects / symptoms?_____

_____

_____

_____

_____

_____

_____

Website: _____ Author: _____ Year: _____

What treatments are available?_____

_____

_____

_____

_____

_____

Website: _____ Author: _____ Year: _____

What is the life cycle of this parasite?_____

_____

_____

_____

_____

_____

Website: Author: Year:

Please draw and describe some info about parasites from the student PowerPoint presentations or teacher slideshow.

Part 3 Lesson 3 Symbiosis

Coevolution: The evolution of two or more species, each adapting to changes in the other.

These ecological relationships include:

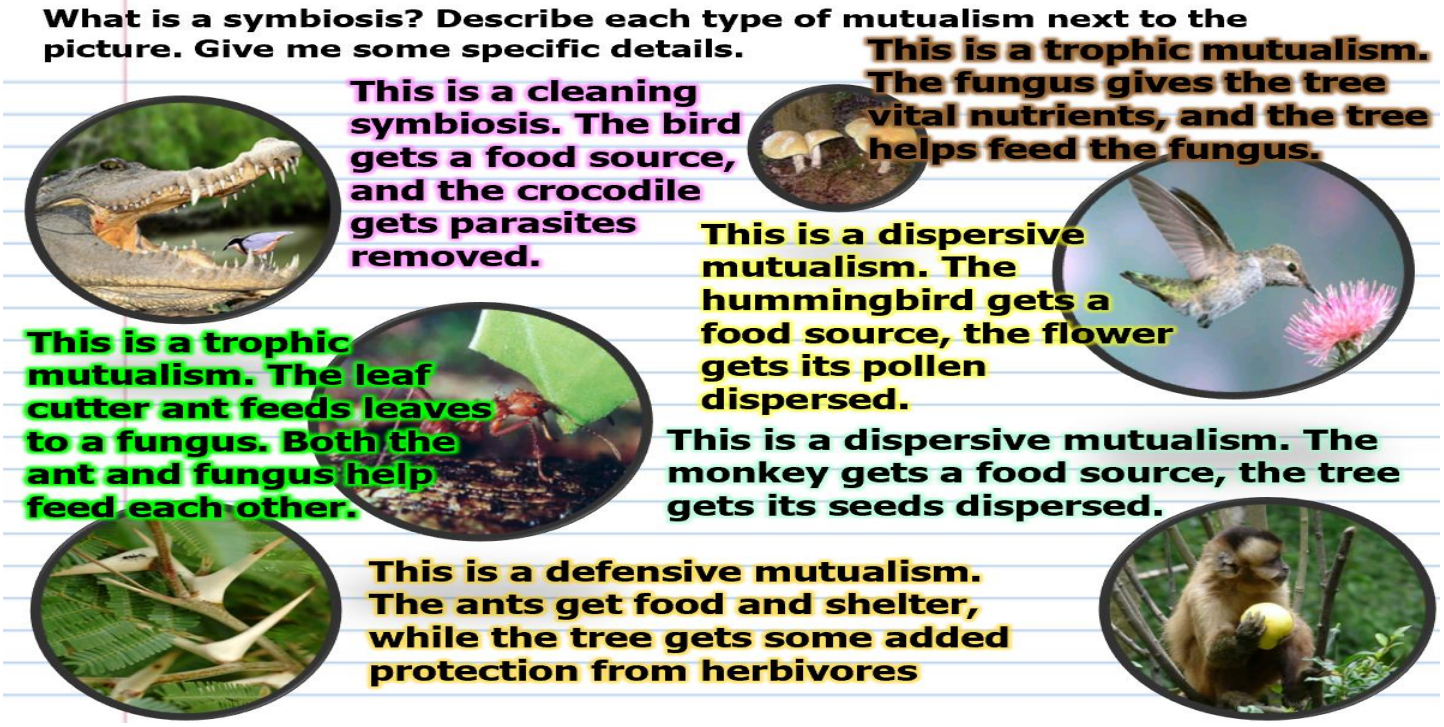
- Predator/prey and parasite/host
- Competitive species
- Mutualistic species

Mutualism: Both organism's benefit.

Types of mutualisms

- Trophic mutualism: Both species help feed each other.
  - Usually nutrient related.
- Cleaning symbiosis: One species gets food and shelter, the other has parasites removed.
- Defensive mutualisms: One species protects the other and gets some benefits for its help.
- Dispersive mutualisms: One species receives food in exchange for moving the pollen or seeds of its partner.

Describe each type of mutualism next to the picture. Give me some details if you can.



Type of Symbiosis
Commensalism: One organism benefits while the other doesn't benefit, or suffer harm.

Please describe how the picture on the right is commensalism? Make sure to include the definition of commensalism in your response. The Remora gets food scraps, protection, and a free ride from the shark, while the shark isn't hurt by the Remora but also doesn't benefit. This type of relationship is known as commensalism, where one organism benefits while the other does not (and is not harmed).	

How are bacteria all three types of symbiosis. Describe below.

Mutualistic: We provide a place to live and food, while the bacteria attack harmful microbes and digest food.	Commensalistic: Most bacteria in our body. They benefit but don't cause us harm.	Parasitic: Harmful bacteria that eat tissue and release toxins.

Each group must report to the class about a marine symbiosis. You should act it out!

- Imperial Shrimp and Sea Cucumbers
- Clownfish and Anemones
- Sharks and Remoras
- Green Turtles and Cleaning Fish

Notes:

Part 3 Lesson 4 Plant and Animal Interactions "Animal Offenses"

Herbivory: The consumption of plants by animals.

-Herbivores are animals adapted to eat plants.
-In predator-prey interactions, adaptations occur in both the herbivore and plant species it eats.

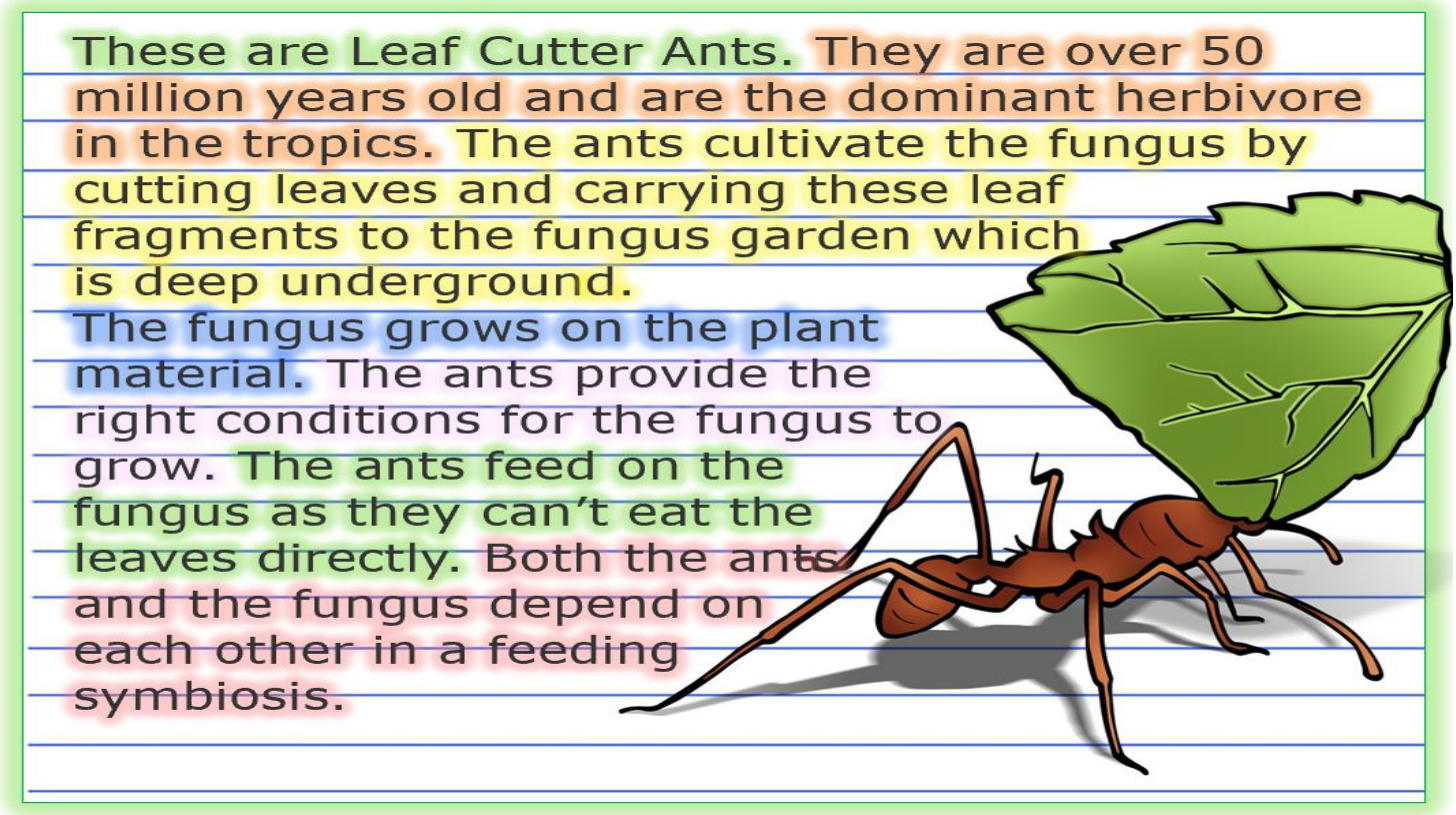
Plants and animals are always coevolving. Plants are creating defenses so they don't get eaten, and animals are evolving ways to get around these defenses and eat the plant.

Evolution: The gradual change in a species over time.

Coevolution: When two or more species influence each others evolution.

Animals Strategies to eat plants

Animals have special teeth and mouth parts to eat plants.
They use microbe farms (leaf cutter ants).



Four chambered stomachs (many herbivores)
Uses bacteria to break down difficult plant matter.
Take in plant toxins: You are able to eat poisonous plants.

Bugged Out

Please create an animal with many strategies to feed on plants and survive.

Insects: Give them specialized mandibles (teeth-like) or piercing mouth parts, ability to sequester (absorb) toxins, microbe farms.

Mammals: Four chambered stomachs with gut bacteria and grinding teeth.

Birds: Crushing Mouth Parts, gizzard stones

Camouflage or give it as a form of mimicry.

Batesian Mimicry (Looks like an object or other organism)

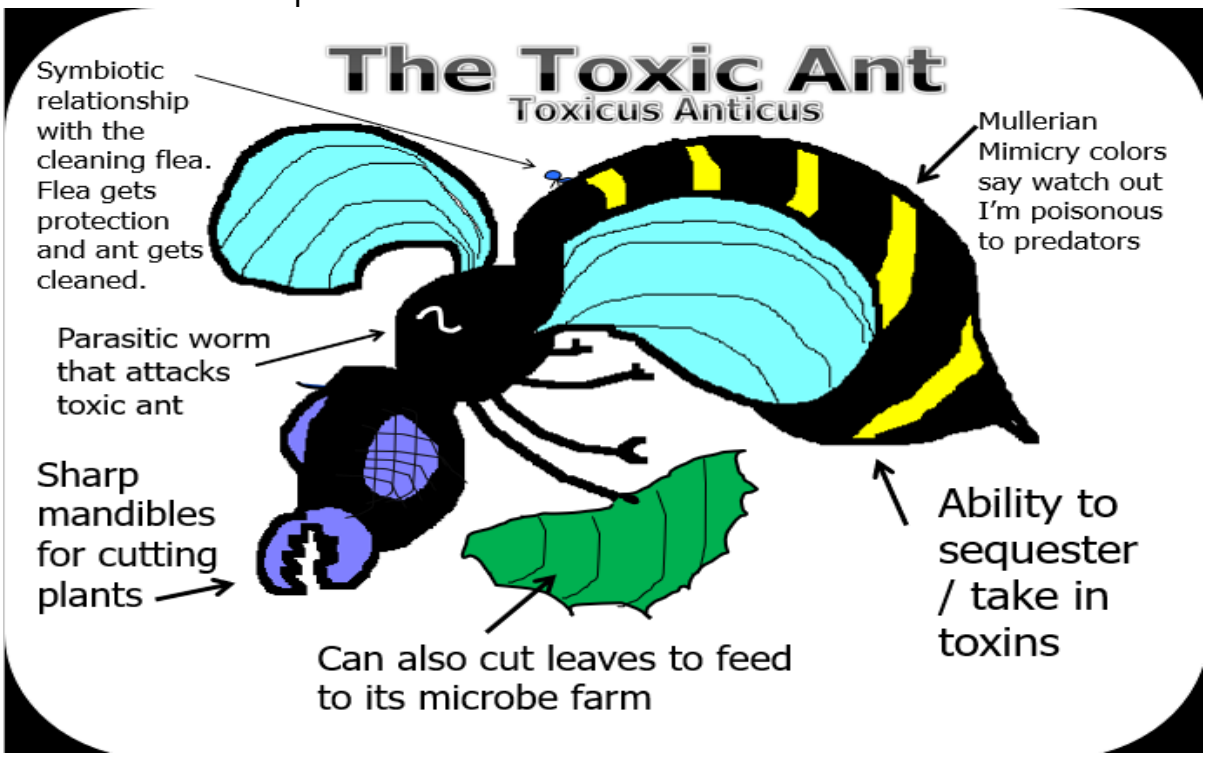
Mullerian Mimicry (Warning Coloration)

A symbiosis with another organisms

Ex. Cleaning symbiosis, Ex. Protective / defensive symbiosis

Give it a cool common and science name; Ex) The Super Ant (*Anticus killericus*)

- The animal should be well drawn, and all the strategies should be labeled neatly with a brief description.



Part 3 Lesson 5 Plant Defenses

Plant defense mechanisms against herbivory.

Grow in a place difficult to be eaten.

Be Camouflaged

Repair quickly and let them eat the non-essential parts of you.

Mechanical Defenses: Hairs, thorns, prickles, serrated edges, and sap.

A prickle is sharp-pointed outgrowth on the bark or epidermis.

A thorn is woody.

Chemical Defenses such as toxins: Plants become poisonous (nicotine, mustard, caffeine).

Be extremely hard to digest.

Cellulose is a complex sugar.

You have protective insects, birds, or mammals that attack predators.

You feed your friends a bit (mutualism).

Name this plant? Poison Ivy

Poison Ivy: A North American ivy plant of the cashew family that secretes an irritant oil from its leaves, which can cause blisters and a rash.

Please describe Poison Ivy in the Spring, Summer, Fall, and Winter. Sketches work as well.

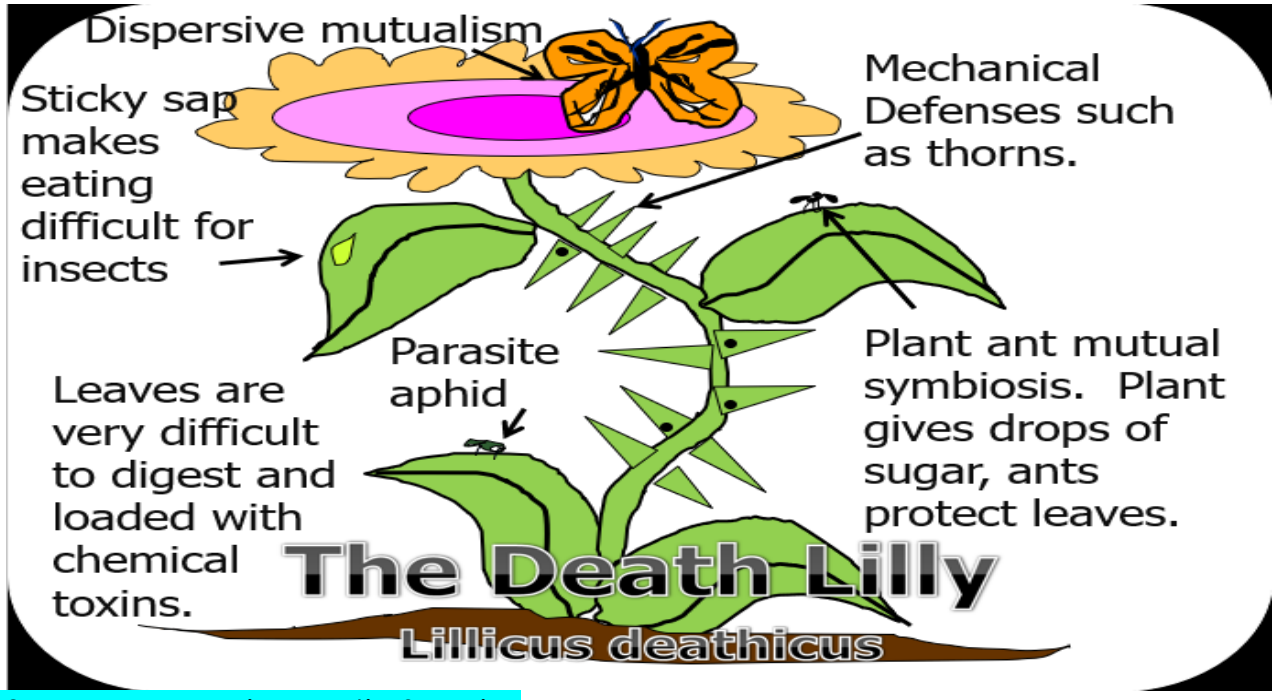
Spring	Summer	Fall	Winter
			

Quiz Wiz –Poison Ivy Identification. 1-10, Write Poison Ivy for the slides that are, and Not Ivy for the others.

1) Poison Ivy	2) Not Ivy	3) Not Ivy
4) Poison Ivy	5) Not Ivy	6) Not Ivy
7) Poison Ivy	8) Not Ivy	9) Poison Ivy
10) Poison Ivy	*11) Jumanji	

Plant Defenses Activity

Please create a unique plant with many defenses. Give it a cool name, Science and Common. The plant should be well drawn, and all of the strategies should be labeled neatly with a brief description. Feel free to give it a dispersive mutualism or parasite.



Part 3 Lesson 7 Invasive Exotic Species

Exotic species: A species that has been introduced to an ecosystem that is not native to the area. Invasive Exotic Species are ones that cause damage.

Endemic: Has lived in the area for a considerable amount of time. (Native)

Human activities (globalization) have greatly increased the spread of exotic species.

Exotic species travel by…	Other ways exotic species are spread.
Ballast water	Domestic animals become feral
Boat hulls	Disposal of waste water (has seeds in it)
Aquaculture escape	Science laboratory escape
Intentional introductions	Sea food packaging disposal
Aquarium releases	Past government programs.
Live food industry (escapes)	Moving fill (has seeds)
Driving vehicles	Land and water alterations
Escaped ornamental plants	Biological control introductions
Fishing bait release	Introduce and exotic to control an exotic.
Illegal stockings	

Negative impacts of invasive exotic species.

- Increased predation.
- Increased competition.
- Spread disease
- Habitat destruction.
- Cause the extinction of a native species.
- Damage the economy.
- Damage to human health.

Biological control: The purposeful introduction of natural enemies to control exotic species.

Name of the Invasive Exotic Species you group will research? Name_____
Group members _____

Notes on Exotic Species

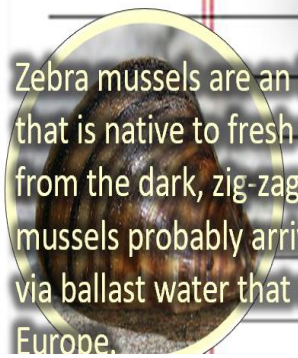
The Nile perch is an invasive exotic species released into the Nile river and other Lakes in Africa. It's a fierce predator that has had a devastating impact in its initial and introduced habitats.

They feed on their own species as well as others, including crustaceans, mollusks and insects. As the fish matures its appetite increases.

The Kudzu or Mile a Minute Vine is an invasive plant that is fast-growing. Kudzu outcompetes everything from native grasses to fully mature trees by shading them from the sunlight they need to photosynthesize.

Japanese knotweed is a non-native invasive plant that was introduced from Asia as an ornamental plant. Knotweed spreads vegetatively by rhizomes and also sprouts from fragments of root and stem material, which are dispersed by water, equipment or in fill.

Feral swine are descendants of escaped or released pigs. Feral swine are called by many names including; wild boar, wild hog, razorback, piney woods rooter, and Russian or Eurasian boar. No matter the name they are a dangerous, destructive, invasive species.



Zebra mussels are an invasive, fingernail-sized mollusk that is native to fresh waters in Eurasia. Their name comes from the dark, zig-zagged stripes on each shell. Zebra mussels probably arrived in the Great Lakes in the 1980s via ballast water that was discharged by large ships from Europe.

Nutria are large, semi-aquatic rodents that are native to South America. They cause extensive damage to wetlands, agricultural crops, and structural foundations such as dikes and roads.

Part 3 Lesson 8 WANTED Poster and Wrap Up

Activity! Creating a **WANTED** poster for an invasive exotic species.

- One page, should have WANTED in bold print.
- Use the internet to research from a list of exotics.
- Requires picture of the specimen and name.
- Information about exotic.
- Describes the negative impacts of the exotic.
- What is being done to control the exotic?
- How did the exotic arrive?

EXAMPLE WITHOUT ANSWERS TO QUESTIONS:

WANTED Exotic Species Poster Name:

Please record the name and a quick sketch of three exotic species and then choose one by circling it.

Please record general information about the species:_____

_____

_____

_____

_____

_____

_____

_____

Author:_____ Year:_____ Title:_____

Website URL:_____

How did it get here and where does it live in the US or abroad?

Author: Year: Title:
Website URL:

What damage does it cause to people and the ecosystem?

Author: Year: Title:
Website URL:

What is being done to prevent its spread?

Author: Year: Title:
Website URL:

Please describe some of the negative impacts and other information about some invasive exotic species. Provide a sketch under the WANTED Posters created by classmates with the name

Invasive Exotic Species

What can you tell me about each of the pictures below? Provide an example from the unit.

Ecological systems are organized within each other. The affects on one system will affect them all. All systems are interconnected. Example: Symbiosis (parasitism, mutualism, commensalism).

Animals are interconnected in a complex web of life. Changes on one part of the web will affect other parts of the web and the stability of the entire ecosystem. Example: relationships between predator/prey and parasite/host, and competitive species and mutualistic species.

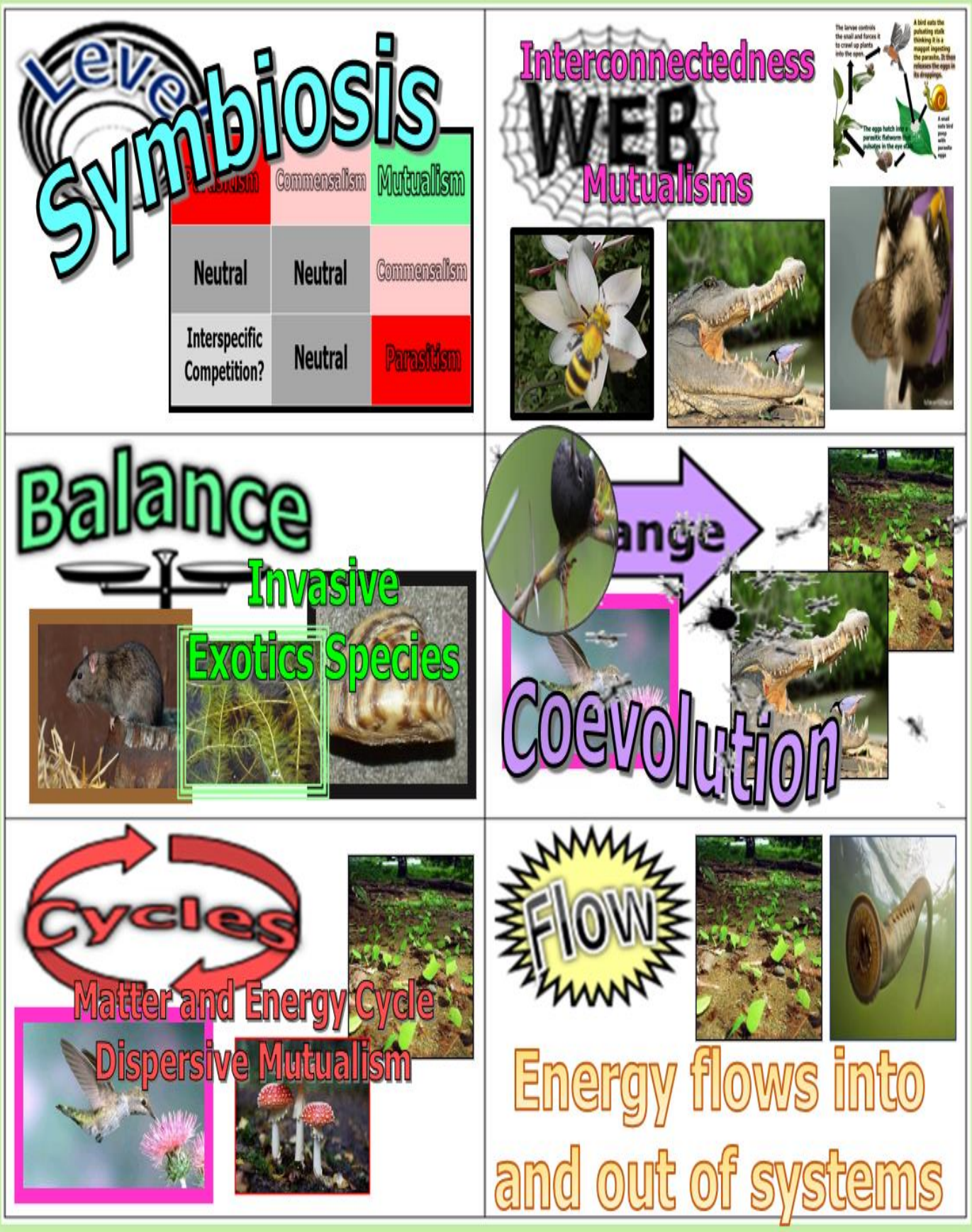
Ecosystems have a way to balance changes so that up and down fluctuations are part of the natural balance of the whole. Example: human activities, invasive/exotic species.

All organisms are in a constant state of change over time with the environment. Some organisms will change with another and will develop special interactions. Others with the nonliving world. Example: Parasitism, mutualism, and commensalism.

Matter and energy cycle through the living and nonliving world. Organisms rely on this matter and energy cycling to survive. Example: predator/prey relationships, parasite/host relationships, competitive species.

Organisms need energy to survive. Energy from the sun flows into and out of systems. This energy drives our world and the organisms in it. Energy is lost, not destroyed, when it changes form. Flows hot to cold. Example: Parasitism.

What can you tell me about each of the pictures below? Provide an example from the unit.

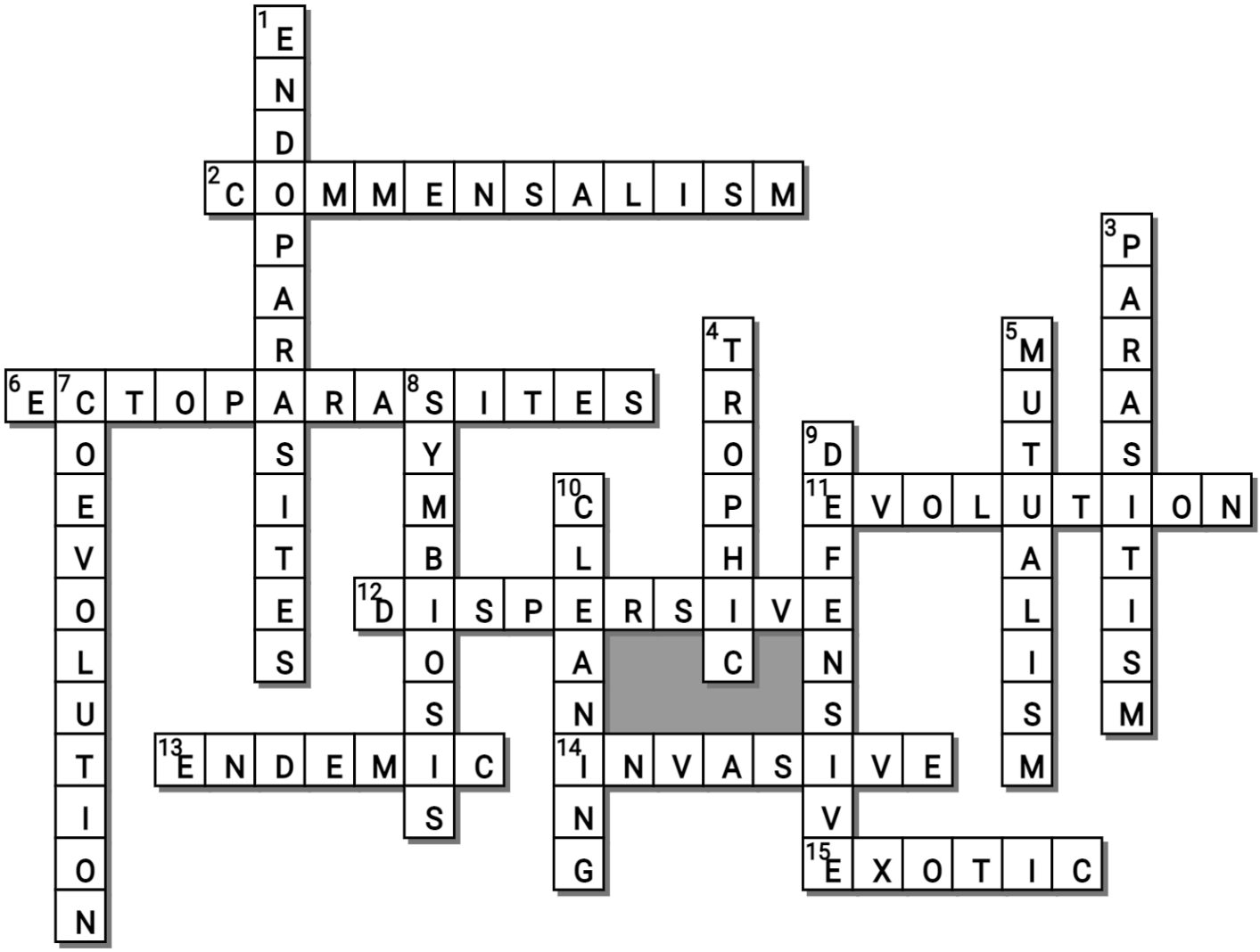


Across

2. One organism benefits while the other doesn't benefit, or suffer harm.
6. Two general types of parasites :_____ live Outside your body.
11. The gradual change in a species over time.
12. _____mutualisms: One species receives food in exchange for moving the pollen or seeds of its partner.
13. Has lived in the area for a considerable amount of time. (Native)
14. _____ Exotic Species: Exotic Species that cause damge
15. _____ species: A species that has been introduced to an ecosystem that is not native to the area.

Down

1. Two general types of parasites _____: Inside your body.
3. One organism benefits while the other is harmed.
4. _____ mutualism: Both species help feed each other.
5. Both organism's benefit.
7. The evolution of two or more species, each adapting to changes in the other.
8. A long term relationship between two or more different species.
9. _____ mutualisms: One species protects the other and gets some benefits for its help.
10. _____ symbiosis: One species gets food and shelter, the other has parasites removed.



----------teacher can remove this word bank to make puzzle more challenging----------

Possible Answers

CLEANING, COEVOLUTION, COMMENSALISM, DEFENSIVE, DISPERSIVE, ECTOPARASITES, ENDEMIC, ENDOPARASITES, EVOLUTION, EXOTIC, INVASIVE, MUTUALISM, PARASITISM, SYMBIOSIS, TROPHIC

Part 2 Review Game Lesson 11

Name:

1-10 = 5 pts * = Bonus + 1 pt,
(Secretly write owl in correct space +1 pt)
Final Question = 5 pt wager

Due: Today
Score ____ / 100

GET OFF ME	BY MY SIDE	STRANGE PETS	NOT FROM HERE	FOREIGN FILMS Bonus round 1 pt each
1) Symbiosis	6) Brood parasitism	11) Defensive mutualism	16) A= Thorns (mechanical defense) B= Microbe farms (fungus and bacteria)	*21) Ratatouille
2) Parasitism	7) Sea Lamprey	12) Cleaning symbiosis	17) B is Poison Ivy	*22) James Bond 007
3) True	8) Coevolution	13) Dispersive mutualism	18) Invasive Exotic Species	*23) The Mummy
4) True	9) A= Mutualistic B= Predator/prey C= Competitive (for light and nutrients)	14) Commensalism	19) Native/Endemic	*24) Finding Nemo
5) A= ectoparasite (outside body) B= endoparasite (inside body)	10) Trophic mutualism	15) D: Mutualistic, commensalistic, and parasitic	20) Cane toads Zebra Mussels Common Starling Etc.	*25) The Karate Kid

Final Question Wager ____/5 Answer:

Exotic species travel by…	Other ways exotic species are spread.
Ballast water	Domestic animals become feral
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Fishing bait release	Introduce and exotic to control an exotic.
Illegal stockings	

Part 3 Symbiosis, Exotic Species

Name:

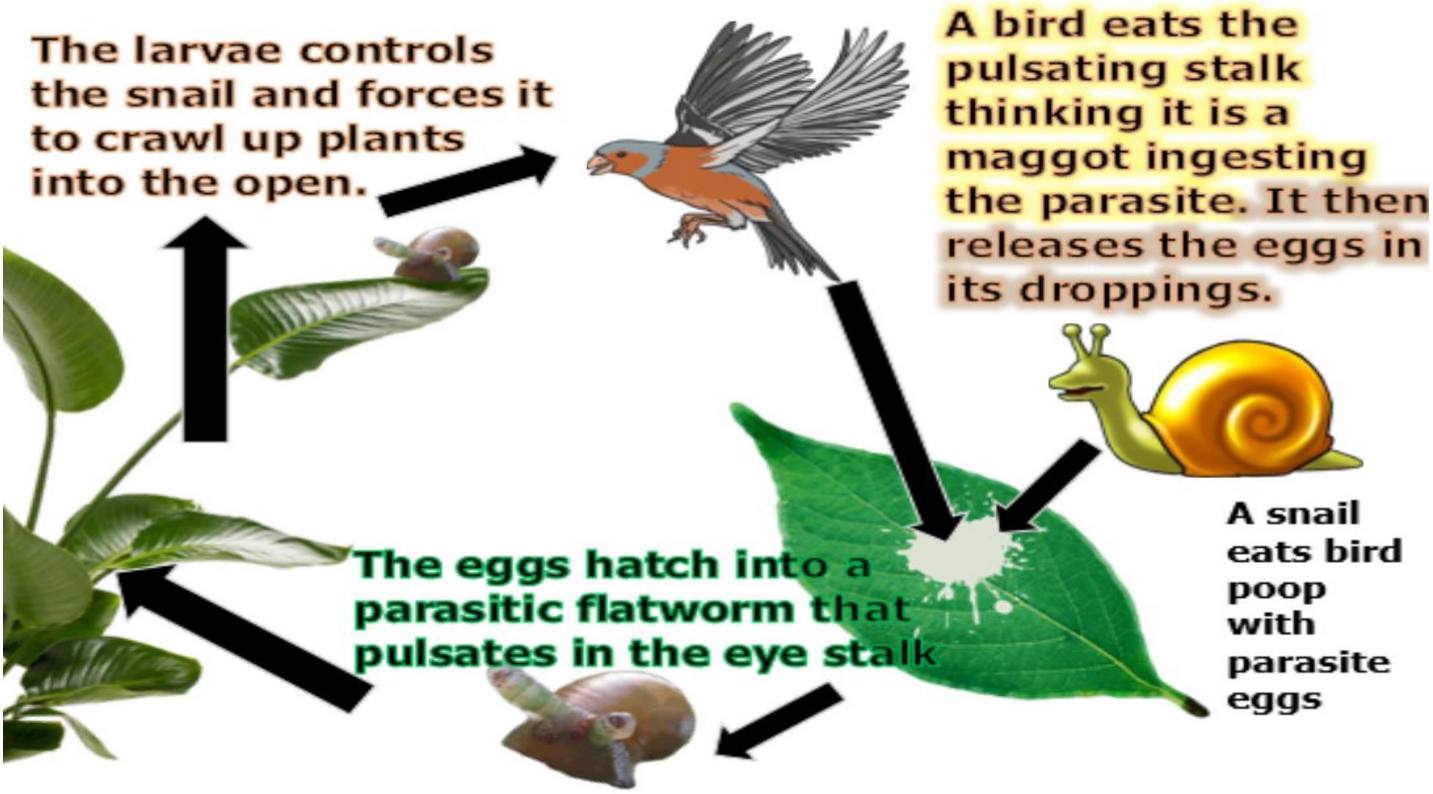
Part 3 Lesson 1

Symbiosis: A long term relationship between two or more different species.

Three types of symbiosis
- Parasitism
- Mutualism
- Commensalism

Parasitism: One organism benefits while the other is harmed.

Most parasites have very complicated life cycles, often going through a number of different species before finding a host. Complete the diagram below as shown in slideshow.



Parasites damage their host by consuming tissues, and releasing toxins.

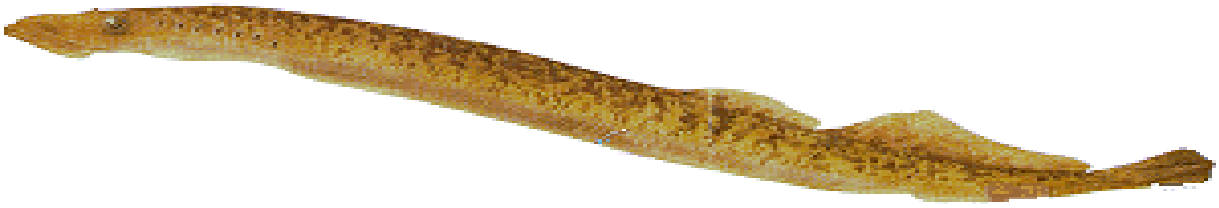
Two general types of parasites
- Endoparasites: Inside your body.
- Ectoparasites: Outside your body.

Which is ectoparasite and which is the endoparasite?

Describe and sketch some parasites in the notebook below

Part 3 Lesson 2 Parasite Project

Sea Lamprey



(scientific name in latin): *Petromyzon marinus*; other aliases: great sea lamprey, lake lamprey, lamprey, lamprey eel
Home Land (origination): Coastal regions of Atlantic Ocean. Locally found on east coast of United States and Canada.
Arrival Date: 1936 they were discovered in Lake Michigan.
How to Identify: Sea lampreys are members of an ancient family of Agnatha or "jawless fishes" that were around before the time of the dinosaurs. They are 12-20 inches long and eel-like. They have dark brown to black backs and light yellow to pale brown bellies. Look for a feathery fin from their midsection down and under the tail. Their mouth is circular with circular rows of teeth. They have large reddish eyes.
Sea lampreys are parasites as adults and use their raspy disc-shaped mouth full of teeth to strike and hold fast to fish. They make holes in the sides of their victims and feed on blood and body fluids. They stay attached for hours, days, or even weeks. Large fish will most likely survive a lamprey attack with just a circular scar left on their side. Small fish may die immediately from the attack or will die from an infection from the large sucking wound. Freshwater eels, native to our Great Lakes and the Eastern United States, look like lampreys, but they're not. Eels measure 2-3 feet with long, slender bodies. They are brown with a white underside. They have dorsal and anal fins that begin at the mid-section of the body and are continuous around the tail. Their mouth is large, with a jaw similar to a fish, unlike the jawless sea lamprey. Freshwater eels are not parasitic and won't attach to fish or suck their blood.

Evidence: Lampreys attach themselves to other fish and suck on their blood and body fluids. They leave rounded scars on the fish. When they first arrived on the Great Lakes scene, they killed large numbers of predatory sport fish. People began to notice the lack of large fish and the scars on others. Lampreys preyed on whitefish, lake trout and chub populations in lakes Superior and Michigan. The lamprey invasion made it hard on the people who fished the Great Lakes to make a living.
One sea lamprey can upset an ecosystem and food chain by eating an estimated 40 pounds of fish or more in its lifetime. Multiply that times 22,000 lamprey found in just one river and you have a lot of dead fish. Because of lower large fish populations, small fish, like the alewife, were able to increase in numbers. Alewives are also invader species which compete with native fish for food and habitat.

Invaded Territory: The Great Lakes and clear, cold streams throughout the Great Lakes region. Construction and improvements on the Erie and Welland Canal (between Lake Ontario and Lake Erie) around 1921 allowed sea lampreys to get through the canal to the next lake.

Here's a list of their arrival dates in each lake:

- Lake Erie, 1921
- Lake Huron, 1932
- Lake Ontario, 1935
- Lake Michigan, 1936
- Lake Superior, 1938

Sea lampreys will lay over 100,000 eggs when spawning, much more than the native lamprey species.

Extermination Techniques: Lampricides (poison) was first used in the late 1950s to kill larval lampreys. The chemical was not harmful to humans and didn't effect many plants, invertebrates, fish or waterfowl populations. The chemical worked, but it was costly and did kill some young fish. In 1958 biologists estimated that the Brule River in Wisconsin produced over 22,000 lampreys each year. The Great Lakes Fishery Commission said that this population made up 30-50 percent of all the lampreys captured on American tributaries. Something had to be done!

In 1986, DNR fish managers, technicians and engineers designed a new lamprey barrier which let fish migrate through to spawn, but captured the lamprey. On that first day, 2,000 lamprey were caught! The new barrier was expected to reduce the number of lamprey above the barrier to nearly zero. Today, biologists are still looking for ways to stop the spread of lampreys in lakes, streams, and rivers. The lamprey population is under control, but they are still a threat to aquatic ecosystems. Several million dollars are spent each year on these control methods. Native predatory fish, like the whitefish and lake trout, have been restocked by fisheries professionals to help maintain a healthy level of these species.

11) Why is the Sea Lamprey bad for the Great Lakes?

They can eat an estimated 40 pounds or more of fish in their lifetime, which upsets the ecosystem by killing off large fish and allows smaller fish, including Alewives, to thrive. Alewives are an invasive species that compete with native fish for food and resources.

12) How did the Sea Lamprey make it to the Great Lakes?

Sea Lampreys got to the Great Lakes through the Erie and Welland Canals, which were going through construction improvements.

13) Why are Sea Lampreys bad for people?

Sea Lampreys are bad for people because their feeding habits (an estimated 40+ pounds of fish in their lifetime) were making it hard for fishermen to make a living on the Great Lakes. The Sea Lampreys were decreasing the large sport fish populations.

14) Why is the Sea Lamprey a difficult species to control?

It's a difficult species to control because there are many, many Sea Lampreys—scientists estimated that a certain river in Wisconsin produced over 22,000 every year. In addition, lampricides, first used in the 1950's, was an effective but costly chemical that killed some young fish, so it wasn't the best solution.

15) What is being done to control the spread of the Sea Lamprey?

Scientists first tried using lampricides, an effective but costly chemical, but in 1986 a new method was revealed: a lamprey barrier, which allowed fish to swim through to spawn but caught lamprey. The barrier has been effective and the population of Sea Lamprey is under control.

Perfect Parasite PowerPoint Preparation Page

Please investigate three parasites. Make a quick sketch and add a description in the boxes below.

Common Name of parasite chosen:_____

Science Name of parasite chosen:_____

How is this parasite transmitted? / How do you get it?_____

_____

_____

_____

_____ Website:

_____ Author: _____ Year: _____

What are the health effects / symptoms?_____

_____

_____

_____

_____

_____

_____

Website: _____ Author: _____ Year: _____

What treatments are available?_____

_____

_____

_____

_____

_____

Website: _____ Author: _____ Year: _____

What is the life cycle of this parasite?_____

_____

_____

_____

_____

_____

Website: Author: Year:

Please draw and describe some info about parasites from the student PowerPoint presentations or teacher slideshow.

Part 3 Lesson 3 Symbiosis

Coevolution: The evolution of two or more species, each adapting to changes in the other.

These ecological relationships include:

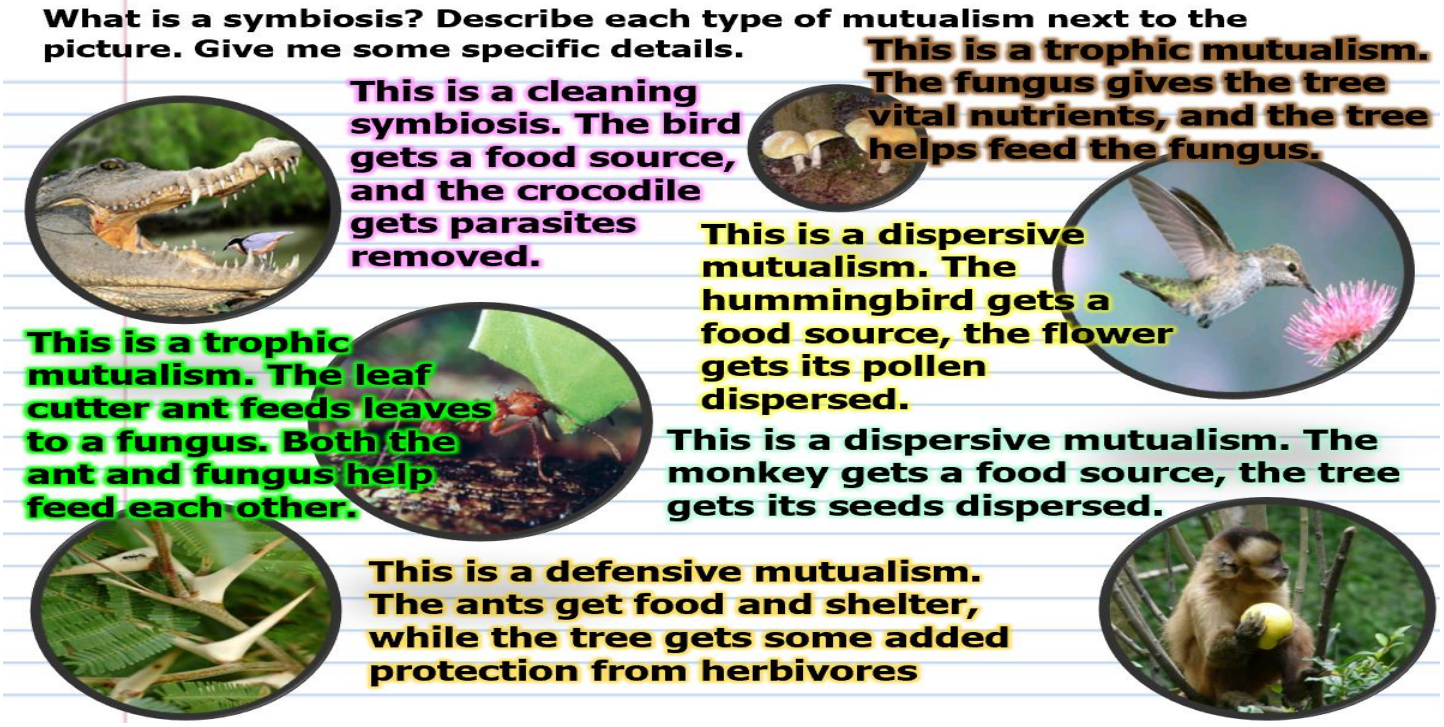
- Predator/prey and parasite/host
- Competitive species
- Mutualistic species

Mutualism: Both organism's benefit.

Types of mutualisms

- Trophic mutualism: Both species help feed each other.
  - Usually nutrient related.
- Cleaning symbiosis: One species gets food and shelter, the other has parasites removed.
- Defensive mutualisms: One species protects the other and gets some benefits for its help.
- Dispersive mutualisms: One species receives food in exchange for moving the pollen or seeds of its partner.

Describe each type of mutualism next to the picture. Give me some details if you can.



Type of Symbiosis
Commensalism: One organism benefits while the other doesn't benefit, or suffer harm.

Please describe how the picture on the right is commensalism? Make sure to include the definition of commensalism in your response. The Remora gets food scraps, protection, and a free ride from the shark, while the shark isn't hurt by the Remora but also doesn't benefit. This type of relationship is known as commensalism, where one organism benefits while the other does not (and is not harmed).	

How are bacteria all three types of symbiosis. Describe below.

Mutualistic: We provide a place to live and food, while the bacteria attack harmful microbes and digest food.	Commensalistic: Most bacteria in our body. They benefit but don't cause us harm.	Parasitic: Harmful bacteria that eat tissue and release toxins.

Each group must report to the class about a marine symbiosis. You should act it out!

- Imperial Shrimp and Sea Cucumbers
- Clownfish and Anemones
- Sharks and Remoras
- Green Turtles and Cleaning Fish

Notes:

Part 3 Lesson 4 Plant and Animal Interactions "Animal Offenses"

Herbivory: The consumption of plants by animals.

-Herbivores are animals adapted to eat plants.
-In predator-prey interactions, adaptations occur in both the herbivore and plant species it eats.

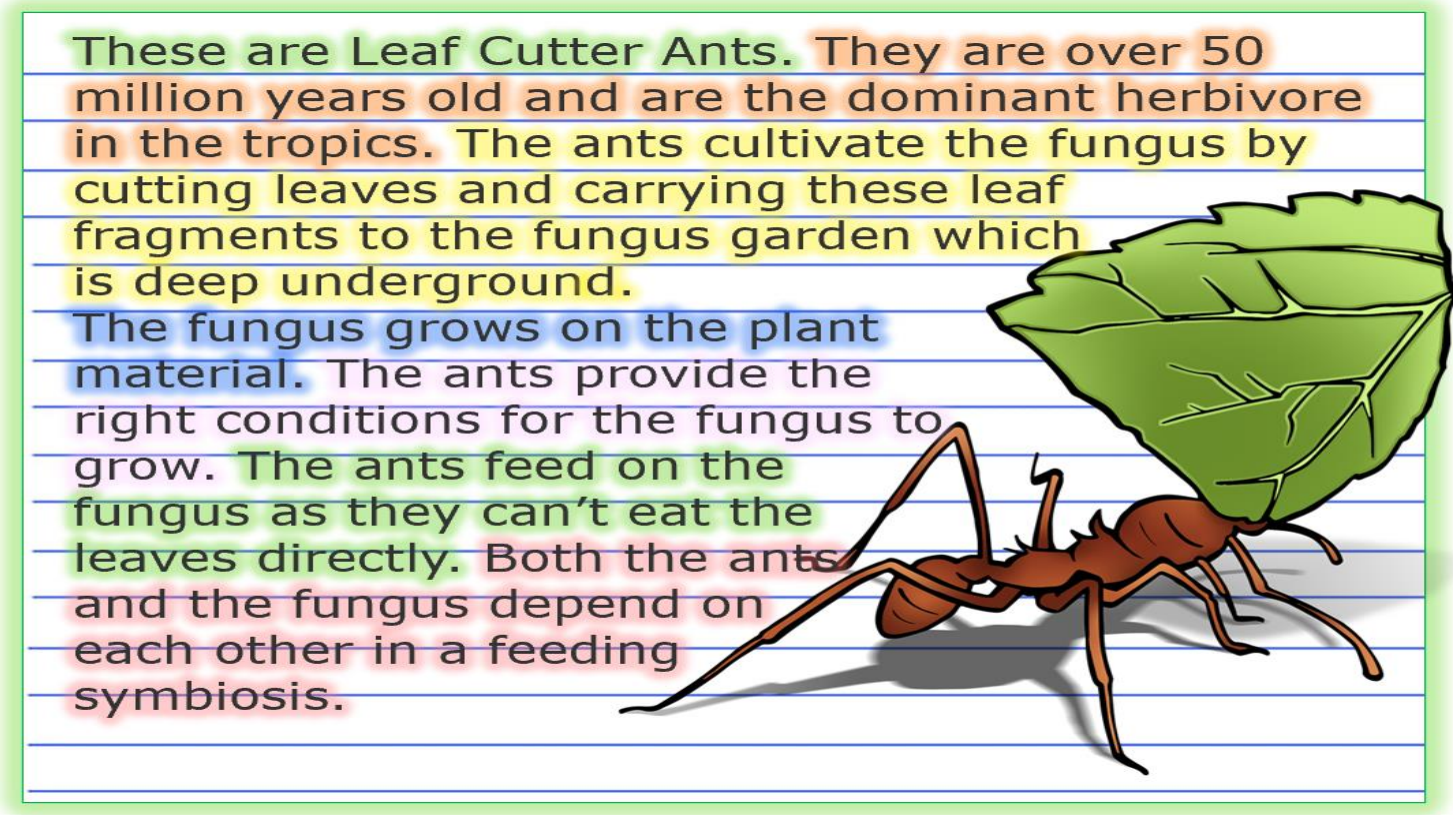
Plants and animals are always coevolving. Plants are creating defenses so they don't get eaten, and animals are evolving ways to get around these defenses and eat the plant.

Evolution: The gradual change in a species over time.

Coevolution: When two or more species influence each others evolution.

Animals Strategies to eat plants

Animals have special teeth and mouth parts to eat plants.
They use microbe farms (leaf cutter ants).



Four chambered stomachs (many herbivores)
Uses bacteria to break down difficult plant matter.
Take in plant toxins: You are able to eat poisonous plants.

Bugged Out

Please create an animal with many strategies to feed on plants and survive.

Insects: Give them specialized mandibles (teeth-like) or piercing mouth parts, ability to sequester (absorb) toxins, microbe farms.

Mammals: Four chambered stomachs with gut bacteria and grinding teeth.

Birds: Crushing Mouth Parts, gizzard stones

Camouflage or give it as a form of mimicry.

Batesian Mimicry (Looks like an object or other organism)

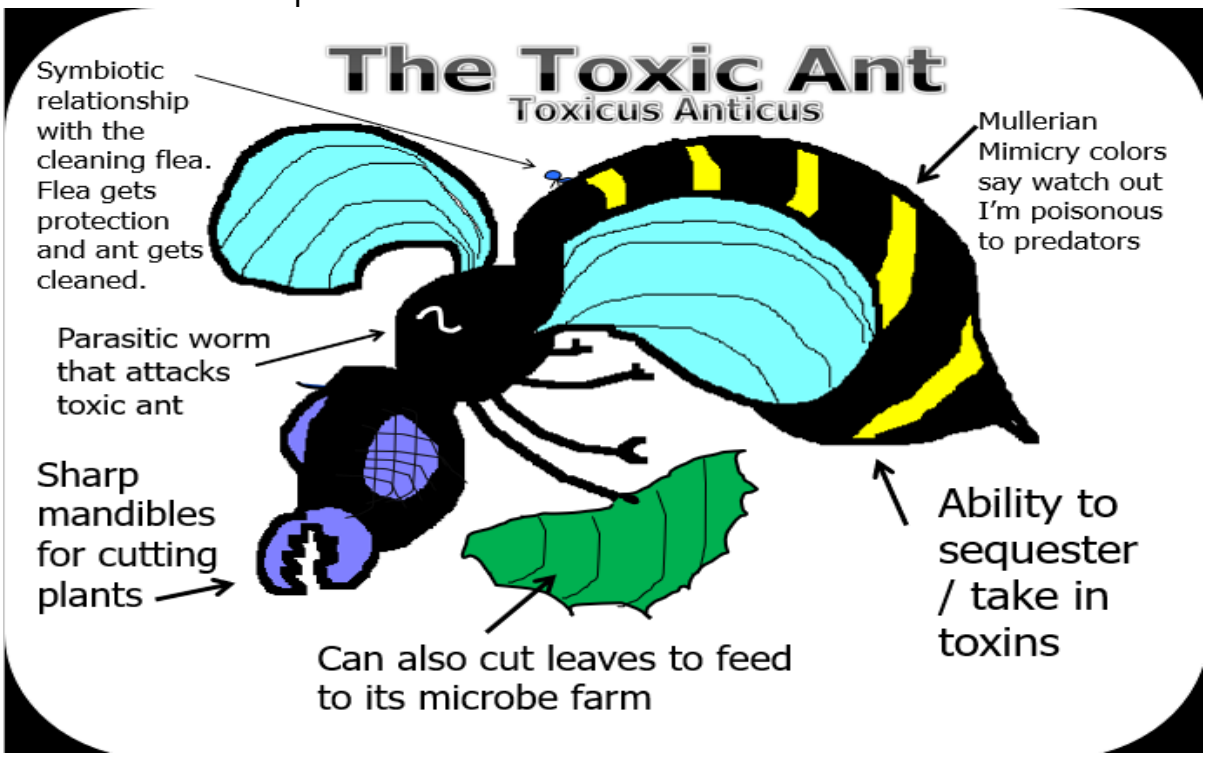
Mullerian Mimicry (Warning Coloration)

A symbiosis with another organisms

Ex. Cleaning symbiosis, Ex. Protective / defensive symbiosis

Give it a cool common and science name; Ex) The Super Ant (*Anticus killericus*)

- The animal should be well drawn, and all the strategies should be labeled neatly with a brief description.



Part 3 Lesson 5 Plant Defenses

Plant defense mechanisms against herbivory.

Grow in a place difficult to be eaten.

Be Camouflaged

Repair quickly and let them eat the non-essential parts of you.

Mechanical Defenses: Hairs, thorns, prickles, serrated edges, and sap.

A prickle is sharp-pointed outgrowth on the bark or epidermis.

A thorn is woody.

Chemical Defenses such as toxins: Plants become poisonous (nicotine, mustard, caffeine).

Be extremely hard to digest.

Cellulose is a complex sugar.

You have protective insects, birds, or mammals that attack predators.

You feed your friends a bit (mutualism).

Name this plant? Poison Ivy

Poison Ivy: A North American ivy plant of the cashew family that secretes an irritant oil from its leaves, which can cause blisters and a rash.

Please describe Poison Ivy in the Spring, Summer, Fall, and Winter. Sketches work as well.

Spring	Summer	Fall	Winter
			

Quiz Wiz –Poison Ivy Identification. 1-10, Write Poison Ivy for the slides that are, and Not Ivy for the others.

1) Poison Ivy	2) Not Ivy	3) Not Ivy
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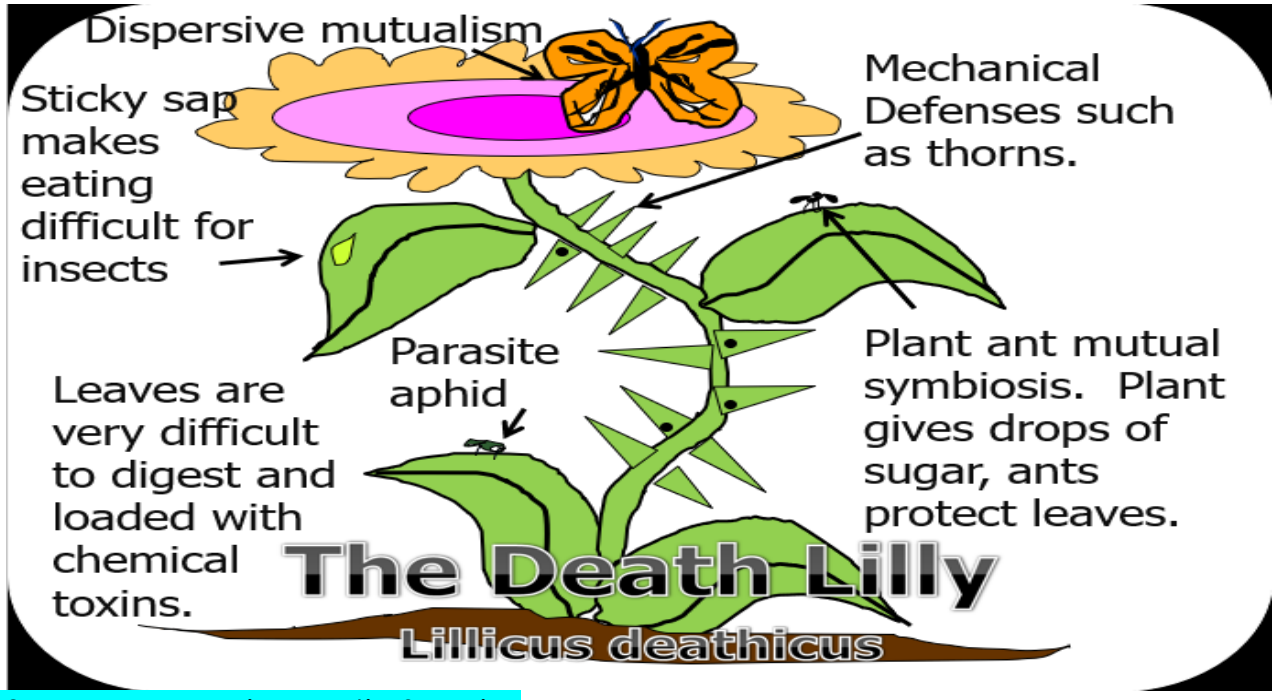
Plant Defenses Activity

Please create a unique plant with many defenses. Give it a cool name, Science and Common. The plant should be well drawn, and all of the strategies should be labeled neatly with a brief description. Feel free to give it a dispersive mutualism or parasite.



Part 3 Lesson 7 Invasive Exotic Species

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Human activities (globalization) have greatly increased the spread of exotic species.

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Illegal stockings	

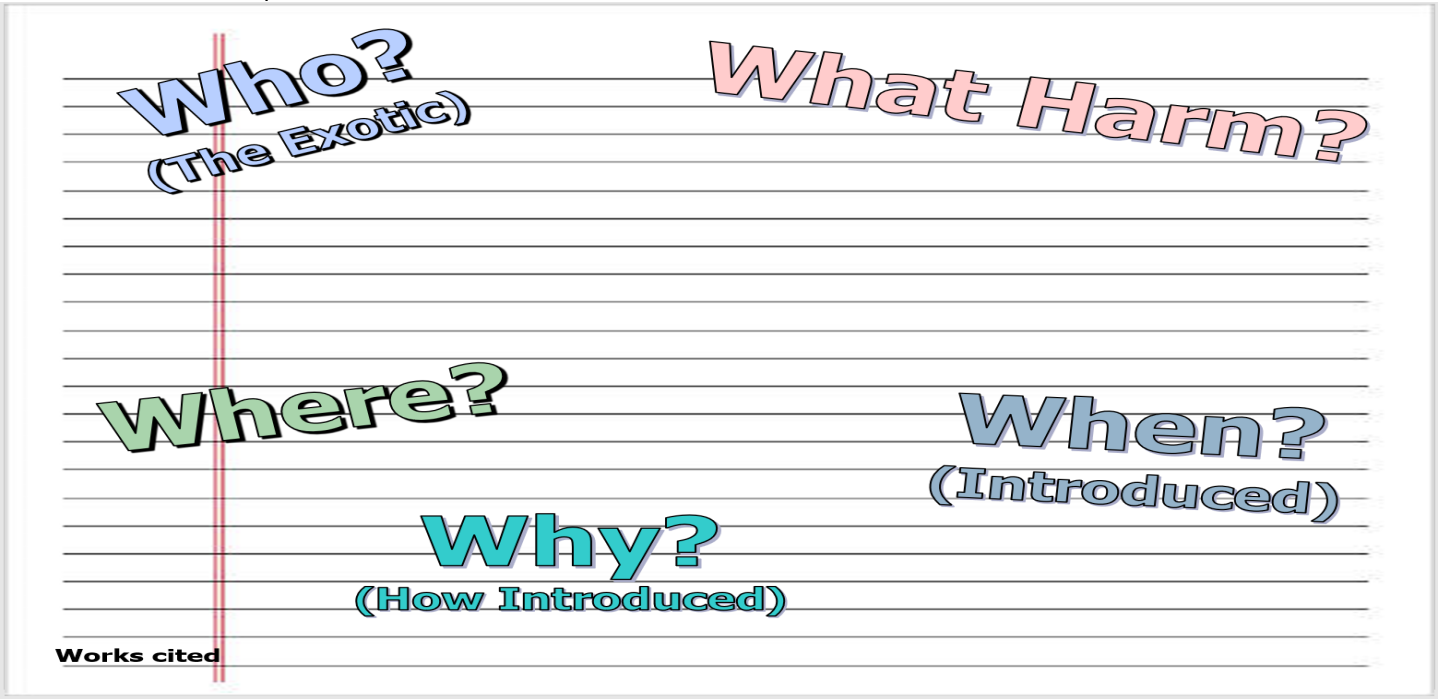
Negative impacts of invasive exotic species.

- Increased predation.
- Increased competition.
- Spread disease
- Habitat destruction.
- Cause the extinction of a native species.
- Damage the economy.
- Damage to human health.

Biological control: The purposeful introduction of natural enemies to control exotic species.

Name of the Invasive Exotic Species you group will research? Name_____
Group members _____

Notes on Exotic Species



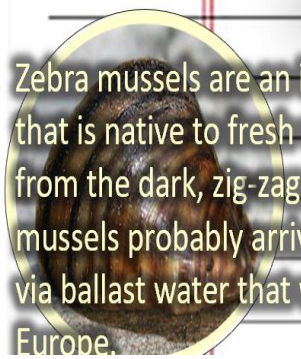
The Nile perch is an invasive exotic species released into the Nile river and other Lakes in Africa. It's a fierce predator that has had a devastating impact in its initial and introduced habitats.

The Kudzu or Mile a Minute Vine is an invasive plant that is fast-growing. Kudzu outcompetes everything from native grasses to fully mature trees by shading them from the sunlight they need to photosynthesize.

They feed on their own species as well as others, including crustaceans, mollusks and insects. As the fish matures its appetite increases.

Japanese knotweed is a non-native invasive plant that was introduced from Asia as an ornamental plant. Knotweed spreads vegetatively by rhizomes and also sprouts from fragments of root and stem material, which are dispersed by water, equipment or in fill.

Feral swine are descendants of escaped or released pigs. Feral swine are called by many names including; wild boar, wild hog, razorback, piney woods rooter, and Russian or Eurasian boar. No matter the name they are a dangerous, destructive, invasive species.



Zebra mussels are an invasive, fingernail-sized mollusk that is native to fresh waters in Eurasia. Their name comes from the dark, zig-zagged stripes on each shell. Zebra mussels probably arrived in the Great Lakes in the 1980s via ballast water that was discharged by large ships from Europe.

Nutria are large, semi-aquatic rodents that are native to South America. They cause extensive damage to wetlands, agricultural crops, and structural foundations such as dikes and roads.

Part 3 Lesson 8 WANTED Poster and Wrap Up

Activity! Creating a **WANTED** poster for an invasive exotic species.

- One page, should have WANTED in bold print.
- Use the internet to research from a list of exotics.
- Requires picture of the specimen and name.
- Information about exotic.
- Describes the negative impacts of the exotic.
- What is being done to control the exotic?
- How did the exotic arrive?

EXAMPLE WITHOUT ANSWERS TO QUESTIONS:

WANTED Exotic Species Poster Name:

Please record the name and a quick sketch of three exotic species and then choose one by circling it.

Please record general information about the species:_____

Author: Year: Title:

Website URL:

How did it get here and where does it live in the US or abroad?_____

Author: Year: Title:
Website URL:
What damage does it cause to people and the ecosystem?

Author: Year: Title:
Website URL:

What is being done to prevent its spread?

Author: Year: Title:
Website URL:

Please describe some of the negative impacts and other information about some invasive exotic species. Provide a sketch under the WANTED Posters created by classmates with the name

Invasive Exotic Species

What can you tell me about each of the pictures below? Provide an example from the unit.

Ecological systems are organized within each other. The affects on one system will affect them all. All systems are interconnected. Example: Symbiosis (parasitism, mutualism, commensalism).

Animals are interconnected in a complex web of life. Changes on one part of the web will affect other parts of the web and the stability of the entire ecosystem. Example: relationships between predator/prey and parasite/host, and competitive species and mutualistic species.

Ecosystems have a way to balance changes so that up and down fluctuations are part of the natural balance of the whole. Example: human activities, invasive/exotic species.

All organisms are in a constant state of change over time with the environment. Some organisms will change with another and will develop special interactions. Others with the nonliving world. Example: Parasitism, mutualism, and commensalism.

Matter and energy cycle through the living and nonliving world. Organisms rely on this matter and energy cycling to survive. Example: predator/prey relationships, parasite/host relationships, competitive species.

Organisms need energy to survive. Energy from the sun flows into and out of systems. This energy drives our world and the organisms in it. Energy is lost, not destroyed, when it changes form. Flows hot to cold. Example: Parasitism.

What can you tell me about each of the pictures below? Provide an example from the unit.

Leve

Symbiosis

[illegible]	Commensalism	Mutualism
Neutral	Neutral	Commensalism
Interspecific Competition?	Neutral	Parasitism

Interconnectedness

WEB

Mutualisms

Balance

Invasive Exotics Species

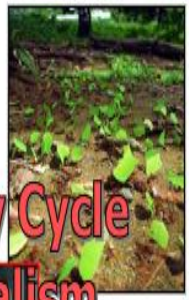
ange

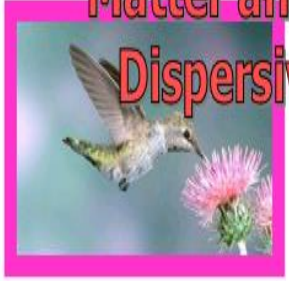
Coevolution

Cycles

Matter and Energy Cycle

Dispersive Mutualism





Flow

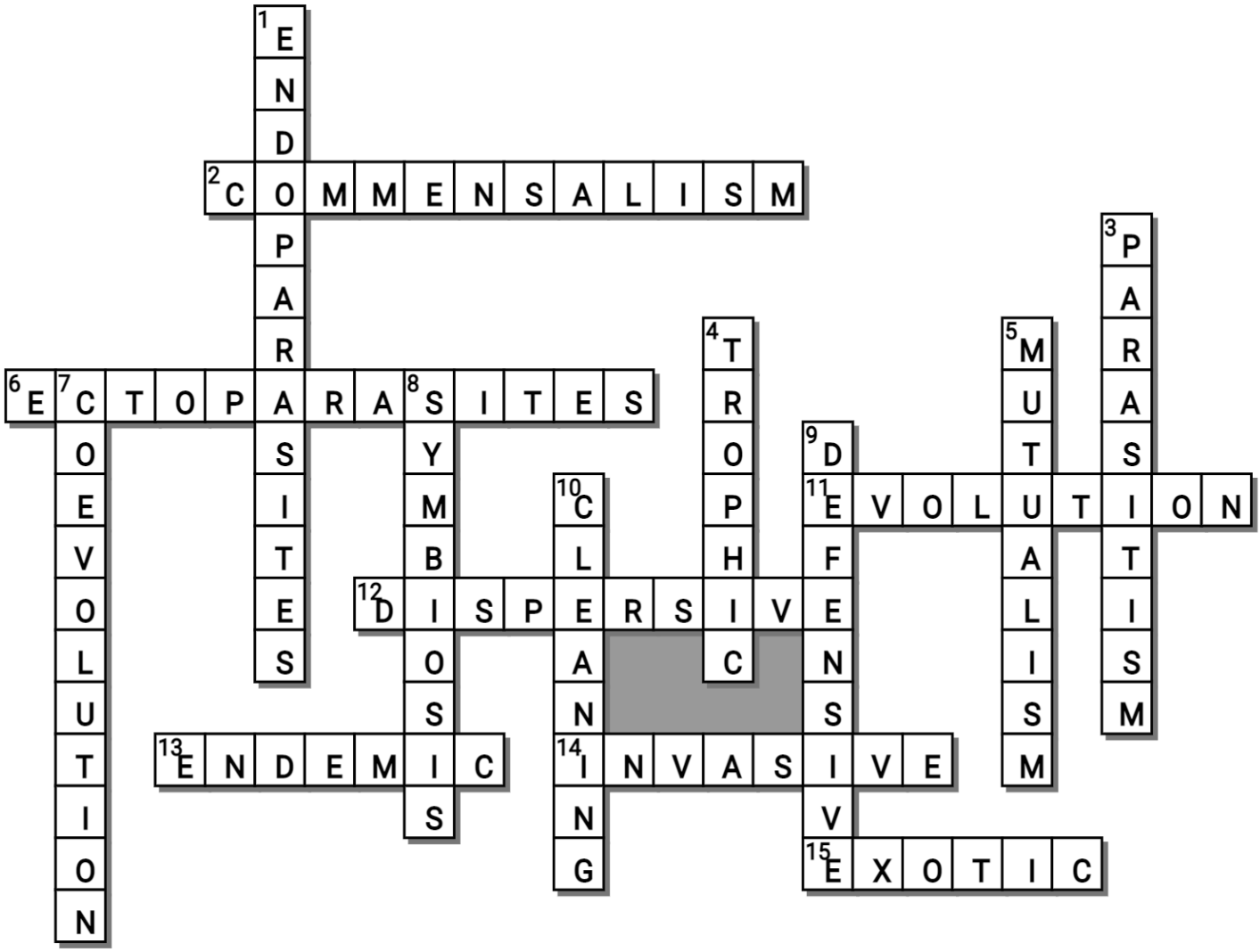
Energy flows into and out of systems

Across

2. One organism benefits while the other doesn't benefit, or suffer harm.
6. Two general types of parasites :_____ live Outside your body.
11. The gradual change in a species over time.
12. _____mutualisms: One species receives food in exchange for moving the pollen or seeds of its partner.
13. Has lived in the area for a considerable amount of time. (Native)
14. _____ Exotic Species: Exotic Species that cause damge
15. _____ species: A species that has been introduced to an ecosystem that is not native to the area.

Down

1. Two general types of parasites _____: Inside your body.
3. One organism benefits while the other is harmed.
4. _____ mutualism: Both species help feed each other.
5. Both organism's benefit.
7. The evolution of two or more species, each adapting to changes in the other.
8. A long term relationship between two or more different species.
9. _____ mutualisms: One species protects the other and gets some benefits for its help.
10. _____ symbiosis: One species gets food and shelter, the other has parasites removed.



----------teacher can remove this word bank to make puzzle more challenging----------

Possible Answers

CLEANING, COEVOLUTION, COMMENSALISM, DEFENSIVE, DISPERSIVE, ECTOPARASITES, ENDEMIC, ENDOPARASITES, EVOLUTION, EXOTIC, INVASIVE, MUTUALISM, PARASITISM, SYMBIOSIS, TROPHIC

Part 2 Review Game Lesson 11

Name:

1-10 = 5 pts * = Bonus + 1 pt,
(Secretly write owl in correct space +1 pt)
Final Question = 5 pt wager

Due: Today
Score ____ / 100

GET OFF ME	BY MY SIDE	STRANGE PETS	NOT FROM HERE	FOREIGN FILMS Bonus round 1 pt each
1) Symbiosis	6) Brood parasitism	11) Defensive mutualism	16) A= Thorns (mechanical defense) B= Microbe farms (fungus and bacteria)	*21) Ratatouille
2) Parasitism	7) Sea Lamprey	12) Cleaning symbiosis	17) B is Poison Ivy	*22) James Bond 007
3) True	8) Coevolution	13) Dispersive mutualism	18) Invasive Exotic Species	*23) The Mummy
4) True	9) A= Mutualistic B= Predator/prey C= Competitive (for light and nutrients)	14) Commensalism	19) Native/Endemic	*24) Finding Nemo
5) A= ectoparasite (outside body) B= endoparasite (inside body)	10) Trophic mutualism	15) D: Mutualistic, commensalistic, and parasitic	20) Cane toads Zebra Mussels Common Starling Etc.	*25) The Karate Kid

Final Question Wager ____/5 Answer:

Exotic species travel by…	Other ways exotic species are spread.
Ballast water	Domestic animals become feral
Boat hulls	Disposal of waste water (has seeds in it)
Aquaculture escape	Science laboratory escape
Intentional introductions	Sea food packaging disposal
Aquarium releases	Past government programs.
Live food industry (escapes)	Moving fill (has seeds)
Driving vehicles	Land and water alterations
Escaped ornamental plants	Biological control introductions
Fishing bait release	Introduce and exotic to control an exotic.
Illegal stockings	