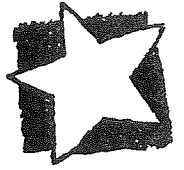


Energy in an Ecosystem



A Sixth Grade Unit
supporting the
Michigan Science K-7 Content Expectations

Name: _____



Name: _____

Date: _____

1

The Moose and Wolf Relationship on Isle Royale, Michigan

Isle Royale, Michigan is an island located in the northwest portion of Lake Superior. It is approximately 80 km (50 miles) from Michigan's shore and 35 km (22 miles) from the Canadian shore. The moose first arrived on the island in about the year 1900 when they swam across Lake Superior from Minnesota. They enjoyed a predator-free environment and the moose population thrived. In 1949 the area experienced a particularly cold winter and a small ice bridge formed between Ontario, Canada and Isle Royale. A pair of wolves crossed the ice bridge and a predator was introduced to the island.

Since 1959, scientists have studied the moose and wolf populations to better understand how the moose and wolf interact and the predator/prey relationship. Isle Royale provides a somewhat "closed ecosystem" for scientists to study. The island is protected and the moose and wolves can be studied without human activity or intervention. There is little migration of other animals onto and off of the island.

When the research first began, many researchers believed that the population of the moose and wolf would eventually reach an equilibrium, or stabilize. The study has not yet shown a trend in moose and wolf counts and the numbers tend to increase and decrease unpredictably.

Moose and wolves are not the only animals on the island. Beavers, snowshoe hares, red fox, mice, squirrels, birds, waterfowl, and an abundance of insects are part of the biotic makeup of the Isle Royale community. The moose is the main or preferred diet of the wolf but they have been observed hunting and eating the snowshoe hares and beavers. The beavers compete with the moose for the same vegetation as a food source, affecting both moose and beaver populations.

The climate on Isle Royale also plays a role in the moose/wolf relationship. The recent summers on Isle Royale have been warming up. The warmer climate in recent years has produced more insects, especially ticks. Ticks consume the flesh of mammals and cause sores, hair loss, and disease. Harsh winters and abundant snowfall make it difficult for the moose and wolf alike. Hunting and foraging are more difficult in the extreme cold and deep snow for both animals.

Look at the wolf and moose population data from 1959 to the present on the following page. Make a graph that illustrates the population increases and decreases. Write questions you have about the relationship between the moose and the wolf populations on Isle Royale.



A C T I V I T Y

The Moose/Wolf Relationship
(cont.)

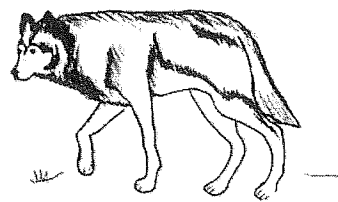
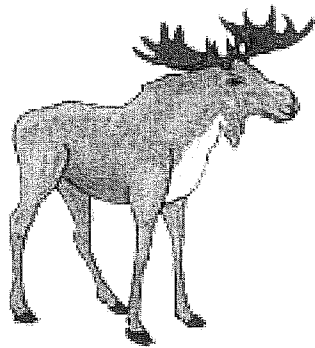
Name: _____

Date: _____

1

Moose/Wolf Data Population Chart

| Year | Moose Population | Wolf Population |
|------|------------------|-----------------|
| 1960 | 500 | 18 |
| 1965 | 600 | 25 |
| 1970 | 1250 | 17 |
| 1975 | 1400 | 40 |
| 1980 | 1000 | 50 |
| 1985 | 1100 | 22 |
| 1990 | 1150 | 15 |
| 1995 | 2450 | 18 |
| 2000 | 1000 | 20 |
| 2005 | 500 | 30 |
| 2008 | 700 | 23 |



Name: _____

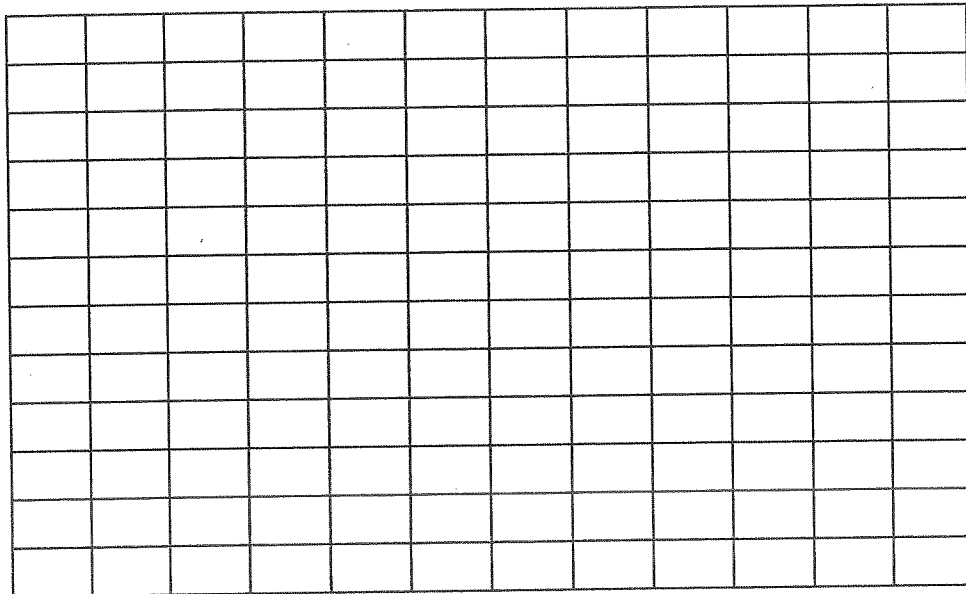
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A C T I V I T Y
The Moose/Wolf Relationship
(cont.)

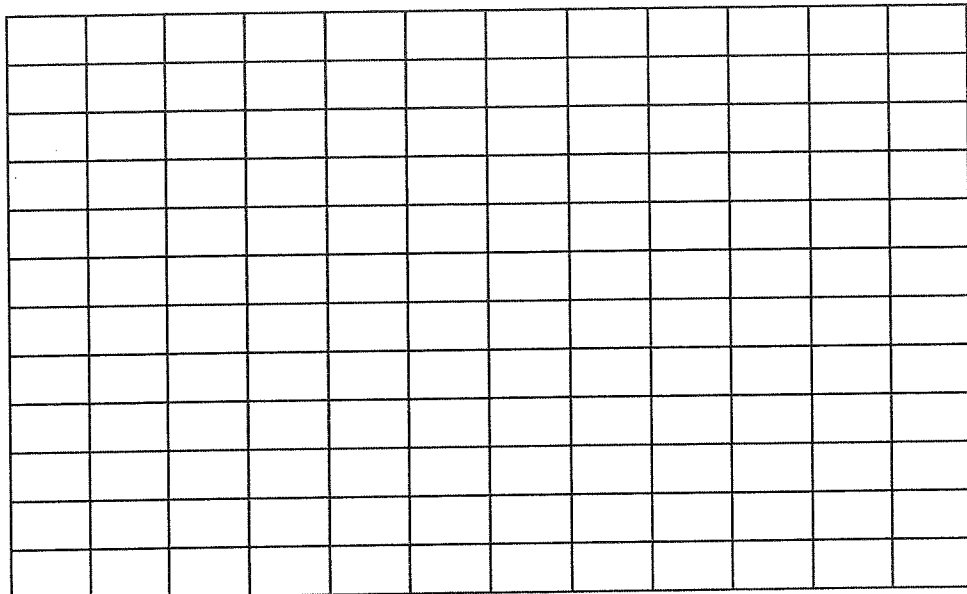


1

Moose Population Graph



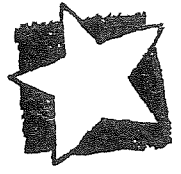
Wolf Population Graph



Name: _____

Date: _____

A C T I V I T Y
Populations in Ecosystems



2

.....

1. Draw and label a picture of your observation animal.

2. Write about your observations of your animal. Tell what physical characteristics you observed.

3. Record at least three questions you have about your observation animal.



Name: _____

Date: _____

2

1. Draw and label an illustration of the classroom ecosystem.

2. Describe the role of each organism in the classroom ecosystem.

Name: _____

Date: _____



1. In the *Classroom Ecosystem Observation Logs*, your class will record the name of observer, time of observation, temperature, soil, water, and light conditions before each entry. Write how this information might be helpful in learning more about the relationship and interaction between organisms and their environment.

2. List at least three questions about the organisms in the ecosystem that you think can be answered through observations.



A C T I V I T Y

**Species, Populations, and
Communities in the Schoolyard**

Name: _____

Date: _____

4

.....

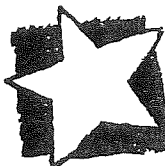
1. Draw a picture of one animal in its surroundings that you observed in the schoolyard. Include in your drawing some of the living and nonliving things that surrounded the animal.

2. Write what role you think the animal plays in the ecosystem (consumer, decomposer). Explain why you think that.

Name: _____

Date: _____

A C T I V I T Y
**Species, Populations, and
Communities in the Schoolyard
(cont.)**



4

-
3. Make a detailed drawing of the animal you selected from the schoolyard. Include labels on the different parts of the animal in your drawing.



**Species, Populations, and
Communities in the Schoolyard
(cont.)**

Name: _____

Date: _____

4

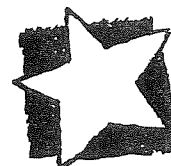
1. Draw a food web that describes the classroom ecosystem. Label the food web using the terms *producer*, *consumer*, *decomposer*, *predator*, and *prey*.

2. Describe the role of the consumer and decomposer in the ecosystem. Describe how the consumer and decomposer obtain food (energy).

Name: _____

Date: _____

A C T I V I T Y
**Relationships Within an
Ecosystem**



5

Relationships In An Ecosystem

Living things interact with one another as they find their needs to survive within an ecosystem. It is the interaction among organisms that forms relationships necessary for the survival of the populations of species and the balance of populations within the ecosystem. Some relationships between organisms are harmful to one of the species; some relationships are beneficial to one or both of the species. There are three main classifications of organism relationships: predation, competition, and symbiosis. Within the classification of symbiosis there exists three distinct relationships: mutualism, commensalism, and parasitism.

Predation

Predation is the interaction between a predator and a prey. It is the part of a food chain where one animal kills another animal for food. The wolf and the moose relationship is an example of predation. The wolf is the predator and the moose is the prey. The wolf is dependent on the moose population for food. The bird and insect relationship is a commonly observed example of predation. The bird (predator) relies on the insect population (prey) for its source of energy.

Competition

When different species share the same environment, there is a natural competition for the resources available. Species may compete for the same food source, water source, space, and nutrients in the soil. All ecosystems have a limited amount of food, water, and shelter. Competition is the struggle between the species to survive, using the limited amount of resources in the ecosystem. In the prairie grass ecosystem, the prairie grasses are the most common source of food for the herbivores (plant eaters) that make the prairie their habitat. The rabbits, prairie dogs, and pronghorn antelope are dependent on an abundance of prairie grass for their food. The animals are in a competitive relationship. A balance in the prairie grass ecosystem is maintained by the balance of animals and the ability for the grasses to continue to grow and re-grow after being eaten by the animals of the prairie. Think about what would happen to the prairie dogs, rabbits, and pronghorn antelope if there were a drought on the prairie.



A C T I V I T Y

Relationships Within an Ecosystem (cont.)

Name: _____

Date: _____

5

Symbiosis

Mutualism - When most people think of a symbiotic relationship, they refer to mutualism. Mutualism is when both organisms benefit from one another. A simple example of mutualism is the relationship between the flowering plant and the bee. The bee benefits from the food gathered from the flower and the plant benefits from the pollination. Pollination is the process of fertilization that is key in plant reproduction. Another example of mutualism is the relationship between the oxpecker and the hippopotamus. The oxpecker is a bird that rides and feeds on the back of the hippopotamus. It eats the ticks off the hide of the hippopotamus. The bird benefits from a meal and the hippo benefits from a clean, tick-free hide.

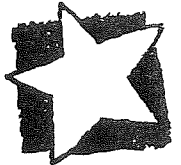
Parasitism - In a parasitic relationship, there is a host that is usually harmed in some manner and a parasite that benefits from the relationship. The relationship between the tick and the hippopotamus or the tick and the moose is an example of a parasitic relationship. The tick benefits from the relationship by finding a food source, but the hippo or moose can be harmed by the tick bite, causing infection, irritation, and possible disease. The parasite usually feeds on the host without killing it, but may cause harm or disease. Mosquitoes are a parasite that feed on the blood of other animals, including humans!

Commensalism - The final symbiotic relationship is an interaction where one species benefits and the other species is neither harmed nor benefited. An example of commensalism is the cattle egret that follows grazing animals, such as cattle and bison. The movement of the grazing herd stirs up insects from the ground and plant growth; the egrets follow along and catch the fleeing insects. The birds benefit and the cattle and bison are unaffected by their presence. Birds also have a relationship with trees as a form of commensalism. The birds build their nests in the branches of trees and the trees are unaffected by their presence.

Name: _____

Date: _____

ACTIVITY
**Relationships Within an
Ecosystem (cont.)**



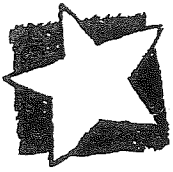
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Identify one example of each relationship within an ecosystem from the Isle Royale or prairie food webs. Explain why the relationship is classified as competition, predation, commensalism, parasitism, or mutualism.

1. Competition

2. Predation



A C T I V I T Y
**Relationships Within an
Ecosystem (cont.)**

Name: _____

Date: _____

5

.....

3. Commensalism

4. Parasitism

Name: _____

Date: _____

A C T I V I T Y
**Relationships Within an
Ecosystem (cont.)**



5

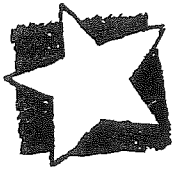
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1. Write the question you are investigating.

2. Write what you think your investigation will demonstrate.

3. List the materials you will use.

4. Write the steps you took.



A C T I V I T Y

**Relationships Within an
Ecosystem (cont.)**

Name: _____

Date: _____

5

.....

5. Make a data chart and record your findings.

Name: _____

Date: _____

A C T I V I T Y
Relationships Within an
Ecosystem (cont.)



5

6. Write what you found out. Include a claim, evidence, and reasoning in your scientific explanation.

7. List any further questions that developed during your investigation.



Name: _____

Date: _____

6

1. Complete the Oak Forest food web.

2. Choose one organism in the food web. Describe the role of the organism in the food web and what would happen to the balance in the population if the organism disappeared.

Name: _____

Date: _____

ACTIVITY
**Losing Our Biodiversity and
 Natural Treasures**



Endangered and Extinct Species Product Descriptor

| Student magazine articles must include: | 0 | 1 | 2 | 3 | 4 |
|--|---|---|---|---|---|
| 1. identification of a plant or animal that is endangered, threatened, or extinct. | | | | | |
| 2. a description of the organism's ecosystem that includes its food source, habitat or shelter, and water source. | | | | | |
| 3. a description of the role the organism plays in its ecosystem (predator, prey, consumer, producer, decomposer). | | | | | |
| 4. a description of the cause or reason for the decline in the species population. | | | | | |
| 5. a description of what will happen to other organisms and the balance within the ecosystem if the population of the endangered species continues to decline. | | | | | |
| 6. a picture or drawing of the plant or animal. | | | | | |
| 7. a description of how scientists and other naturalists are taking steps to prevent the further decline in the organism's population and extinction of the species. | | | | | |
| Student oral/Power Point presentations must include: | 0 | 1 | 2 | 3 | 4 |
| 1. a detailed description of the physical characteristics of the plant or animal (color, size, outer covering, claws, teeth, limbs, or leaf and root structures). | | | | | |
| 2. a detailed description of the behavioral characteristics of the plant or animal that helps it to survive. | | | | | |
| 3. a detailed description of the ecosystem where the animal or plant lives and finds its needs for survival. | | | | | |
| 4. a description of the role the organism plays in its ecosystem (predator, prey, consumer, producer, decomposer). | | | | | |
| 5. a description of the organism's ecosystem that includes its food source, habitat or shelter, and water source. | | | | | |
| 6. a description of the cause or reason for the decline in the species population. | | | | | |
| 7. a description of what will happen to other organisms and the balance within the ecosystem if the population of the endangered species continues to decline. | | | | | |
| 8. a picture or drawing of the plant or animal. | | | | | |
| 9. a description of how scientists and other naturalists are taking steps to prevent the further decline in the organism's population and extinction of the species. | | | | | |
| 10. an opinion of how others can help in saving the endangered species or how to prevent the extinction of the other species. | | | | | |



A C T I V I T Y
Ecosystems in Michigan

Name: _____

Date: _____

8

As a group, brainstorm ideas of what living factors, nonliving factors, and environmental conditions (climate and weather) make up your ecosystem.

1. Write the type of ecosystem your group is exploring: _____
2. List the biotic factors that are part of your ecosystem.

3. List the abiotic factors that are part of your ecosystem.

4. List animals and plants that are able to survive in more than one Michigan ecosystem.

5. List animals and plants that are restricted to one kind of ecosystem.



Name: _____

Date: _____



1. Draw and label a food web that represents the flow of energy in the Michigan ecosystem you studied.

2. Describe what would happen if one of the populations of organisms in the food web became overpopulated.

3. Describe what might cause a population of organisms to become overcrowded.



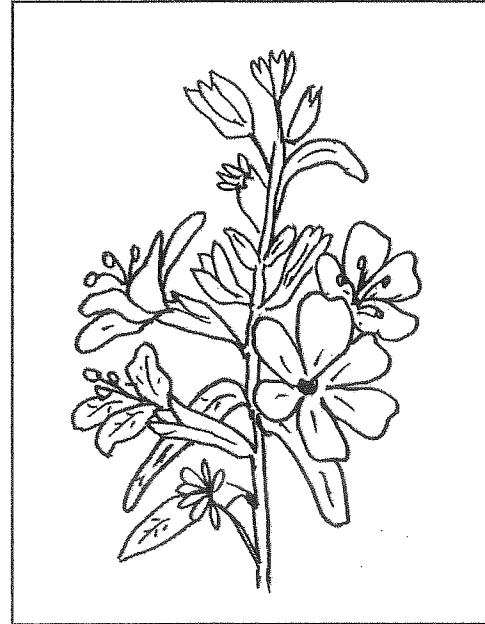
Name: _____

Date: _____

9

Purple Loosestrife - A Beauty of a Beast!**Physical Description:**

Purple loosestrife is a perennial plant, which means that it can re-grow each year. Purple loosestrife has a dense bushy growth of a single stem to over fifty stems that stand between 1.0 to 2.13 meters (3–7 feet) tall. It is the showy flowers that make the purple loosestrife such a beautiful plant. The blossoms can range from a bright purple to a magenta color. They bloom from early July to September. The petals form long spikes at the top of a green to purple stem. Short, thin, alternating leaves adorn the stems from the base to the blossom. The roots of the purple loosestrife are called taproots. They are large, woody roots that grow deep into the soil and send out hair-like fibrous roots that form a stable platform or mat for the plants to spread and grow.



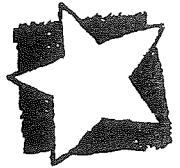
The plant can germinate, grow, and survive on a wide range of soil conditions. It grows the best in moist soils and is found in large numbers along streams, around ponds, and bordering wetlands. Any sunny or partly shaded wetland is susceptible to a purple loosestrife invasion. They produce between 100,000 to 300,000 seeds a year and the seeds can remain viable for many years. When the soil is moist and the temperatures are warm, the seeds germinate and the purple loosestrife spreads. The seeds are dispersed throughout the area and carried to new wetlands by wind, water, animals, boats, and human activity. They can be carried for long distances, spreading the purple beauty for miles.

Origin:

Purple loosestrife was introduced in the United States from Europe. It was brought over to the United States by European settlers in the 1800s and introduced as a garden perennial. It continues to be sold in some areas as a garden plant for its beauty in landscaping and for its ability to attract bees and produce nectar for honey making. The plant has extended its range from the northeastern United States to most parts of the United States and Canada. The purple loosestrife thrives in areas that do not experience extremes of precipitation and temperatures. Temperate climates go from season to season without extremes; Michigan is considered to be in a temperate climate. Purple loosestrife has not spread to the deep south or far north.

Name: _____

Date: _____



Ecological Impact:

Currently, 24 states within the United States have laws that prohibit the importation and distribution of purple loosestrife because of its aggressive and invasive nature. The plant can multiply rapidly and take over a wetland, choking out the native plants that also make the wetlands their habitat. The cattail reed, a common wetland plant in Michigan and throughout the United States, is rapidly losing its habitat to the purple loosestrife. The animals within the wetland ecosystem that depend on the cattail for food, shelter, and nesting purposes, are also losing some things they need to survive.

The plant cannot only reproduce quickly, but it also has the ability to make adjustments and survive in a variety of soil conditions, giving it an advantage over the native species that are competing for space. In the United States there is a lack of a predator to keep the plant population in check. In Europe there are beetles that feed on the purple loosestrife and keep the growth in balance.

Purple loosestrife displaces native plants in wetlands and diminishes the biodiversity of plants in the surrounding area. The purple loosestrife can eventually take over a wetland and overrun thousands of acres in size, and almost entirely eliminate any open water in the ecosystem. It chokes waterways and diminishes the open water for fish, frogs, toads, turtles, and waterfowl. The purple loosestrife is competitively superior over the native wetland species.

What Can Be Done:

For small populations of purple loosestrife, the plant can be removed by hand. Once a large population of the plant is established, it is very difficult to remove. The use of herbicides in a wetland is very risky. The introduction of chemicals may affect the native plants and animals in the area as well. To help stop the further introduction and spread of purple loosestrife, gardeners and horticulturalists need to be careful and verify that the plants they use are only native plants to their area. Boaters should take care to thoroughly clean their watercraft (boats, canoes, rafts, and kayaks) before transporting it to another water way. Hikers should also take care to clean their boots of soil and seeds at the conclusion of a hike through any wetland or forested area. Volunteers are needed at local wetlands and parks to help remove the invasive species by hand and help educate others about the threat of the purple beastly beauty.



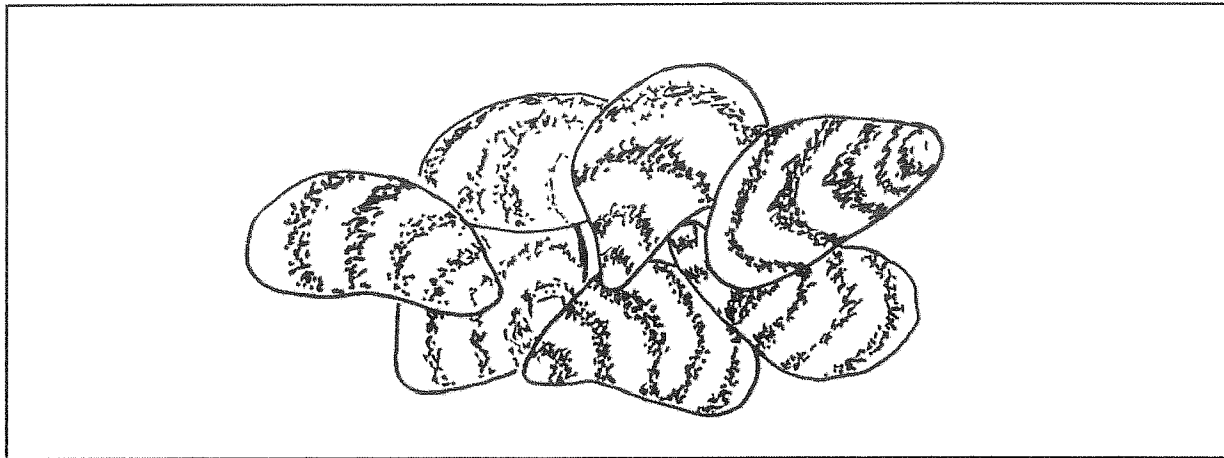
Name: _____

Date: _____

9**Zebra Mussels – Muscle Their Way Into Michigan Waters!****Physical Description:**

Zebra mussels are a small mussel with a striped pattern on their shells. The shells are all different with a variety of stripes and stripe formations. Coloring on the shells range from a light tan to browns and blacks. Zebra mussels are about the size of a fingernail and can grow to a maximum length of 5 cm (about 2 inches).

Young zebra mussels are very small and difficult to see. They swim freely in the waters and can easily spread by water currents. Once the zebra mussels have grown to adults they can attach themselves to hard surfaces, such as piers, docks, boats, pipes, pilings, and the outer coverings of other animals, crayfish, turtles, native mussels, and each other. The adult female zebra mussel begins to reproduce at two years of age and can lay between 30,000 to 1,000,000 eggs per year.

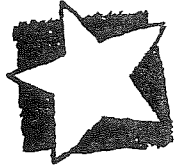
**Origin:**

Zebra mussels live in fresh water ecosystems at water depths between 6 to 24 feet. The origin of the zebra mussel is Russia. The animal was transported in the ballast water of large cargo ships. When the ships emptied their ballast water from their place of origin, the zebra mussels were released into the St. Lawrence Seaway and the Great Lakes. The first signs of zebra mussels in the Great Lakes occurred in 1988 in Lake St. Clair. In less than 10 years, zebra mussels spread to all five of the Great Lakes by attaching to ships and boats that travel from lake to lake. In 1992, only one inland lake in Michigan had evidence of zebra mussel populations. Today there are well over 100 inland lakes in Michigan with vast populations of the invasive zebra mussels.

Name: _____

Date: _____

A C T I V I T Y
**Invasive Species in Michigan
(cont.)**



9

Ecological Impact:

Zebra mussels are considered filter feeders. They feed on the microscopic and small animals and algae that are in the water by filtering the water in their surroundings. An adult zebra mussel can filter up to a quart of water per day, and when a lake or stream has an abundant population of zebra mussels, the entire lake or stream may be filtered in a day. They take in large quantities of organisms that are also the food source for other animals in the ecosystem. By depleting the food source of the fish in the ecosystem, it also affects the food source of larger fish, mollusks, and birds.

In the process of filtering the water, zebra mussels make the water of the lakes, rivers, and ponds very clear. Although this seems like a positive effect on the bodies of water, it can lead to an increase and overpopulation of the plant growth in the ecosystem. The clear water makes it possible for the sunlight to reach the bottom of the lakes, ponds and streams, increasing photosynthesis and plant growth.

What Can Be Done:

Once a zebra mussel population has become established in an ecosystem, it is impossible to remove it. The primary emphasis in controlling further growth and invasion is through education and prevention. Boaters and fishermen are advised, and in some area required by law, to clean the hulls and motors of their boats after removing the boat from a lake and prior to launching the boat into the water again. The introduction of poisons and chemicals into the water to kill the zebra mussels is not an option as the poisons and chemicals are harmful to other animals in the area, including humans! Scientists and naturalists are still looking for ways to safely eliminate the zebra mussels from the waters of the Great Lakes.



A C T I V I T Y

**Invasive Species in Michigan
(cont.)**

Name: _____

Date: _____

9

1. Describe the physical characteristics of the invasive species (purple loosestrife or zebra mussel). What does it look like?

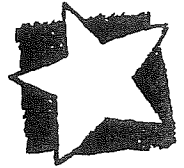
2. Describe how the invasive species arrived in Michigan. How did it get here?

3. Describe the ecosystem of the invasive species. What ecosystem has it invaded?

Name: _____

Date: _____

A C T I V I T Y
**Invasive Species in Michigan
(cont.)**

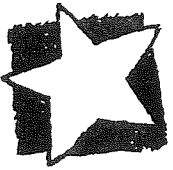


9

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4. Describe the effect the invasive species has on its adopted ecosystem. How does it upset the balance?

5. What are some of the steps scientists and naturalists are taking to stop the spread of the invasive species?



A C T I V I T Y

**Invasive Species in Michigan
(cont.)**

Name: _____

Date: _____

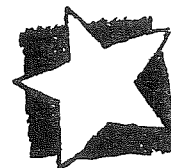
9

Invasive Species Facts Card Set Product Descriptor

| Student invasive species fact cards must include: | Yes | No |
|---|-----|----|
| Card #1: Cover Drawing and Title - Labeled drawing of a plant or animal that is an invasive species in Michigan. | | |
| Card #2: Physical Description - What do they look like? | | |
| Card #3: Origin - Where do they come from and how did they get to Michigan? | | |
| Card #4: Ecological Impact - How do they affect an ecosystem, the food web within the ecosystem, and the balance in an ecosystem? | | |
| Card #5: Prevention and control - What steps are being taken to prevent and control the population growth of the invasive species? | | |
| Student oral presentations must include: | Yes | No |
| 1. a detailed description of the physical characteristics of the invasive species. | | |
| 2. a description of the origin of the invasive species. | | |
| 3. a description of how the invasive species arrived in Michigan. | | |
| 4. a description of the effect of the invasive species on the ecosystem and its food web. | | |
| 5. a description of the current steps being taken to prevent and control the population growth of the invasive species. | | |
| 6. a personal recommendation of how people can help control and prevent the further spread and introduction of invasive species to Michigan. | | |
| 7. all members of the group. | | |
| 8. at least one visual aid - (drawing of species, map of food web, drawing of ecosystem, map of origin and how it traveled to Michigan, etc.) | | |

Name: _____

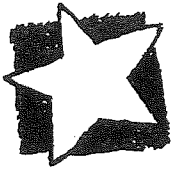
Date: _____



.....
Choose one invasive species that your class has researched: _____

1. Draw a food web of an ecosystem that has been invaded by the species.

2. Describe the effect the invasive species has on the food web.



A C T I V I T Y

Climate Change

Name: _____

Date: _____

10

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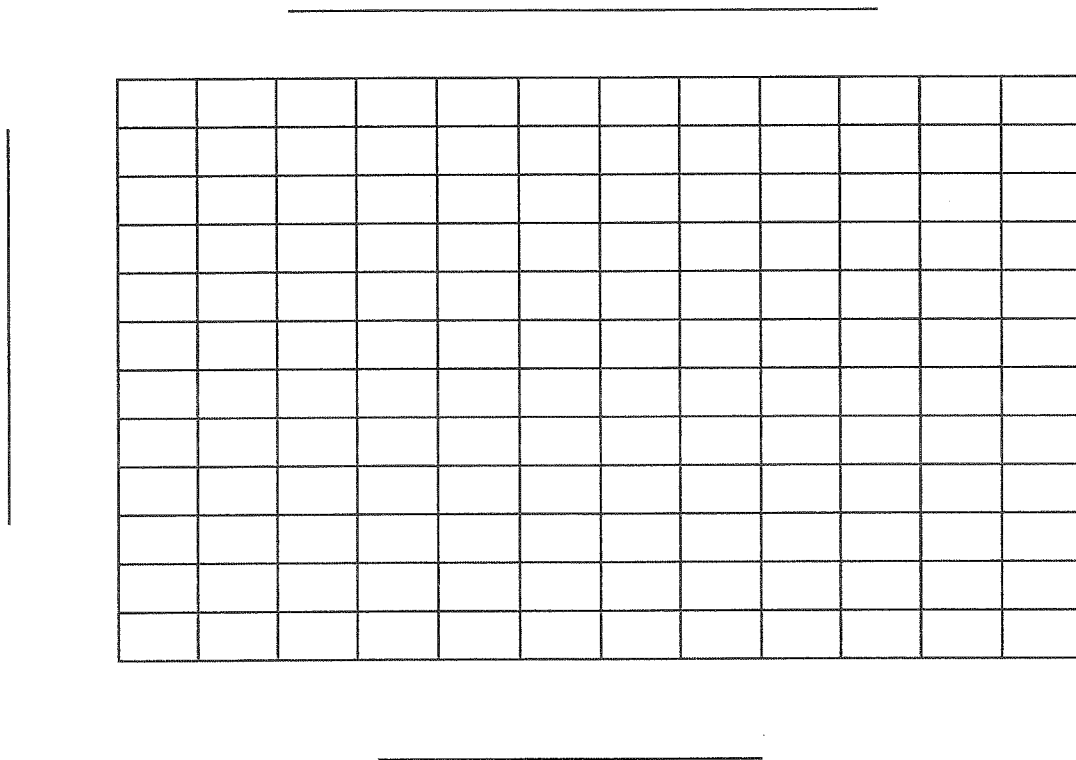
1. Make a chart of the temperature of the water in Bottle 1 and Bottle 2 pond ecosystems.

Name: _____

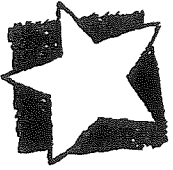
Date: _____



2. Graph the data from your chart.



3. Write a conclusion based on your data.



ACTIVITY
Climate Change (cont.)

Name: _____

Date: _____

10

1. What region is your team exploring? _____

2. Describe the ecosystem in your case study.

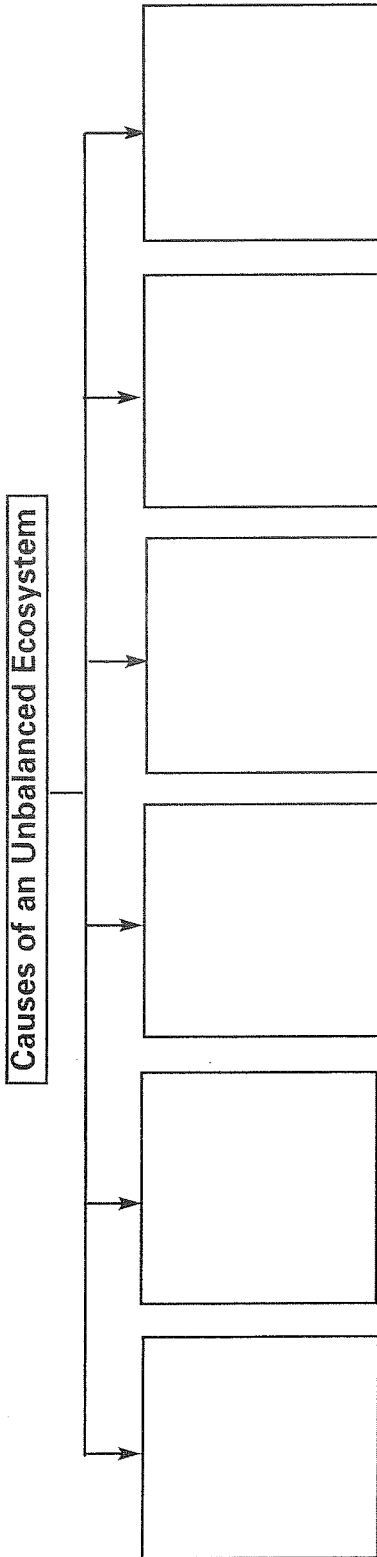
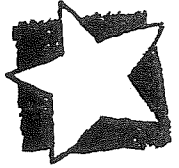
3. Describe the impacts of climate change on your ecosystem.

4. What effect does climate change have on the spotlighted species of your ecosystem?

5. Describe steps that are being taken to protect your ecosystem.

Name: _____

Date: _____





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abiotic components – Abiotic components of an ecosystem are the nonliving parts, such as air, water, soil, rocks, sunlight, temperature and other climate factors.

balance in an ecosystem - Balance in an ecosystem refers to the numbers of living organisms in an ecosystem that provide a balance between the food source and the organisms.

biotic components – Biotic components of an ecosystem are the living parts, including all the plants and animals.

climate change - Climate change is the long-term change in the average weather conditions in a region and on Earth as a whole.

community - A community is all the different populations that share an ecosystem or live together in one area.

competition - Competition is a relationship between species within an ecosystem for food, space/shelter, water, sunlight, or nutrients.

consumers – Consumers are organisms that eat other organisms to obtain energy.

decomposers – Decomposers are organisms that break down dead plants and/or animals to obtain energy. Bacteria and fungus are examples of decomposers.

ecosystem - An ecosystem includes the community plus all the aspects of nonliving (abiotic) things, such as water, air, soil, and climate.

endangered species - An endangered species is any organism that is in immediate danger of becoming extinct.

environmental impact - Environmental impact refers to the possible effect, positive or negative, of a change or program on an ecosystem.



Key Terms (cont.)

food web - A food web describes the way food (energy) passes from multiple organisms to other organisms. The food web includes more than one source of energy for the different organisms that live in the same ecosystem.

habitat destruction - Habitat destruction is a process that results in the devastation of a natural habitat causing the displacement or death of plants and animals in the region. The habitat is changed or destroyed so it can no longer support the organisms in their growth and survival.

invasive species - An invasive species is a species that is introduced into an area where it does not normally exist.

mutualism - Mutualism is a relationship between species in an ecosystem where both species benefit from the relationship.

parasitism - Parasitism is a relationship between species within an ecosystem where one species benefits (parasite) and the other species is harmed (host).

pollution - Pollution is the process where chemicals or materials that are produced or thrown away affect the quality of water, soil, or air. Pollution harms or destroys living things and affects the environment.

population - A population consists of all the members of one species in a particular area.

predator - A predator is an animal that hunts and eats other animals.

prey - Prey is an animal that is hunted and eaten by other animals.

producers - Producers are organisms that make their own food. Plants are producers.

resource depletion - Resource depletion refers to the exhaustion or using up of materials. Resources, referred to as renewable and non-renewable, are consumed or used beyond the ability of the ecosystem to regrow or replace them.



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source of energy - Source of energy refers to the food source for organisms in an ecosystem.

species - Species refer to a group of organisms that are physically similar, mate with one another, and produce offspring that can also mate and reproduce.

species extinction - Species extinction is the death of one species. Species extinction is final; the plant or animal will never exist on Earth again.

symbiosis - Symbiosis is a relationship where at least one species benefits and the other species is unharmed, benefits, or is harmed.