Title of Lesson	Abiotic and Biotic Factors
Frame of Reference	Abiotic and biotic factors are one of the initial parts of understanding ecology. Since Ecology is the "scientific study of interaction between organisms and their environments". It is important to understand why both living (biotic) and dead (abiotic) components are important in a natural setting.
Instructional Objective	Students should be able to indentify living and dead things with the correct vocabulary as well as give a short description of how the organism or component can affect a whole system.
Activity Purpose	This activity is included because it is one of the fundamental steps in how a system acts as a whole. The student will have a better understanding of the abiotic and biotic things around them and be able to compare them to other areas of the country, world, or region they travel to. An example of what a student should gain is how the amount of precipitation (non-living) affects what plants or animals can habitat an area-this is an elementary example, but one the students will be able to understand.
Learning Objectives	Given no references and using the pictures provided by the teacher, the students should be able to accurately identify different abiotic and biotic parts of an ecosystem within 80-percent accuracy. Some example pictures are shown below (from US fish and wildlife)

Skill Level	This lesson is mainly for lower skill level students because it is a basic, visual principal. However, it does present some challenging application activities that could be used for students with higher level skills when talking about how one factor influences another. It is one of the early focuses in ecology so it is very important in an ecology lesson.
MN Standards of Science	Grades 9-12. Life Science. Substrand F: Flow of matter and energy. Standard:"The student will describe and explain the cycling of matter and flow of energy through an ecosystem's living and non-living components." Benchmark 1.
Prerequisite Units	Students up to this 10th grade biology class should have some main ideas of what ecology is. Ecology is a broad biologic idea and is early in this particular textbook. The students would have last had life science in 7th grade (in MN). Previous standards focused on the relationships, but did not necessarily include vocabulary or classification schemes.
Common Alternative Conceptions	Hopefully after the lesson, students will be cleared with the conception that there is no relationship between abiotic and biotic factors. The activity that we will be doing on this day will help this conception be cleared. However, they may leave with the conception that every biotic factor affects every abiotic factor, which is not necessarily the case. In my instructional part of the class I will address this.
Summary of Student's Initial Conceptions	1) Abiotic and biotic components are completely separate and do not interact at all. 2) Effects of abiotic factors do not control biotic factors and vice versa.
Targeting Students Initial Conceptions	When students are going though their pictures and listing all the living and non-living things, they will be asked the question, "what does the component contribute to the big picture?" The goal will be focused on clearing up the misconceptions that abiotic and biotic factors are disconnected. The conceptions should be adjusted either while they are in their groups discussing their pictures or in lecture.
Materials Needed	Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the slides with the ecosystems of study on it as well as any prepared lecture notes that he has.

Training Leaders, Aides, etc.

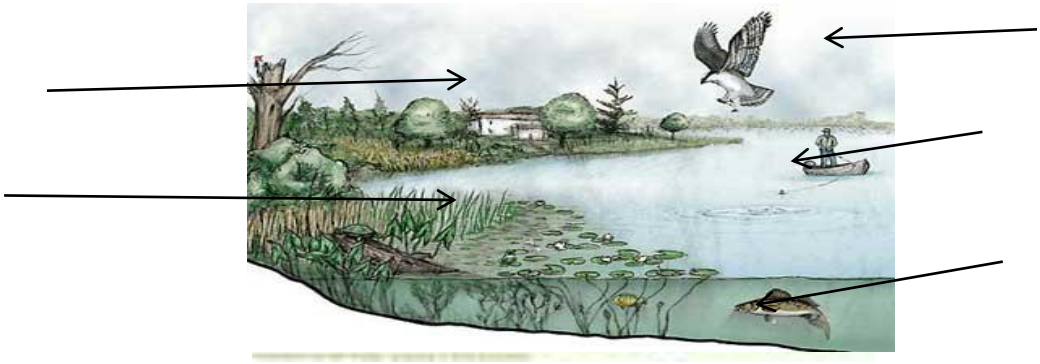
I would make sure that the leaders or aides were fairly comfortable with determining living or dead things. This lesson would be fairly good to have someone from the outside come in. I would basically give them the correct vocabulary (biotic/abiotic) and they could help the students. I would also give them the benefit of knowing things such as weather, soil, and temperature affects ecosystems so they could give students little hints. With their experience they may also be able to help them with how things interact. I would probably give them more literature about this if they wanted it, mainly because it is very connected.

Terms and Concepts

TERMS: ecology, biotic, abiotic, interactions
CONCEPTS: Living and non-living things all have interactions with each other. Ecosystems are full of these interactions and is the basis for the study of ecology.

Quiz/Exam Questions

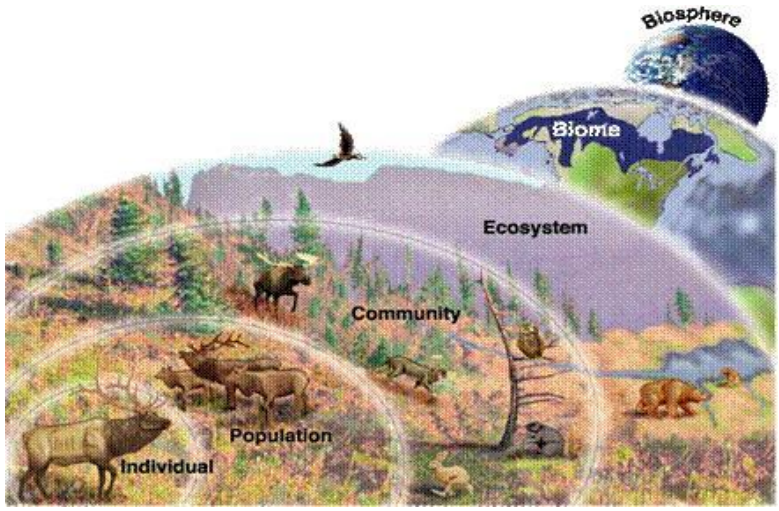
1) From the picture below, label whether the object the line is pointing to is either a biotic or abiotic element.



2) What is the term used for living things found in an ecosystem?

3) What is the term for non-living things found in an ecosystem?
4) What kind of affect does weather have on an ecosystem? How does it affect both living and non-living things?
Picture was taken from US fish and wildlife service:
http://www.fws.gov/klamathfallsfwo/about/ecosystem.jpg

Title of Lesson	Ecological Organization
Frame of Reference	The ecological organization is the idea that a single organism is part of more of than just a single niche. This concept shows how ecology has to do with more than just a single organism, but how it is a part of larger parts of ecology. It is a great starting lesson for when we get into the larger parts of ecology of the world itself.
Instructional Objective	Students will be able to see how a organism has more of an effect on just itself, but is a member of a population, community, ecosystem, biome, and biosphere.
Activity Purpose	This activity is included in the lesson to show students that there are many broad components and classifications of ecology and that we can study the interaction at many different levels.
Learning Objectives	Using the data given in the class, students will be able to draw a diagram from a single organism to how it is a part of the biosphere with the different levels labeled with 80-percent accuracy. An example is below:



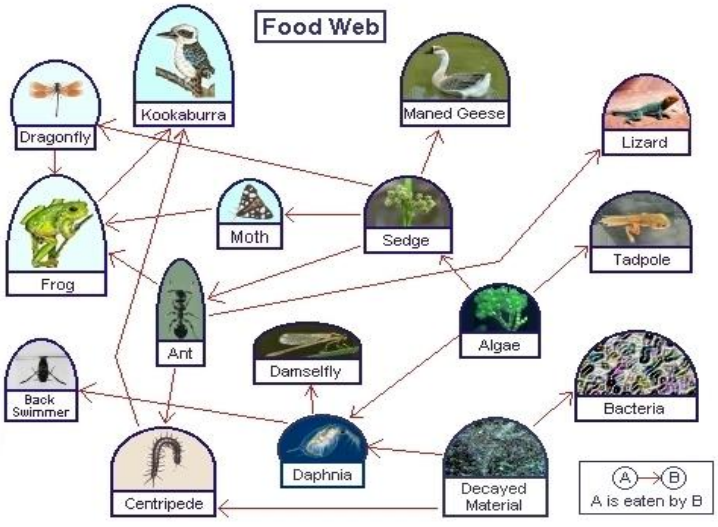
http://www.cfkeep.org/html/phpThumb.php?src=/uploads/ecolevels.gif&aoe=1&w=

Skill Level	The overall skill level may be a bit difficult for the empirical thinkers because students will not necessarily be able to see or touch things concretely. They will have to think outside of where they currently live and where they have traveled as we start to get into the larger classifications of ecology. The hypothetical thinkers will have fewer troubles, as their ability to "imagine" may be stronger than the empirical thinkers.

MN Standards of Science	Grades 9-12. Life Sciences. Substrand F: Flow of matter and energy. Standard:"The student will describe how the environment and interactions between organisms can affect the member of species and the diversity of species of an ecosystem." Benchmark 5.
Prerequisite Units	Students have already been introduced to biotic and abiotic factors. As we now expand on the relationships and think larger scale they will need to retain these ideas as well as the background knowledge they should have from 7th grade ecology lessons.
Common Alternative Conceptions	The students will hopefully be able to distinguish the ecological levels so they can clear some of these misconceptions. The students may still leave with feeling an organism is "unimportant" but the lesson hopes to clear some of these thoughts.
Summary of Student's Initial Conceptions	1) There is not a difference between a population and community. 2) An ecosystem is simply a collection of living things. 3) Some populations of an ecosystem do not matter because they don't serve a purpose.
Targeting Students Initial Conceptions	I will be targeting these major conceptions as we view data and photos from different population, community, and ecosystem characteristics when one part of an ecosystem is lost. An example is if there is a keystone species lost or an invasive species takes over.
Materials Needed	Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the slides with the ecological organization and also data that shows what is included in each one of the parts of the organzation: number of species, biotic, abiotic, etc.
Training Leaders, Aides, etc.	I would definitely give the students some information on the levels of an ecosystem. It is still difficult to distinguish the difference between the levels and what is all contained in them. Once I know they were comfortable with that, I would let them come to the classroom and guide the students.
Terms and Concepts	TERMS: organisms, populations, communities, ecosystems, biosphere CONCEPTS: There are many different levels that ecology exist, ranging from a single organisms to the entire biosphere.
Quiz/Exam Questions	1) What would happen to a fish in a stream if a fertilizer was added to the field nearby? 2) What is the lowest unit of ecology that can still evolve? 3) What are the levels of ecology organization and what kind of biotic/abiotic, if any, are found in them?

Title of Lesson	Autotrophs, Heterotrophs, and Decomposers
Frame of Reference	In this lesson there is more of a in depth look at the biotic parts of the ecosystem. There are classifications of these organisms that are important to know their overall function to the ecosystem.
Instructional Objective	Students will be able to classify the different parts of the biotic parts of an ecosystem and their function to the whole.
Activity Purpose	This lesson is in the unit because it serves as a way to further classify all of the living organisms. Because there are so many interaction between living things, whether it is competition, food chains, or breaking down living things, it is important to understand each one's function.
Learning Objectives	Given a picture of an ecosystem, the student will able to identify and explain the function of each heterotroph, autotroph, and decomposer within 75-percent accuracy.
Skill Level	The lesson will be doing a lot of analyzing and seeing synthesizing information which is fairly high on Blooms Taxonomy. Lower achieving students should be able to identify the three different kinds of organisms, but may struggle with the function. I will have the students work in groups that will hopefully help with those students and how they should be thinking. The higher achieving students will also have some difficulty figuring out the "function", but once again the peer lead groups should assist with the understanding.
MN Standards of Science	Grades 9-12. Life Sciences. Substrand F: Flow of matter and energy. Standard:"The student will describe how the environment and interactions between organisms can affect the member of species and the diversity of species of an ecosystem." Benchmark 5.
Prerequisite Units	The previous lessons already discussed in our ecology chapter and hopefully some outside experience with nature and the ability to recognize various animals, plants, and fungi or other decomposers.
Common Alternative Conceptions	The students will hopefully realize that there are also aquatic ecosystems as well and that there are producers, consumers, and decomposers in these areas also. They may still think that respiration is related to photosynthesis, but hopefully it will be more clear how they are different going from one direction to the other.
Summary of Student's Initial Conceptions	1) Photosynthesis only happens in plants. 2) Respiration is the reverse of photosynthesis. 3) There are no plants that live in water.

Targeting Students Initial Conceptions	When students analyze their ecosystem picture and then the traits of each organism, they will be able to tell that there are differences. Looking at multiple ecosystems will prove that there are producers, consumers, and decomposers in nearly every ecosystem where there are living things. Every one of these has to be part of the ecosystem in order for it to be functional
Materials Needed	Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the slides with various types of organisms (autotroph, heterotroph, decomposer, etc) so that student are able to see the different kinds of organisms being discussed.
Training Leaders, Aides, etc.	I would have the aides and leaders read a lot about ecosystems and the many different kinds. Many will be used to their own region or ecosystem, but in the class they will be learning about deserts, tropical regions, and aquatic. I would have these individuals "discover" the ecosystems with the students maybe give some ideas from the information that I gave them to read.
Terms and Concepts	TERMS: autotrophs, heterotrophs, scavengers, decomposers, omnivores, carnivores, herbivores CONCEPTS: Every living organisms has a way it survives either by producing its own food or by eating a certain kind of food.
Quiz/Exam Questions	1) Look at the picture below, are these organisms autotrophs, heterotrophs, or decomposers?



http://www.arcytech.org/java/population/images/food_web. jpg

2) What is the purpose of decomposers? What are some examples?

Title of Lesson	Food Chains and Food Webs
Frame of Reference	We further investigate the interactions of producers, consumers, and decomposers as we are now starting to create food chains and food webs. Food chains and food webs are great diagrams for showing the relationships among the living things of a particular ecosystem.
Instructional Objective	Students will be able to construct food chains and food webs from a particular ecosystem and recognize the relationships that organisms have with one another. They will also gain insight to the future lesson on competition and predator/prey relationships.
Activity Purpose	Purpose of the activity is for the students to see the interconnections of ecosystems and how one organisms affects others.
Learning Objectives	The student will be able to create food chains and food webs given the organisms of a particular organism with 60-percent accuracy.
Skill Level	Although nearly every student has seen a food chain, with this particular lesson also dealing with food webs, it presents a challenge to the students because of the multiple interactions each organism has with one another. Nearly every student will struggle with this critical thinking skill, so mastery is not necessarily the most important. The main point is that students understand that connections are very in depth in ecosystems.
MN Standards of Science	Grades 9-12. Life Sciences. Substrand C: Interdependence of life. Standard:"The student will describe how the environment and interactions be+D89tween organisms can affect the member of species and the diversity of species of an ecosystem." Benchmark 1.
Prerequisite Units	All previous lessons in this unit are important in the foundation of understanding food chains and food webs.
Common Alternative Conceptions	Students may still walk out the door after the lesson with some troubles with what animals should be at the top or where a food chain or food web ends. However, the hope is that the students will get an idea of the interactions that occur. The conception of producers not being included in food webs or chains should be easily cleared as we investigate different kinds of ecosystems.

Summary of Student's Initial Conceptions	1) Food webs are interpreted as simple food chains. 2) Organisms higher on the food web eat everything that is lower on the food web. 3) The food chain can reverse order. 4) Food chains involve predator and prey, but now producers.
Targeting Students Initial Conceptions	We will analyze food chains and how they are different and also how there are food chains that can vary in size and "ending" consumers.
Materials Needed	Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the slides with examples of food chains and food webs. The teacher will also want to grap large paper so that food webs can be large enough to have picture and lines, while still not looking too complicated for students.
Training Leaders, Aides, etc.	Many know what a food chain or food web is; however, I would make sure the guest is familiar with the ability for the food web to cycle and how one interaction affects the other. I would try to have them read something accurate on the internet before they came into the classroom. It is the interactions and connections from organism to organism that students really struggle with the most.
Terms and Concepts	TERMS: food chain, food web, interactions, cycle CONCEPTS: Food chains and food webs are very important part of an ecosystem and the organisms that live there. An organism may be affected by something that is not even a part of its diet.
Quiz/Exam Questions	1) Create a food chain for a desert ecosystem 2) Create a food web that includes at least 3 plants, 6 animals, and 2 decomposers. 3) What is the difference between a food chain and food web?

Title of Lesson	Symbiosis: Commensalism, Parasitism, and Mutualism
Frame of Reference	There are names for the different interactions of two organisms. This lesson goes into these interactions and how each organisms is affected. They are very common relationships found in nature and are important to know about.
Instructional Objective	Students will be able to tell the differences between symbiosis, commensalism, parasitism, and mutualism and also name some example of animals that exhibit this kind of relationship.
Activity Purpose	This activity is included in the unit because it is important to understand the relationships between two animals in a particular ecosystem. It is also one of the important MN standards of science that students need to learn to graduate.
Learning Objectives	Given no reference, the student will be able to list and give examples of the three kinds of symbiosis within 80-percent accuracy.
Skill Level	The skill level for this activity is fairly low, mainly because it involves remember terms and a relationship. However, the skill set for analyzing the data of what animals are or are not affected does take some analyzing and interpreting skills.
MN Standards of Science	Grades 9-12. Life Sciences. Substrand C: Interdependence of life. Standard:"The student D108will describe how the environment and interactions between organisms can affect the member of species and the diversity of species of an ecosystem." Benchmarks 2 and 3.
Prerequisite Units	Once again it is important that they have had the lessons leading up to this point. I would also hope they have some knowledge from previous science subjects about evolution as we will also be dipping into co-evolution of animals with symbiosis.
Common Alternative Conceptions	Students will be cleared of their misconceptions that interaction between two animals always ends up with one being eaten or damaged. There are some of these relationships where there is not any organism harmed and even some that are benefited between interactions. There still may be some confusion when they leave that co-evolution exists ONLY because the two organisms benefit from each other. There is still some adaptation that has to be done on their own in order to survive (i.e. climate shifts, soil, disasters, etc).

Summary of Student's Initial Conceptions	1) The only interactions in ecology is predator-prey relationships. 2) Species coexist in an ecological system because of their compatible needs and behaviors: they need to get along. 3) The needs and roles of species are general and typical of species.
Targeting Students Initial Conceptions	As the students are doing activities they will see that there are indeed relationships between two organisms. They will also see cases where there was co-evolution between organisms (i.e. butterfly tongue fitting a particular flower).
Materials Needed	Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the data sheet that has various types of relationships on it and also a key code created that uses "n", "+", or "-" signs that signifies what kind of relationship is being talked about in the lesson or on the worksheet.
Training Leaders, Aides, etc.	Unless the individual coming in already knows what these terms mean, I would have them be a co-investigator with the students. The terms and ideas are sometimes confused so I will give them some material to read prior; however, I would have the guest be mostly an investigator with the students.
Terms and Concepts	TERMS: symbiosis, commensalism, mutualism, parasitism CONCEPTS: There are many types of relationships between two organisms that exist, some of these relationships even cause a co-evolution.
Quiz/Exam Questions	1) Explain the following terms and give an example of each: commensalism, parasitism, and mutualism. 2) What are the differences between commensalism, parasitism, and mutualism? Indicate with plus (+) or (-) signs of how each animals is affected.

Title of Lesson	Trophic Levels
Frame of Reference	Now that we have classified and discovered there are different organisms and relationships between them, we will now see how the actual energy is passed from one to the other.
Instructional Objective	The purpose is to show how energy is used by an organism and also the transfer energy from one organism to the next for several levels. The main goal of this lesson is to clear the misconceptions of how energy and trophic levels are related.
Activity Purpose	The main goal for this activity is to expand more on the food chains that we created and now show how energy and trophic levels are involved as we go through the food chain.
Learning Objectives	Given the data in class, the student will be able to describe the relationships in trophic levels with 100-percent accuracy.

Skill Level	The students will once again be analyzing data and drawing conclusions. However, the skill level the student will need to "see" the relationship will be pretty obvious because of the large loss of energy in trophic levels. However, students will need to have the ability to interpret data and create a graph or figure that describes the relationships.
MN Standards of Science	Grades 9-12. Life Sciences. Substand F: Flow of matter and energy. Standard:"The student will describe and explain the cycling of matter and flow of energy through an ecosystem's living and non-living components." Benchmark 5.
Prerequisite Units	The students have learned about food chains and food webs. However, they have not had much exposure to energy loss or transfer. There is also an interdisciplinary opportunity in particular here with chemistry in physics that will be incorporated as we talk about energy.

Common Alternative Conceptions	In this lesson I hope to clear up ALL of the misconceptions with loss of energy. It is imperative that students understand that although higher order animals may eat more, it does not mean that they need more example. An example is how a hummingbird eats nearly 1000x a human compared to its body weight. The data and analyzing that the students will do in this lesson will take away every misconception.
Summary of Student's Initial Conceptions	1) The top of the trophic level has the most energy because it accumulates up the chain. 2) Populations higher on the food web increase in size because they eat more than the ones lower on the food web. 3) No energy is lost in trophic transfer.
Targeting Students Initial Conceptions	Students misconceptions will be cleared up right away with the data analyzing and graphing. There is a significant difference in energy lost from one trophic level to the other and the evidence will be extremely conclusive. It will clear up many of the conceptions that energy is maintained or gained as you go up in trophic levels.
Materials Needed	Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the slides with trophic calories/energy for each level and also the organisms that are included in each of the levels. That is to create a visual connection for the student to relate to well as well as a data table.
Training Leaders, Aides, etc.	Anyone wanting to come in for this day will need to be good at analyzing data and creating graphs or figures. I will give them reading material as well as talk with them prior to me allowing them into the classroom because this is a very misconceived notion and I want students to get it.
Terms and Concepts	TERMS: trophic levels, first trophic level, first order consumers, second order consumers, third order consumers, food pyramid, CONCEPTS: There are different levels in the way organisms pass their energy on and also how much of that energy is passed on to the next level.
Quiz/Exam Questions	1) What are things we can do as humans to eat higher energy foods? 2) What is bioaccumulation compared to energy trophic levels? 3) How much energy is passed on from one trophic level to the next?

Title of Lesson	Predator-Prey Relationships
Frame of Reference	Now that we have talked about some of the food chains and food webs, we will now go into further detail about how the populations change with the amount of predator and prey in an ecosystem. The patterns and fluctuations of predators and prey will be studied to see how they relate to each other.
Instructional Objective	The goal of this lesson is to have students see how predator and prey relationships are never at a constant or at equilibrium, but rather they can change. We will also discuss how introduction of a new species can cause a drastic change in the population of a particular specie.
Activity Purpose	The goals are to have students be able to analyze a table of population data and create a graphical representation of what is happening and then being able to explain "why".
Learning Objectives	Given a graph, the student will be able to describe what is happening with each population in the predator-prey graphical representation within a 75-percent accuracy. (please see picture below)
Skill Level	The skill level for this activity is fairly advanced because you are not given much direction when this lab is introduced and students don't really have much exposure to what will happen. Students have to collect data, generate a graph, and interpret what has happened and why. The students will be working in groups to discuss their thoughts and the group will try to come up with a general consensus of what happened.
MN Standards of Science	Grades 9-12. Life Sciences. Substrand: Interdependence of life. Standard:"The student will describe how the environment and interactions between organi+D145sms can affect the member of species and the diversity of species of an ecosystem." Benchmark 4.
Prerequisite Units	Expanding on previous lessons as well as interpreting graphs, this lesson will talk about how relationships change within the lesson plan.
Common Alternative Conceptions	Because of the exposure the students get in the media and their previous experiences to the big, bad predators, they may still go away with thinking that the bigger the better. However, I hope to at least have them realize that you do not have to be a fierce animal to be at the top of a food chain.
Summary of Student's Initial Conceptions	1) The relative sizes of prey and predator populations have no bearing on the size of each other. 2) The number of producers is high to satisfy consumers. 3) The "Balance of Nature" refers to populations of predators and prey being similar in size. 4) Carnivores are big and more ferocious than herbivores.

Targeting Students Initial Conceptions

By comparing the food webs and food chains that they have created as well as comparing data from predator-prey relationships, the students will see that there is more to a dominant organism than just being "better". There are ecosystem factors that affect the entire system, including a two organisms relationship.

Materials Needed

Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the slides with the graphs or tables that show the predator-prey relationships. The teacher will also need to make sure the student groups have access to a graphing program either in excel or on their calculator so student can actually see the cycles that are happening.

Training Leaders, Aides, etc.

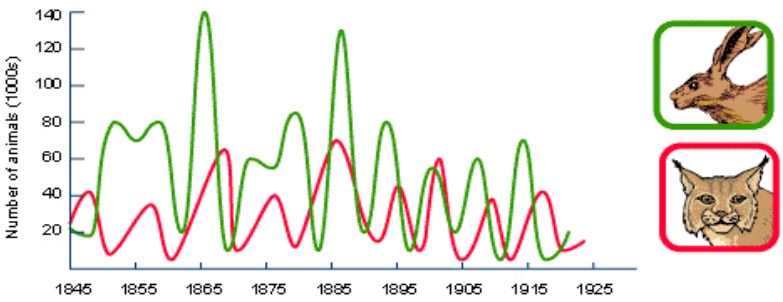
If there is an individual that comes in on this day, I would make sure they were pretty good at excel or another graphing program as well as being able to identify patterns. The predator-prey activity is mostly graphical and compiling data. I think it would be a good day for someone like this to come in because they can explain excel and provide insight on the best ways to use it. The graphs that they will produce will be very visual and beneficial for them to see. I would recommend if someone came in to read information on the Isle Royal Wolf/Moose study. This is a classic example of predator-prey relationships.

Terms and Concepts

TERMS: Isle Royale Experiment, predation, predator, prey
CONCEPTS: The amount of species of predator and prey can severely affect the population of one another.

Quiz/Exam Questions

1) What is happening in this area to the two animals?
http://www.bbc.co.uk/schools/gcsebitesize/science/images/bilynxandhare.gif



2) What do you think would happen if an exotic, invasive species was introduced to the area?

Title of Lesson	Predation and Defense Mechanisms **This lesson is designed to be shorter so that there is time to further discuss or work on the predator-prey relationships from the day before**
Frame of Reference	The unit has now talked about how there are relationships between organisms both good and bad, but what are some of the ways organisms protect themselves or attack their prey? This lesson is designed to explore some of the ways they do this.
Instructional Objective	Students will be able to identify some of the ways organisms protect or consume their prey.
Activity Purpose	This activity is a further extension of the predator-prey lesson, now we will see this can sometimes cause a change in how two organisms interact or what organisms are able to consume one another.
Learning Objectives	Given a list of organism interactions, the students will be able to describe what kind of relationship these two organisms have, as well as a defensive mechanism or attack mechanism they may use within 75-percent accuracy.
Skill Level	This lesson is going to be difficult for some of my concrete learners because they will have to create the interactions in their head as well as provide a mechanism that is involved. The operational learners will have an easier time making these connections, however, will still have to name a mechanism that incurs between a pair.
MN Standards of Science	Grades 9-12. Life Sciences. Substrand C: Interdependence of life. Standard:"The student will describe how the environment and interactions between organisms can affect the member of species and the diversity of species of an ecosystem." Benchmark 1.
Prerequisite Units	The predator-prey and prior units of the ecology unit are important to know. Student also would have talked about some of these mechanisms in their 7th grade life science courses, although not as in-depth.
Common Alternative Conceptions	Many of these misconceptions are ones that were dealt with in previous lessons. There will be a continuum in this lesson to try to deter those ideas further. Students may still think that the "big and bad" animals will dominate, but I will propose smaller plant and animals that have their own defense mechanisms.

Summary of Student's Initial Conceptions	1) Carnivores are big and ferocious, herbivores are not. 2) Plants are weak and cannot defend themselves. 3) Animals habitat is not part of predation or defense mechanism. 4) Traits are passed on by the bigger, stronger organisms that replace the smaller, weaker ones.
Targeting Students Initial Conceptions	Because the common notion is that bigger is better, I will proposed animals such the black locust, poison dart frog, and other "smaller" organisms that do just fine fighting off their predators even though they are not "big and bad".
Materials Needed	Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the slides with various pictures of animal or organism relationships so student can identify them.
Training Leaders, Aides, etc.	If guests come on this day, I would ask them to read about the different mechanisms of predation and defense. It would be good for them to get some background knowledge before they watch the students. The helper will have to understand animal relationships and ways they interact which can be difficult for some. I would be sure to ask them if they had any questions and somewhat quiz them at what they know.
Terms and Concepts	TERMS: habitat, cryptic coloration, mimicking, physical or chemical combat, fight or flight CONCEPTS: There are several things that animals do to adapt to their surroundings or change to make their odds of survival better.
Quiz/Exam Questions	1) What are some defense mechanisms that prey will use on their predators to keep them away? 2) What is the reasons for a zebras stripes? 3) What is the basis of the white tail on what tail deer?

Title of Lesson	Biomes(Part 1)
Frame of Reference	It is time to go big picture with our unit on ecology. The study of biomes takes into consideration all of the different types of vegetative areas we have on our entire planet. We have gone from organism to population to community to ecosystem and now it is time to go to biomes.
Instructional Objective	Students will be able to identify and characterize the all of the different biomes of Earth. They will also be able to manipulate data from the seven different biomes and determine what kind of climate they have and the vegetation that is included.
Activity Purpose	Students will be given data about vegetation, temperature, precipitation, latitude and longitude with other information and describe the differences and similarities of the data. The goal is to have the students be able to see how the data is different and that biomes are determined using these characteristics.
Learning Objectives	Given no prior reference, the student will be able to name and describe the biomes of the world within 80-percent accuracy.
Skill Level	The skill level needed during this two day lesson is pretty high. Students will have to compile data from all of the biomes and then be able to differentiate each variable. It is a long and strenuous lesson and students may need "brain breaks" so make sure they don't lose focus. The student will also give an oral presentation on a particular biome.
MN Standards of Science	Grades 9-12. Life Sciences. Substrand C: Interdependence of life. Standard:"The student will describe how the environment and interactions between organisms can affect the member of species and the diversity of species of an ecosystem." Benchmark 4.
Prerequisite Units	This is the culminating activity for the ecosystem chapter, so students will need all of the previous lesson's knowledge.
Common Alternative Conceptions	The students may still leave with some problems differentiating certain biomes such as the taiga and tundra, but the goal is have them realize why they are different.
Summary of Student's Initial Conceptions	1) Students may have the wrong ideas of why biomes are different. 2) Students may have the wrong number of biomes. 3) The weather is the only variable that determines differences in biomes.

Targeting Students Initial Conceptions	By comparing the data of all of the biomes and being able to name them, they will have a good idea of these differences and similarities. The data will really give them concrete evidence that there are differences between them.
Materials Needed	Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the packet of informationt that pertains to the various temperature, precipitation, and other differences in the biomes of the world.
Training Leaders, Aides, etc.	The guest or aide would want to read quite a bit about each biome before he or she attended the class. The main goal of this experiment is to determine the differences in biomes and why they are that way. A good, solid reading would really help with the helper if they are in the class.
Terms and Concepts	TERMS: Tundra, Taiga, Desert, Grassland, Tropical Rain Forest, Temperate Rain Forest, Temperate Deciduous Forest, Chaparral, precipitation, climate, vegetation CONCEPTS: The world is broken down into biologically and geographically different areas due to the type of ecosystems they have. Each biome has their own special features that make them unique.
Quiz/Exam Questions	1) What are the factors that determine a biome? 2) What are the different biomes? 3) Please describe some of the features for each biome.

Title of Lesson	Biomes (Part 2) and Review
Frame of Reference	It is time to go big picture with our unit on ecology. The study of biomes takes into consideration all of the different types of vegetative areas we have on our entire planet. We have gone from organism to population to community to ecosystem and now it is time to go to biomes.
Instructional Objective	Students will be able to identify and characterize the all of the different biomes of Earth. They will also be able to manipulate data from the seven different biomes and determine what kind of climate they have and the vegetation that is included.
Activity Purpose	Students will be given data about vegetation, temperature, precipitation, latitude and longitude with other information and describe the differences and similarities of the data. The goal is to have the students be able to see how the data is different and that biomes are determined using these characteristics.
Learning Objectives	Given no prior reference, the student will be able to name and describe the biomes of the world within 80-percent accuracy.
Skill Level	The skill level needed during this two day lesson is pretty high. Students will have to compile data from all of the biomes and then be able to differentiate each variable. It is a long and strenuous lesson and students may need "brain breaks" so make sure they don't lose focus. The student will also give an oral presentation on a particular biome.
MN Standards of Science	Grades 9-12. Life Sciences. Substrand C: Interdependence of life. Standard:"The student will describe how the environment and interactions between organisms can affect the member of species and the diversity of species of an ecosystem." Benchmark 4.
Prerequisite Units	Given no prior reference, the student will be able to name and describe the biomes of the world within 80-percent accuracy.
Common Alternative Conceptions	The skill level needed during this two day lesson is pretty high. Students will have to compile data from all of the biomes and then be able to differentiate each variable. It is a long and strenuous lesson and students may need "brain breaks" so make sure they don't lose focus. The student will also give an oral presentation on a particular biome.

Summary of Student's Initial Conceptions	"The student will describe how the environment and interactions between organisms can affect the member of species and the diversity of species of an ecosystem."
Targeting Students Initial Conceptions	This is the culminating activity for the ecosystem chapter, so students will need all of the previous lesson's knowledge.
Terms and Concepts	TERMS: Tundra, Taiga, Desert, Grassland, Tropical Rain Forest, Temperate Rain Forest, Temperate Deciduous Forest, Chaparral, precipitation, climate, vegetation
Materials Needed	Students are responsible for bringing their notebook, textbook, colored pencils, pens and pencils to class. The teacher needs to prepare the packet of informationt that pertains to the various temperature, precipitation, and other differences in the biomes of the world.
Training Leaders, Aides, etc.	The students may still leave with some problems differentiating certain biomes such as the taiga and tundra, but the goal is have them realize why they are different.
Terms and Concepts	1) Students may have the wrong ideas of why biomes are different. 2) Students may have the wrong number of biomes. 3) The weather is the only variable that determines differences in biomes. By comparing the data of all of the biomes and being able to name them, they will have a good idea of these differences and similarities. The data will really give them concrete evidence that there are differences between them.
Quiz/Exam Questions	1) What are the factors that determine a biome? 2) What are the different biomes? 3) Please describe some of the features for each biome.

Annotated Bibliography

Bybee, R (1993) An instructional model for science education. In Developing Biological Literacy. Biological Science Curriculum Study, Colorado Springs.
This journal talks about some of the models that are best used for instruction of the various sciences and some of things that may help in assisting lowering misconceptions.

Demastes S, Wandersee JH (1992) Biological literacy in a college biology classroom. Bioscience 42: 63-65
This article talks about how important reading in the content area is and how it can help clarify students thoughts and ideas about biology.

Eyster LS, Tashiro JS (1997) Using manipulatives to teach quantitative concepts in ecology: a hands-on method for detecting and correcting misconceptions about limiting factors in eutrophication and vegetarianism. American Biology Teacher 59(6):360-364.
As the title suggests, the journal talks about the best ways to remove or limit misconceptions that may be brought about. This particular journal talks about the quantitative data which is very important when using inquiry and data to concept teaching techniques.

Khalid T (2002) Pre-service teachers' misconceptions regarding three environmental issues. Canadian Journal of Environmental Education 6.

This talks about even some of the teachers misconceptions that are brought into the classroom and that even we as teachers need to double check our work before we bring it into the classroom. This article is similar that was read in our methods class about how there are still some practicing teachers that have some misconceptions while they teach.

Lawson A.E., Thompson L.D., (1988) Formal reasoning ability and misconceptions concerning genetics and natural selection. Journal of Research in Science Teaching 25: 733-746.

As stated in the title, this journal talks about the misconceptions that are brought about by genetics and natural selection. Both of these definitely have a part of ecology and are important to know prior to your teaching of ecology.

Leach J, Driver R, Scott P, Wood-Robinson C (1996) Children's ideas about ecology 3: ideas found in children aged 5-16 about the interdependency of organisms. International Journal of Science Education 18: 129-141.
I thought this journal was good because this states some of the exact misconceptions that the students in my 10th grade class will have.

Munson BH (1994) Ecological misconceptions. Journal of Environmental Education 25(4):30-34.

This journal was very good because it gave me some more of the conceptions and problems that I may have troubles clarifying while teaching this lesson.

McComas WF (2002) The ideal environmental science curriculum: I. history, rationales, misconceptions & standards. The American Biology Teacher 64: 665-672.

A very well rounded journal that talks about the overall teaching of some of the environmental sciences and things that you can and should take into consideration if you are teaching these subjects.