

The Big Bad (?) Wolf Predator and Prey: The Wolves and Moose of Isle Royale

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Goal Statement

In this unit, students will learn about the wolves and moose of Isle Royale and their predator/prey relationship. The students will graph actual research data from Isle Royale and will summarize and research the data to form opinions on population fluctuations. Students will learn how unique the Wolf-moose study at Isle Royale is. Students will discuss future human impact and global warming effects on Isle Royale.

Objectives

From this lesson students will be able to:

1. Describe how Isle Royale is a unique place for a research study on the predator/prey relationship.
2. Describe their awareness of the predator/prey relationship clearly in a brief essay on the wolves and moose of Isle Royale.
3. Organize and summarize a data set in a graph using graph paper or Excel.
4. Identify the factors in the Isle Royale ecosystem that influence fluctuations in population size
5. Describe the negative impact of human activities on the Isle Royale ecosystem.
6. List the possible consequences of global warming on Isle Royale.

Audience

The students that I teach live on the Keweenaw Peninsula of Michigan, which is located approximately 50 miles from Isle Royale. The Keweenaw Peninsula is similar to Isle Royale geographically and geologically (Shelton). Isle Royale is a place many of my students would like to visit one day and is also an ongoing research project that my students can explore and investigate. Wolves are now more common on the Keweenaw Peninsula and have been seen by students and teachers in our school. The Isle Royale wolf moose research project is close to home and a real life research project that my students can identify with. This is the longest continuous study of a predator and its prey in the world and it is



CELEBRATING

50
years

of RESEARCH

WOLVES

MOOSE

AND

ISLE ROYALE

M S T A • 2 0 0 8

Subject/

Target Grade

Grades 7-12

Biology or

Mathematics



Personal Statement

Experiencing the Ecology of Isle Royale class through Michigan Technological University has given me an awesome experience. I gained a greater appreciation for the environment, especially the wilderness and coldness of Lake Superior in June. Talking with the Rolf and Candy Peterson and seeing the skulls, antlers and bones

of the moose, put me in awe of the wolf-moose research being done. I found the study fascinating. I wanted to share my excitement of what I learned at Isle Royale with my students. Being that the 50th anniversary of the wolf- moose study in approaching, I wanted to bring the study into my classroom.

in our backyard. This study is different because it involves just a single predator (the wolf) and a single prey (the moose) on a small island with little human impact.

Isle Royale is the largest island located in Lake Superior. The island is approximately 45 miles in length and 9 miles wide. Isle Royale consists of Isle Royale (main island) and multiple smaller islands. Isle Royale is about 12 miles south of Canada, 20 miles Southeast of Grand Portage, Minnesota and 53 miles north of Copper Harbor, Michigan. Isle Royale National Park was established in 1940, designated a wilderness area in 1976 and an International Biosphere Reserve in 1980. Isle Royale is a remote island, the only mode of transportation available is by boat or seaplane. (http://en.wikipedia.org/wiki/Isle_Royale)

Moose first arrived at Isle Royale around 1900.

There are typically from 800 to 1200 moose on the island, but in 2007 the population is at 385. The moose population tends to increase in years with mild winters, early spring green-up, abundant winter forage, low wolf numbers and low levels of tick infestation. Wolves first arrived at the island on an ice bridge from Canada in 1940. The wolf population averages from 15 to 26, in 2007 there are 21. Disease has also influenced the wolf population. Between 1980 and 1982, the wolf population declined from 50 to 14, due to canine parvovirus. (www.isleroyalewolf.org)

The Isle Royale wolves and moose have been studied since 1959. This Isle Royale wolf-moose study is unique because it entails just a single predator (the wolf) and a single prey (the moose) on a small island with very little human influence.

Wolf Facts

General Facts

- o Wolves have no natural predators except people.
- o Wolves can cover extremely large distances and have been known to travel up to 15 km (about 9 mi) a day.
- o A typical wolf pack may have a range of up to 130 sq km (50 sq mi) of territory.



Wolf Behavior Facts

- o Wolves are social animals that depend on each other for food and protection.
- o A wolf pack, which will tend to stay together, can vary in number from a pair of animals to 10 wolves. Adult wolves share responsibility for caring for young.
- o Wolves are generally afraid of people and avoid contact with them.
- o Wolves can kill animals that are quite large, usually by isolating a weak or young animal, and chasing and attacking it in a group.
- o Canadian wolves generally prey on elk.
- o Normally, wolves consume everything they kill. Other predators or scavengers will quickly consume a dead animal, making it difficult to determine a cause of death.
http://www.pbs.org/wgbh/nova/teachersprograms/2415_wolves.html

Gray Wolf Fact Sheet

Range and Habitat	
Original Range:	In North America, gray wolves were found throughout Alaska and Canada, down through most of the United States (except for California and the southeastern US), and south into central Mexico.
Current Range:	In North America, gray wolves are found only in the states of Alaska, Idaho, Michigan, Minnesota, Washington and Wyoming.
Habitat:	Gray wolves have been found in almost every habitat imaginable, including mountains, plains, high Artic, tundra and desert.
Food:	Mainly elk, moose, bison, deer or caribou. Wolves will also eat mice, rats, squirrels, beavers, hares or other small mammals.
Physical Characteristics	
Height:	26 – 38 inches high (measured from the bottom of their paw to the highest point on their shoulder)
Weight:	Average from 60 -100 pounds, but can weigh between 40 and 175 pounds.
Color and identification:	Gray wolves range in color from white to black, including shades of tan, gray, and brown. Most wolves have lighter colored legs with a darker upper body.
Current Populations	
Status:	Considered endangered in the lower 48 states (considered threatened in Minnesota); populations are protected, and numbers are increasing. Alaska and Canada are considered to have healthy wolf populations, and gray wolves are not protected.
Number:	Less than 9,000 total for the US
Threats to their survival:	Starvation, disease, other wolf packs Habitat loss, human persecution
Conflicts with Humans:	May occasionally kill livestock; often feared because of myths and inaccurate information

(Gray Wolf Fact Sheet from Grizzly & Wolf Discovery Center)



Hunting Strategies

Wolves are extraordinary predators that play an extremely important part of a healthy, thriving ecosystem. Wolves are called apex predators, which mean that they are top on the food chain. As predators, they serve to help keep the ecosystem in balance by hunting prey that are weak, sick or elderly, leaving stronger and healthier animals to survive and produce viable young. Other competing predators would be cougar, coyote, bear and human beings.

A wild predator's life is not an easy one. Almost every time they are hungry, wolves must find and bring down prey. Each predator has its own tools and hunting strategies. Wolves use their incredible sense of smell combined with excellent hearing abilities to help them find vulnerable prey. Wolves look for the animals they can kill easily, expending as little energy as possible and decreasing chances of injury. Large ungulates, like deer, moose, elk and caribou, are a wolf's primary food source. Wolves also eat smaller animals like beaver, rabbit, mice, and ground squirrel.

When hunting large game, the wolf pack separates out and surrounds its prey. Wolves usually bite the shoulders and flanks. While some pack members

harry the prey from the rear, other wolves seize the prey by the nose.

Hunting can be a dangerous activity for a wolf. The antlers and hooves of a large animal like a moose or caribou can injure or kill attacking wolf. As hunters, wolves have a low success rate. One study shows that for every twelve moose tracked, only one was caught. Wolves are built for feast or famine diet and can 'wolf' down up to 20 pounds at one feeding. If wolves do not finish what they have killed, the leftovers will feed the scavengers—fox, coyote, and raven.

Wolves must travel many miles to find suitable prey. Scientists have estimated that one wolf needs ten square miles for a "home" territory. In the Arctic, wolves often follow their main prey, caribou, as the caribou migrate, often thousands of miles. In nature there is a place for both predator and prey, and though their relative numbers fluctuate, predator and prey maintain equilibrium necessary for the survival of both.

Vocabulary:

Ungulate: A mammal having hooves.

(Hunting Strategies from Grizzly & Wolf Discovery Center)



Lesson 1: Introduction The Big Bad (?) Wolf

Duration: 45-50 minutes

1. Have students listen to howls of wolves. (<http://www.pbs.org/wgbh/nova/wolves/howl.html>).
2. Have the students write down the first thought when they hear or see an image of a wolf. Have students write/brainstorm for 10-15 minutes on what they know about wolves. This can include the wolf's habitat, behavior, prey, stereotyped images of wolves and how wolves are portrayed in the media (pop culture).
3. Have a class discussion on what the students know about wolves, images portrayed in the media and how these portrayals may have originated. Ask students if they have ever seen a wolf, where and when? (Wolf sightings have been increasing in the Upper Peninsula of Michigan)
4. Review predator-prey relationships. (Hunting Strategies)



Lesson 2: Wolves & Moose of Isle Royale-DVD

Duration: 125 minutes

Note—this lesson is based on the DVD “Wolves and Moose of Isle Royale”, which is available for purchase through www.irnha.org—the lesson may also be modified to use with background information on the research available through www.isleroyalewolf.org.

1. Show students video Wolves& Moose of Isle Royale, presented by John Vucetich. This video is 95 minutes and can be divided into 3 parts; the natural history of moose and wolf (lecture 1), scientific investigations of wolves and moose (lecture 2) and supporting research.
2. Handout student questions about DVD, Wolves & Moose of Isle Royale.

Wolves & Moose of Isle Royale Questions

1. How is the Isle Royale wolf-moose research project unique? And why is this study important?
2. If Isle Royale was directly in the middle of Lake Superior, how would that affect the wolf-moose study?
3. What if Isle Royale was just 1 mile from Canada, how would that affect the wolf-moose study?
4. If Isle Royale were half its size, how would that affect the wolf-moose study?
5. If Isle Royale were twice the size it presently is, how would that affect the wolf-moose study?
6. Explain what characteristics moose have as quoted in the DVD, “moose are said to be creatures of the North Country and well adapted for that,” list at least three reasons.
7. Dr. Vucetich quoted Paracelsus in the presentation, “He who knows nothing, loves nothing but he who understands also loves, notices, sees...the more knowledge that is inherent in a thing the greater the love.” Explain what Dr. Vucetich is trying to emphasize with this quote.



Lesson 3: An Isle Royale Researcher

Duration: 120 minutes

1. The students are now Isle Royale researchers and have gathered the following data on wolf and moose populations for 2007:

Year	Number of Wolves	Number of Moose
2007	21	385

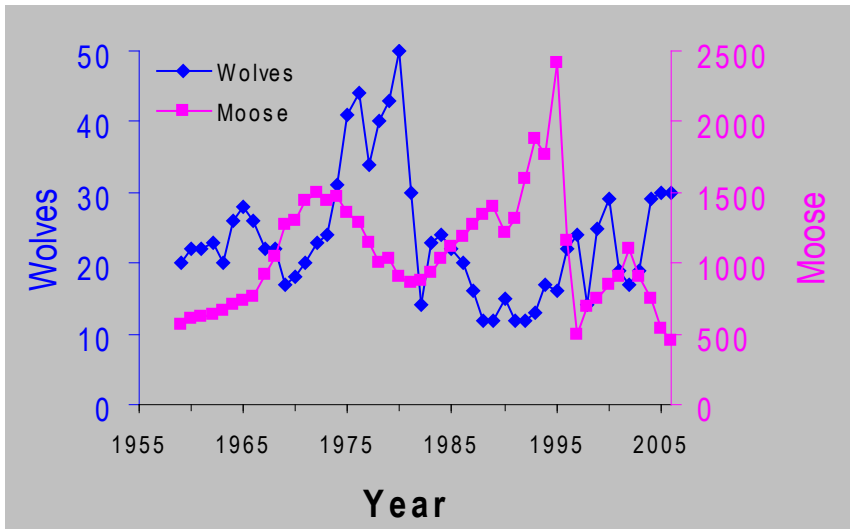
Adding this data to the data from previous years, the researchers created a graph that will be used in the Ecological Studies of Wolves on Isle Royale:

Year	Wolves	Moose	Year	Wolves	Moose
1959	20	563	1983	23	932
1960	22	610	1984	24	1038
1961	22	628	1985	22	1115
1962	23	639	1986	20	1192
1963	20	663	1987	16	1268
1964	26	707	1988	12	1335
1965	28	733	1989	12	1397
1966	26	765	1990	15	1216
1967	22	912	1991	12	1313
1968	22	1042	1992	12	1590
1969	17	1268	1993	13	1879
1970	18	1295	1994	17	1770
1971	20	1439	1995	16	2422
1972	23	1493	1996	22	1163
1973	24	1435	1997	24	500
1974	31	1467	1998	14	699
1975	41	1355	1999	25	750
1976	44	1282	2000	29	850
1977	34	1143	2001	19	900
1978	40	1001	2002	17	1100
1979	43	1028	2003	19	900
1980	50	910	2004	29	750
1981	30	863	2005	30	540
1982	14	872	2006	30	450

2. Students will create a graph using the following data (their choice on type of graph) They will be graded on the accuracy of the graph and the readability of the graph. Students can use a computer to graph the data. (The graph is located on page 3 of the Ecological Studies of Wolves on Isle Royale 2006-2007 or at <http://www.isleroyalewolf.org/data.htm>)



Moose-Wolf Populations 1959-2007



4. Students will answer the following questions from their graph.
 - a. Find the equation for the population of moose over time and wolves over time. Put the equation into $y = mx + b$ (students will not be able to do this because it is not a linear relationship)
 - b. Do you see any pattern between the population of wolves compared to the population of moose? (students should notice that when wolf populations are high the moose populations are low and when the wolf populations are low the moose populations tend to be higher.)
5. Students will work in groups. Each group will be given a decade in which to study. The group will do research and try to determine if they can identify some of the factors in the Isle Royale ecosystem that influence fluctuations in population size. Each group will be responsible for at least 1 page typed and a short 5 minute presentation on their findings.
6. Students will answer the following essay questions:
 - a. Describe how Isle Royale is a unique place for a research study on the predator/prey relationship.
 - b. Describe the predator/prey relationship of the wolves and moose of Isle Royale.
 - c. Identify the factors in the Isle Royale ecosystem that influence fluctuations in population size
 - d. Isle Royale has been undeclared as a national park and has been purchased by a large resort conglomerate. Describe the changes positive and negative changes and how the impact on the Isle Royale ecosystem.
 - e. List the possible consequences of global warming on Isle Royale.

Sources

http://www.pbs.org/wgbh/nova/teachers/programs/2415_wolves.html

This site is a program overview of a PBS special, Wild Wolves

<http://www.pbs.org/wgbh/nova/wolves/howl.html>

This site has different howls of wolves for the students to listen to and also information on why wolves howl.

http://en.wikipedia.org/wiki/Isle_Royale_National_Park

General information about Isle Royale

Peterson, Carolyn C. *A View from the Wolf's Eye*. 2005 (also available on-line at http://www.isleroyalewolf.org/Candysbook/candy's_book_intro.htm)

This is a book that gives the perspective of Candy Peterson from 30+ years of assisting her husband Rolf Peterson in wolf-moose research. This book gives a great insight into the wolf-moose research through the Peterson family.

Peterson, Rolf O., Vucetich, John A., *2004-2005 Ecological Studies of Wolves on Isle Royale*. March 2005

This is the summary of the ecological study of the wolves of Isle Royale. There is information on the study, the wolf and moose populations, wolf pack territories, weather, snow and ice conditions, forest vegetation and other wildlife.

Peterson, Rolf O., Vucetich, John A., *Ecological Studies of Wolves on Isle Royale 2006-2007*. March 2007 (also available on-line at <http://www.isleroyalewolf.org/>)

This is the summary of the ecological study of the wolves of Isle Royale. There is information on the study, the wolf and moose populations, wolf pack territories and kill locations and moose distribution. The data for the lesson (moose-wolf populations 1959-2007) was gathered here.

Shelton, Napier. *Superior Wilderness Isle Royale National Park*. 1997. Isle Royale Natural History Association. Houghton, MI.

This is the text book used for the ecology of Isle Royale class. This book has information on the geology, fishing, vegetation, people, mining, birds and other wildlife, the wolf-moose study and the guardians of Isle Royale.

Wolves and Moose of Isle Royale. Presented by John A. Vucetich. DVD .Solex Media. 2006. 95 minutes

This DVD presents the natural history of moose and wolves and also the scientific investigations of wolves and moose on Isle Royale. The DVD also has photos and maps that enhance the presentation.

Grizzly & Wolf Discovery Center, P.O. Box 996, Yellowstone, MT 59758

(800)257-2570 www.grizzlydiscoveryctr.org

This teacher packet was full of facts and other information on wolves and grizzly bears



Michigan Standards Addressed

Mathematics

L1.2.4 Organize and summarize a data set in a table, plot, chart or spreadsheet; find patterns in display of data; understand and critique data displays in the media.

English Language Arts

Standard 1.1 Understand and practice writing as a recursive process.

CE 1.2.1 Write, speak and use images and graphs to understand and discover complex ideas.

Biology

L3.p2A Describe common relationships between and among organisms and provide examples of predator/prey relationship.

L3.p2B Describe common ecological relationships between and among species and their environments.

L3.p3A Identify the factors in an ecosystem that influence fluctuations in population size.

B3.4A Describe ecosystem stability.

B3.4C Examine the negative impact of human activities

B3.4E List the possible consequences of global warming

B3.5A Graph changes in population growth, given a data table.

B3.5B Explain the influences that affect population growth.