

How Humans Affect Ecosystems: A Call to Action

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Introduction

For as long as I can remember I have been interested in humans' effect on the environment. In grade school I began my personal quest to recycle and reuse as much as possible. To this day my father and close friends always cite me as the voice in their heads when they look at an item to determine if it should be thrown in the recycle bin or the trash. I took an environmental biology class in high school, and learned how to create my own compost pile. Another impact that class had on me is from something that my teacher would always tell us before sharing information with us that was unsettling. She would say, "You can choose to act and change your behaviors or not, but you can no longer claim ignorance once you know the truth about something. The choices you make are now conscious decisions." This had a profound effect on me because it made me feel empowered over the decisions that I made in life, and mindful of the impact that they would have on the earth and the world around me. Overall, throughout all of my educational experiences, I have sought out ones that would educate me in this subject area, and hope that I would one day be able to parlay this knowledge and empowerment to my students.

This unit is designed with a fifth grade curriculum in mind, but could be used with a wide range of students from the primary grades on up to middle school. The main focus is on objectives related to ecosystems, but this unit would also be appropriate for other earth sciences and environmental studies classes. I teach at an elementary school in North Carolina. In my instruction, I follow the local pacing guide that is supplied to our school by the school district. The curriculum is based on the North Carolina Standard Course of Study for fifth grade. Most students come from homes with parents that have college degrees, and in some cases are professors at the local college. For the most part, the students are very high achieving and work hard every day. I also teach students with special needs, so I try to provide lessons that allow students to produce differentiated products, as well as give them choices on what they are studying within the framework of the state objectives. Through this unit, I hope to provide many different kinds of learning opportunities for all the students in my class.

I think that fifth grade is the perfect age for this unit. My students have a general curiosity about the world around them. At this age, they also begin to question why things are the way they are. Why do we have to recycle? Why does it matter how long I take a shower? Why are adults so concerned about global warming? The students I work with in this age group always seem more interested in making a personal connection to

what they are learning. I have noticed that my students like to focus on themselves and their immediate surroundings. I think that this kind of curiosity and personal interest could really work to an advantage for this type of unit of study because the students believe that what they do has an impact, and can also be very persuasive in educating their families on the kinds of changes they can make around the house that can help the environment.

Objectives

As students watch the news at night or overhear their parents discuss the rising gas prices, or see a commercial that shows a polar bear stranded on a tiny island of ice, there is no doubt that a curriculum unit on the impact humans have on the environment is a timely one. Humans undoubtedly impact their environment, but to what degree and in what ways? How do the everyday choices that we as humans make about where we grocery shop and the kinds of vacations we take impact the land, air, and other living things around us? Humans “have become a hundred times more numerous than any other land animal of comparable size in the history of life...and appropriates between 20 and 40 percent of the solar energy captured in organic material by land plants.”ⁱ Humans by sheer numbers alone, will impact their environment, and in ways that are not sustainable. To be considered environmentally sustainable, the actions one takes would not only benefit the present environment, but would not leave future generations with an ecologic problem. This unit sets out to explore these ideas, as well as give students a deeper understanding of the different parts of ecosystems and how those parts interact together. Not only is this kind of unit relevant to the time in which we live, but it also matches up well with the curriculum students need to learn for fifth grade.

In North Carolina science is a tested subject area on the year’s end of grades tests, and an entire quarter of the curriculum is focused on the subject area of ecosystems. I want my students to learn about ecosystems, how human’s impact them, and then play an active role in spreading their knowledge to others in their school and community. There are many different ways in which humans can impact the environment, so I want to provide opportunities for the students to learn about both the positive and negative ways they can affect ecosystems. The main areas in which I would like the students to work would be with recycling, water footprint, carbon footprint, energy use, and species extinction. Through the background information on ecosystems, as well as the students call to action to spread the word about human impact, many state objectives on ecosystems will be covered.

Background Information

This unit will build a baseline understanding about ecosystems that is covered in the fifth grade curriculum and textbooks. A brief synopsis of those topics will be addressed in this

section, but the main focus will be on information that will help me guide my students to their call to action in areas that are not covered at length in the textbooks provided.

Ecosystems

An ecosystem is a habitat that contains all of the living (**biotic**) and nonliving (**abiotic**) parts that interact together. In fifth grade we consider ecosystems to be both small areas (i.e., a backyard) as well as larger areas (i.e., salt water ecosystems).

Within an ecosystem there are species that interact in different communities. A **community** is all of the species that interact in an area and are connected either through a food web or by other life processes. **Populations** of species are composed of the individual organisms that belong to the same species (the organisms share the same genomes and exhibit similar traits in the wild). In ecosystems, organisms play different roles in food chains. The plants and other organisms that make their own food are called **producers**. Producers use energy from the sun and transform it to energy that is usable for the plant. Any organism that cannot make its own food and has to get its energy from consuming another organism is called a **consumer**. Fifth grade learns about the different types of consumers: **herbivores** (plant eaters), **carnivores** (meat eaters), **omnivores** (organisms that eat both plants and other consumers) and **scavengers** (organisms that eat dead animal matter). **Decomposers** recycle nutrients through a food chain by breaking down organic matter of dead plants and animals. Each organism in a community has a certain, specific role that it fulfills for that ecosystem. This role is called the species' **niche**.

Energy can be traced through a food chain through an **energy pyramid**. The main source of energy on earth comes from the sun. Each level of the energy pyramid only retains about ten percent of the energy that it gets from the level before it. The exception to this rule would be for the producers. Most producers in our food chains are only able to use less than one percent of the energy that strikes the Earth's surface from the sun. After that, each trophic level retains about ten percent of the energy from the level before it. The organisms that we usually consider to be at the top of the pyramid are typically the largest in size and the smallest in numbers only uses, or has access to, a very small percentage of life's available energy.

Organisms in an ecosystem are also connected through **symbiosis**. Symbiosis describes a close relationship between two or more species. There are three different kinds of symbiosis: **parasitism**, **commensalism**, and **mutualism**. Parasitism is a relationship between a **parasite** and its **host**. The parasite lives on its host and derives nutrients from it, without killing it. So the parasite benefits from the relationship, while the host is harmed. For example, the relationship between a flea and a dog is parasitism. In commensalism, one organism benefits from the relationship, while the other is neither harmed nor helped. An example of this kind of relationship is found by examining why

the remora fish attaches itself to the loggerhead sea turtle. The remora benefits from this relationship because it can access scraps of food when the turtle feeds, and the turtle is neither harmed nor helped in this situation. Mutualism is a relationship between organisms in which both benefit. An example of this kind of interaction can be shown through the relationship between the Yucca tree and the Yucca moth. The Yucca tree protects the eggs of the moth, and in doing so, the moth pollinates the yucca flower.ⁱⁱ

Ecological Footprint

In The Diversity of Life Edward Wilson describes human's impact on Earth's environment through an ecological footprint as "the amount of productive land needed to supply each person with food, water, energy, living space, commerce, transportation, and waste management."ⁱⁱⁱ He goes on to describe that this is more far reaching than just the physical land that the person uses each day, but also encompasses how much land is needed to support that person through the food that he/she eats because of where it is grown, and the resources used through the production of the materials and clothes that a person uses, etc. When thinking about the human's impact on the environment through this ecological footprint, there are many things outside of what many humans come in contact with each day that are needed to maintain their current lifestyle.

As a part of the ecological footprint, humans can investigate their **water footprint**. This means how much water is needed to support a person due to the kind of lifestyle he/she lives. This water footprint takes into account the water that is needed for food and drink consumption, as well as bathing, taking care of wastes, and water that is used in production of the items that a person uses. In one of the activities of this unit, students will be able to use resources online to calculate their water footprint, in order to get a sense of how much water their current lifestyle uses.

Another component of an ecological footprint that students can use to gauge their mark on the environment is the **carbon footprint**. This information is something that students can use to connect how they are living with the impact they are having on global warming (an issue that they have undoubtedly heard much about at home and in the news), as carbon emissions are considered a greenhouse gas. When students look at their carbon footprint, they will analyze how different lifestyle choices that they make impact the amount of carbon that is released into the atmosphere. This can come from the kind of transportation they use to get to and from school, as well as the products that they use in their everyday lives. Like the water footprint, students will be using online resources to calculate their own carbon footprint.

Species Extinction

Human's development on land has had a huge impact on species extinction and the diminishment of biodiversity. There are three main ways that humans have the most

impact on species extinction: habitat destruction (both loss and degradation of habitat), introduction and spread of nonnative (or invasive) species, and pollution.^{iv} Far and away the factor that has the most impact on species loss is through habitat destruction.

In an effort to keep track of species loss, there are different degrees in which species can be classified that determine their threat of extinction. The International Union for Conservation of Nature and Natural Resources has come up with a system that is widely used to measure species loss.

“Lower Risk: a species is considered safe for now, even if it is dependent on conservation methods

Vulnerable: a species is shrinking in population size and extinction is a good possibility in the near future

Endangered: a species is at very high risk of extinction in the near future, so efforts should be made to conserve this species and its habitat

Critically Endangered: a species is at extremely high risk of extinction in the wild in the immediate future and the likelihood of its survival is very grim

Extinct in the Wild: this kind of species is only surviving in nonnative environments (such as conservatories or in captivity)

Extinct: There are no known individuals left of this kind of species.”^v

For students to understand the importance of species extinction, they will need to have a good knowledge base on biodiversity and how living things interact together in an area. This would also encompass the impact species have on food chains and food webs, and the role that species play in their community. When students understand these ideas, they will be able to get a sense of the greater impact that removing a species can have on an area (specifically with keystone species, which is described below). They will also understand that the greater the biodiversity a community has, the less it is affected by environmental stresses.

Scientists do not know and have not classified all of the species on earth, so sometimes they do not know the impact a specific species has on its ecosystem until it is gone. There are some cases where entire species can be wiped out in one event, because no one knows that the species exists only in that area. This can occur with rare species and ones that are small in size. This can also be due to the fact that many species geographical ranges are small.

There are also some species that have larger roles in their community. These species are called **keystone species**. If a keystone species is removed from an area then that community has to change significantly in order to maintain balance. Inversely, if a keystone species is returned to its community, then the area will return to a balance shown in its natural state. This kind of species impact usually is not known until that species is removed from a community and scientists see the effect that it has on the other organisms living there. An example of a keystone species is the sea otter. In the nineteenth century it was hunted by European explorers for its pelt, and thus faced near extinction. Through this removal, scientists were able to see the great effects it had on sea urchin population, and the ripple effect on the seaweed in the area. When the otter was returned to the area many other organisms followed and the community was restored to a more diverse and healthy ecosystem.^{vi}

Recycling

In the fifth grade curriculum students learn about how the earth recycles through the life processes: the water cycle, the carbon cycle, the nitrogen cycle, and how nutrients are recycled by decomposers. By examining these life cycles, students can draw connections between how earth recycles and how humans recycle man-made items.

Our local recycling, at both the schools and within the county, has undergone a change this year. There are more items that can be recycled, so the importance of educating my students on this change and how recycling can be implemented both at home and at school will be important aspects to cover. For Mecklenburg County, there is a website dedicated to educating the public about the items that can and cannot be recycled.^{vii} I will utilize this website and share it with my students as a resource to use when educating others about how to recycle.

There are many benefits to recycling. First of all, recycling saves landfill space. The more people recycle, the less there is to throw “away.” In educating my students about recycling, I will also be sure to share with them images and information about what happens when things are thrown away and where “away” really is. Since we have already discussed how the number one factor that impacts species extinction is habitat destruction, this is a great time to revisit this point with my students. When there are items that we can recycle, why take up more land space to dispose of them as trash? Recycling paper saves trees, and recycling glass saves energy. Recycling other products such as aluminum, newspaper, and plastic also help save energy that would be used to create these products as brand new. Overall, recycling also helps release less pollutants into the air and water.^{viii} For more information about the benefits of recycling and for facts and figures on recycling, please look in the annotated list of teacher resources at the end of this unit.

When students are called to action in this unit, I want them to be able to feel empowered to make a difference in their local community by taking a stand using one of these areas they have researched. Most of these human impacts take a negative toll on the environment, and thus the students would need to perpetuate ideas of conservation or lifestyle change to make less harmful impact on the environment. I also want students to be able to share some positive things that humans can do that impact their local and global environment. I think this can be achieved through the process of recycling.

Strategies

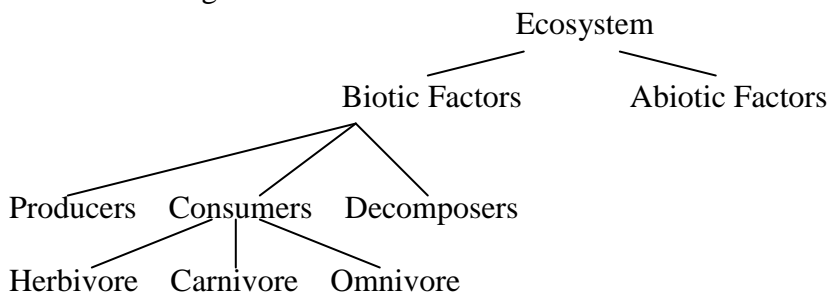
Use of Technology

In this unit, students will use many different forms of technology. Students at my school have access to desktop computers in the classroom as well as the computer lab. We also have a Promethean Whiteboard to use. Both of these resources will be used throughout the unit. A fair amount of the computer usage will be as a tool for research.

When using the internet to research, I want my students to be sure that they can trust the information that they are gathering. Before I have them research on their own, I will do a mini-lesson on finding and evaluating a website. I will also take them through some kid-friendly search engines, to show them how to navigate those resources, and make the most out of their searches.

Journaling

As we go through the background information about ecosystems, the students will keep notes in their science journal. This will be the place where they define vocabulary, as well as provide examples of the different parts of an ecosystem. I like to use graphic representations of the parts of an ecosystem in the students' notes to show how the different parts can be classified and categorized. For example, the following diagram would be helpful for my students to see how parts of an ecosystem that they have learned about can fit together:



This chart in no way provides a comprehensive look at the classification and categorization of an ecosystem and its parts, but it does allow students to have a graphic representation of the ideas that we have been discussing.

Students will also have a section in their journals labeled “For More Information.” Since we will be using a lot of resources outside of the textbook, and students will be doing a lot of research on their own, this will be a place where they can write down the names of books and other web sources from which they find information from.

Hands On Experiences

Throughout the beginning of the unit students will be given opportunities to get outside to observe the ecosystem around our school. They will be asked to classify organisms that they can see and those that they cannot. We will talk about what clues we could find that would tell us other organisms that may be living in the area, even if we do not see them.

Activity One

“How can humans impact their surroundings?”

Objective:

Students will investigate the different ways that humans impact ecosystems.

Procedure:

First, I will have the students brainstorm all of the ways that they think humans impact the environment. They will discuss in small groups, and then share with the whole class. Through this class discussion I will help facilitate by asking guiding questions like:

What does it mean to impact the environment? Can humans only affect their surroundings in a negative way? Do you think that some people have more affect on their environment than others? What would cause this to happen? Do the decisions that we make for how we live our lives only impact Davidson or do you think that some of them might impact other parts of North Carolina? How might this be so?

After our discussion, I will show them clips from the CNBC news story, “Trash Inc.: The Secret Life of Garbage.”^{ix} The entire news program is about 45 minutes long, but has some images that are not appropriate for fifth graders, so I will only show a segment of the show. The segment that I want to have my students watch at this point in my unit is about how scientists have found these areas in the ocean that collect garbage from China and the United States. The clip shows the impact that this garbage has on a beach in Hawaii, as well as possible hazards that it poses to the ocean life. I think that it will provide thought-provoking images for my students to think about.

After they have watched the video, I will have them discuss the impact that this plastic garbage is having on the organisms either in the ocean or on the beach (“plastic beach” as it is referred to in the clip). What could happen if fish mistake plastic garbage for food? What effect does the plastic have on the organisms that live on the beach?

Since students have been looking at a way that humans negatively impact their environment, I want to provide another opportunity that can show a positive impact. Using the Promethean Whiteboard, I will show them the article on Daniel McCormick’s Watershed Sculptures.^x This is a local example of something that humans can do that can have positive effects on ecosystems around them. The students will discuss how these sculptures impact the local watershed, and what affects that has on the people and other organisms that live in the area.

For the purpose of this unit, I will make sure that students come away from this activity understanding that there are positive and negative ways that humans can affect the environment. Specifically, I want to be sure that we have talked about the ways that humans impact the ecosystem through recycling, water use, with their carbon footprint, and species extinction (through habitat loss or degradation). Though we won’t discuss at length all of these areas in this activity, I want to make sure that students have at least heard of all these components, so we set the foundation for the other activities.

Activity Two

“What kind of impact am I having?”

Objective:

Students will make a connection to how humans impact the environment by researching their own ecological footprints.

Procedures:

I will begin this activity by asking if the students know of a way that we can calculate how much impact humans are having on the environment. The website www.myfootprint.org describes an ecological footprint as “the amount of land and ocean area required to sustain your consumption patterns and absorb your wastes on an annual basis.”^{xi} Students will be using this website and two others to calculate their ecological, water, and carbon footprints. It will be important for me to discuss with my students that this is a learning tool, and we are using it to become more cognizant of our actions, not determine who is the “best” at making less of an impact on the environment.

Students will use the following websites to calculate their carbon, water, and ecological footprints:

Carbon: <http://www.safeclimate.net/calculator/>^{xii}

Water: <http://www.h2oconserve.org/home.php>^{xiii}

Ecological: <http://www.myfootprint.org/>^{xiv} or <http://www.footprintcalculator.org/>^{xv}

Students will use these websites to get an idea of how much they are impacting their environment. After everyone has had a chance to find out his/her calculated impact, we will come back together to discuss what we found. I will use the following questions to guide our discussions:

What do these numbers mean to you? How do you compare to other classmates? What behaviors do you think have the most impact? What could you do to decrease your water/carbon impact? Does this make you want to do something to change or does it feel overwhelming?

For homework, I want the students to go home and think more about what they found out today. They are encouraged to have their parents and/or siblings to take the same quizzes to calculate their ecological footprints as well. Then I want the students to write a response about how this activity impacted them, and brainstorm what they would be interested in learning more about now. These responses will help facilitate the discussion for the next activity.

Activity Three

Objective:

Students will be responsible for researching about an environmental impact, and then use that information to support a call to action.

Procedures:

We will begin this activity by having the students share some of their responses from the ecological footprint activity. This will serve as the springboard, which I will use to introduce their research project.

The students will be responsible for researching more about one of the ways that humans affect different ecosystems. They may choose to research recycling, water footprints, carbon footprints, or species extinction. Their choices are limited to these major impacts so that I can provide a set of reliable resources for them to use in their research. After the students choose their area of research, they will be given a list of resources that they can use to complete their research, as well as a list of guiding questions. Students are not confined to answering only these guiding questions, but they are to serve as the basis of their research. The guiding questions and resource lists can be found in Appendix A.

After students have conducted their research, we will discuss different ways that they can share their information with the public. Students will have to come up with their

intended audience (peers, families, school, Davidson residents, etc.), the purpose of their publication (do they want to inform their audience about what they researched, or persuade them to take action themselves?), and then they will choose the proper means for disseminating this information to their audience. Ways they could present their product are as follows: write an article for the school newspaper, do a report for the school news show, make a poster, design an information pamphlet, write a report, write a letter to the editor of the Charlotte newspaper, create a PowerPoint presentation, write a guest column for the local Davidson News website. If their audience is their own family, they might design a plan that outlines their current activities, articulate how they are impacting the environment, and then what they are going to do that will change this impact. If they wanted to investigate the school's impact, they could design a plan for the school and then present it to the Principal. I would like for the final product the students create to give the students the opportunity to choose the kind of written medium they would like to use, as well as provide them an opportunity to create a written piece that has a specific audience in mind.

When students are finished with their finished products, we will have them share with the rest of the class. If their product was chosen with another audience in mind (Principal, community members, etc.), I will provide an opportunity for them to share that with their intended audience as well. Students will be assessed on their research, as well as their final product. The final product should reflect an understanding of human impact on the environment, as well as a plan of action that will decrease that impact.

Resources

Teacher Resources

"BBC Climate Change." BBC.

news.bbc.co.uk/2/hi/science/nature/portal/climate_change/default.stm (accessed October 30, 2010).

This website goes into depth about what global climate change is, what people can do about it, and provides evidence in support of global climate change.

Brown, Lester Russell. *Plan B 3.0: Mobilizing to Save Civilization*. New York: W. W. Norton, 2008.

This book is a good resource for background information about global climate change, and a proactive approach to fixing it.

CNBC. "Trash Inc: The Secret Life of Garbage." CNBC.

<http://www.cnbc.com/id/38830389> (accessed November 7, 2010).

This news segment is about 45 minutes long and highlights different aspects of garbage. It is used as a resource in Activity One.

Union of Concerned Scientists. "Climate Choices- Northeast." Climate Choices. www.climatechoices.org/ne (accessed October 30, 2010).

This website shows how different places on earth are responding to global climate change. There is a place where readers can upload their own pictures and stories about how they are helping combat global climate change.

"Daniel McCormick ." Environmental Art Museum.

http://www.greenmuseum.org/content/artist_index/artist_id-130.html (accessed October 30, 2010).

This article gives a little bit of background on the artist Daniel McCormick and is used in Activity One.

Dodds, Walter K.. *Humanity's Footprint: Momentum, Impact, and our Global Environment*. New York: Columbia University Press, 2008.

This book takes a look at how humanity has impacted the environment throughout time, and provides ties to many different parts of the 5th grade curriculum through discussions of the carbon cycle, water cycle, species extinction, water use, and the web of life.

Hall, Julie, and Sarah Lane. *A Hot Planet Needs Cool Kids: Understanding Climate Change and What you can do about it*. Bainbridge Island, WA: Green Goat Books, 2007.

This book's audience is specifically teachers and kids. It defines climate change, and explains the impact that greenhouse gases, fossil fuels, population growth, electricity use, consumerism, automobile use, farming, and deforestation have on climate change.

Johnson, Rebecca L.. *Investigating Climate Change: Scientists' search for answers in a warming world*. Minneapolis, Minn.: Twenty-First Century Books, 2009.

This book takes a scientific approach to climate change by looking at the evidence that supports the theory that human actions are impacting global climate change.

Kaye, Cathryn Berger. *A Kids' Guide to Climate Change & Global Warming: How to take action*. Minneapolis, MN: Free Spirit Pub., 2009.

This book is set up like an interactive workbook and provides instructions on how to use it as part of a school curriculum.

"NPR: Climate Connections Interactive Map." NPR : National Public Radio : News & Analysis, World, US, Music & Arts : NPR.

<http://npr.org/news/specials/climate/interactive/?ps=bb4> (accessed October 30, 2010).

This site looks at how places around the world are trying to lessen their carbon footprint.

Rogers, Elizabeth, and Thomas Kostigen. *The Green Book: The everyday guide to saving the planet one simple step at a time*. New York: Three Rivers Press, 2007.

This book provides examples of ways that humans can help reduce their carbon footprint in all aspects of their everyday lives.

"Stop Global Warming.org." StopGlobalWarming.org.

<http://www.stopglobalwarming.org/> (accessed October 30, 2010).

This website provides take action tips, provides links to current news about global climate change, as well as recommended books for further research.

The 11th Hour. DVD. Directed by Nadia Connors. Burbank: Warner Home Video, 2007.

This 2007 documentary examines the current issues facing the environment, and how people can help ecosystems.

Wilson, Edward O.. *The Diversity of Life*. Cambridge, Mass.: Belknap Press of Harvard University Press, 1992.

This book is a great resource for understanding more about ecosystems, and is referenced throughout much of the background information in this unit.

Student Resources

"AMNH-Expedition: Endangered!." AMNH-Expedition: Endangered!.

www.amnh.org/nationalcenter/Endangered/index.html (accessed October 30, 2010).

This is a good resource for students researching endangered species.

"Adventure Ecology." Adventure Ecology. www.adventureecology.com/ (accessed October 30, 2010).

This website is set up like a blog, so it may contain material that is not appropriate for students, but it also has a lot of great information about events that impact species extinction.

"Bell LIVE: The Watershed Game." Bell Museum of Natural History: General Information: Hours, Location, and Admission.

<http://www.bellmuseum.org/distancelearning/watershed/watershed2.html> (accessed October 30, 2010).

This interactive game teaches students about things that can affect the watershed.

CNBC. "Trash Inc: The Secret Life of Garbage." CNBC.

<http://www.cnbc.com/id/38830389> (accessed November 7, 2010).

This news segment is about 45 minutes long and highlights different aspects of garbage. It is used as a resource in Activity One. It also has a segment on how people can use landfills to make electricity, and one on how fibers are created from recycled plastic bottles. Both segments are appropriate for students to watch, and might be helpful for their research.

"Carbon Footprint - Carbon Footprint Reduction." Carbon Footprint - Home of Carbon Management. <http://www.carbonfootprint.com/minimiseconf.html> (accessed October 30, 2010).

This website provides a list of ways that people can cut their carbon emissions.

"Climate Change News and Actions by SafeClimate | calculator." Climate Change News and Actions by SafeClimate | calculator. <http://www.safeclimate.net/calculator/> (accessed October 30, 2010).

This is a carbon footprint calculator that may be most beneficial for students looking to measure their family's carbon footprint.

David, Laurie, and Cambria Gordon. *The Down-to-Earth Guide to Global Warming*. New York: Orchard Books, 2007.

This book is geared towards kids, and provides information about global climate change, as well as ways that kids can get involved in helping.

David, Laurie. *Stop Global Warming: The Solution is You!: An Activist's Guide*. 2nd ed. Golden, Colo.: Fulcrum Pub., 2008.

This book is not intended for research, but would be something that might interest students that want to be inspired to get involved in taking action to stop global warming.

"Down-to-Earth Guide to Global Warming | Scholastic." Scholastic, Helping Children Around the World to Read and Learn | Scholastic.com.

<http://www.scholastic.com/downtoearth/> (accessed October 30, 2010).

This is the companion website to the book *The Down-to-Earth Guide to Global Warming*.

"Ecological Footprint Quiz by Center for Sustainable Economy." Ecological Footprint Quiz by Center for Sustainable Economy. <http://www.myfootprint.org> (accessed October 30, 2010).

This site provides a quiz to help measure a person's ecological footprint.

"H2O CONSERVE." H2O CONSERVE. <http://www.h2oconserve.org/home.php> (accessed October 30, 2010).

This site will help students determine their water footprint, as well as provide ways to help decrease this impact.

Hackett, Jay K.. Macmillan/McGraw-Hill North Carolina Science: grade 5. New York, N.Y.: Macmillan/McGraw-Hill, 2008.

This is the student textbook we use for the 5th grade curriculum in my school district.

Hall, Julie, and Sarah Lane. *A Hot Planet Needs Cool Kids: Understanding Climate Change and What you can do about it*. Bainbridge Island, WA: Green Goat Books, 2007.

This book's audience is specifically teachers and kids. It defines climate change, and explains the impact that greenhouse gases, fossil fuels, population growth, electricity use, consumerism, automobile use, farming, and deforestation have on climate change.

"Human Impacts on Water Quality." Tunkhannock Creek Watershed Atlas.
<http://www.atlas.keystone.edu/edu/Teachers/basics/04humanimpacts.htm> (accessed October 30, 2010).

This is a resource for students that are researching human impact on water quality.

International Union for Conservation of Nature and Natural Resources. "IUCN Red List of Threatened Species." IUCN . www.iucnredlist.org/ (accessed October 30, 2010).
This site is for students researching species extinction. It has a list of species at each level concern (threatened, endangered, extinct, etc.).

Javna, John, Sophie Javna, and Jesse Javna. *50 Simple Things You Can Do to Save the Earth*. New York: Hyperion, 2008.

This book is written for kids, and includes fifty things people can do to help save the Earth with a short explanation of each way.

Jefferson, Millie. "15 Ways to Reduce Your Carbon Footprint | Consumed | Sustainability Coverage From American Public Media." Sustainability Coverage From American Public Media. <http://sustainability.publicradio.org/consumed/tips.html> (accessed October 30, 2010).

This list includes different ways that people can reduce their carbon impact, with a short description of each.

Kaye, Cathryn Berger. *A Kids' Guide to Climate Change & Global Warming: How to take action*. Minneapolis, MN: Free Spirit Pub., 2009.

This book is set up like an interactive workbook and provides instructions on how to use it as part of a school curriculum.

Kaye, Cathryn Berger, and Philippe Cousteau. *Going Blue: A teen guide to saving our oceans, lakes, rivers, & wetlands*. Minneapolis, MN: Free Spirit Pub., 2010.

This resource is good for students researching human impact on water.

"Kids' Planet ESPECIES Animal Fact Sheets." Defenders of Wildlife - Kids' Planet.
<http://www.kidsplanet.org/factsheets/map.html> (accessed October 30, 2010).

This is a good resource for students researching species extinction.

Mecklenburg County Government. "default." Mecklenburg County, NC Solid Waste and Recycling. <http://www.wipeoutwaste.com> (accessed October 30, 2010).

This site contains information about recycling in Mecklenburg County. It also provides links to other resources about recycling and waste reduction.

"National Recycling Coalition Recycling Calculator." National Recycling Coalition. www.nrc-recycle.org/recyclingcalculator.aspx (accessed October 30, 2010).

This site is an interactive look at how recycling reduces energy use and source consumption. It is great to show on an interactive whiteboard.

"Recycle City." US Environmental Protection Agency. <http://www.epa.gov/recyclecity/> (accessed October 30, 2010).

This site has activities, games, and facts about recycling.

"Recycle Guys Home." Recycle Guys Home. <http://www.recycleguys.org/> (accessed October 30, 2010).

This is a great site for younger grades, as it uses cartoon characters to educate students about recycling.

"Recycling | Reduce, Reuse, Recycle | US EPA." US Environmental Protection Agency. <http://www.epa.gov/osw/conservation/rrr/recycle.htm> (accessed October 30, 2010).

This site lists the benefits of recycling, as well as goes through a brief description of the process of recycling.

Thornhill, Jan. *This is My Planet: The kids' guide to global warming*. Toronto: Maple Tree Press, 2007.

This book gives kids tools to combating global warming in ways that are relatable to them.

"WWF - There's more than one way to save a planet...." WWF - WWF. http://www.panda.org/about_wwf/what_we_do/climate_change/what_you_can_do/index.cfm (accessed October 30, 2010).

This site is provided by the World Wildlife Fund and lists different ways that people can help the planet.

"World Wildlife Fund - Wildlife Conservation, Endangered Species Conservation." World Wildlife Fund - Wildlife Conservation, Endangered Species Conservation. <http://www.worldwildlife.org> (accessed October 30, 2010).

This site is a good resource for students researching species extinction.

"Yahoo Kids! Directory." Kids Games, Kids Movies, Kids Music, and More - Yahoo! Kids. <http://kids.yahoo.com/directory/Science-and-Nature/Living-Things/Animals/Extinct-Animals> (accessed October 30, 2010).

This site is a good resource for students researching species extinction.

"www.footprintcalculator.org." www.footprintcalculator.org. <http://www.footprintcalculator.org/> (accessed October 30, 2010).

This site can be used to calculate one's ecological footprint.

List of Materials for Classroom Use

Interactive Whiteboard- this will be useful to show the video clips that are online, and other resources that are available online. If an interactive whiteboard is not available to use, a projector that can connect to the computer will work as well.

Computers- access to computers will be very important as the students begin their research, and for them to calculate their ecological footprints.

Notebooks- students will need a notebook for their journaling.

Posters, paper, PowerPoint- these resources will be needed for students when they begin putting together their presentations.

Access to research material- copies of the resources listed for students will be needed for the student research.

Appendix A

Research: Water Footprint

Approved Resources:

<http://www.h2oconserve.org/home.php>

<http://www.atlas.keystone.edu/edu/Teachers/basics/04humanimpacts.htm>

<http://www.bellmuseum.org/distancelearning/watershed/watershed2.html>

Going Blue: A Teen Guide to Saving Our Oceans, Lakes, Rivers, & Wetlands By:
Cathryn Berger Kaye & Philippe Cousteau

Guiding Questions to help facilitate your research:

1. What is my own water footprint?
2. What does a water footprint mean?
3. How can I reduce my water footprint?

4. What are some practical ways that other students/the school/families can reduce their water footprint?
5. What parts of ecosystems are affected by humans' use of water?
6. If there is no regard to freshwater use, what effects could there be?
7. Why should people be concerned about their water usage?

Research: Carbon Footprint

Approved Resources:

<http://www.myfootprint.org/>

<http://www.carbonfootprint.com/minimisecfp.html>

<http://sustainability.publicradio.org/consumed/tips.html>

<http://www.scholastic.com/downtoearth/>

The Down to Earth Guide to Global Warming by, Laurie David and Cambria Gordon

Guiding Questions to help facilitate your research:

1. What is my own carbon footprint?
2. What does a carbon footprint mean?
3. How can I reduce my carbon footprint?

4. What are some practical ways that other students/the school/families can reduce their carbon footprint?

5. What parts of ecosystems are affected by increased amount of carbon into the environment?

6. If there is no regard to the amount of carbon released in the environment, what effects could there be?

7. Why should people be concerned about their carbon footprint?

Research: Recycling

Approved Resources:

www.wipeoutwaste.com

<http://www.recycleguys.org/>

<http://www.epa.gov/recyclecity/>

<http://www.nrc-recycle.org/recyclingcalculator.aspx>

Guiding Questions to help facilitate your research:

1. What does recycling mean?

2. How do you participate in recycling?

3. What items can and cannot be recycled?

4. What happens when certain items are recycled? Glass? Plastic? Paper? Batteries and other hazardous materials?

5. How does recycling impact ecosystems?

6. If there is was no recycling, what would happen?

7. Why should people care about recycling?

Research: Species Extinction

Approved Resources:

<http://kids.yahoo.com/directory/Science-and-Nature/Living-Things/Animals/Extinct-Animals>

<http://www.kidsplanet.org/factsheets/map.html>

<http://www.amnh.org/nationalcenter/Endangered/index.html>

<http://www.iucnredlist.org/>

www.worldwildlife.org

Guiding Questions to help facilitate your research:

1. What does species extinction mean?

2. How do species become extinct?

3. How do humans have an impact on species extinction?

4. What are some effects on the ecosystem when an organism is extinct?

5. What can people do to limit species extinction?

6. What are some local (to North Carolina) species that are extinct?

7. Why should people be concerned about species extinction?

ⁱ Wilson, Edward O.. *The Diversity of Life*. Cambridge, Mass.: Belknap Press of Harvard University Press, 1992. Page 272.

ⁱⁱ Hackett, Jay K.. *Macmillan/McGraw-Hill North Carolina Science: grade 5*. New York, N.Y.: Macmillan/McGraw-Hill, 2008.

ⁱⁱⁱ Wilson, Edward O.. *The Diversity of Life*. Cambridge, Mass.: Belknap Press of Harvard University Press, 1992. Page xi.

^{iv} Wilson, Edward O.. *The Diversity of Life*. Cambridge, Mass.: Belknap Press of Harvard University Press, 1992.

^v International Union for Conservation of Nature and Natural Resources. "IUCN Red List of Threatened Species." IUCN . www.iucnredlist.org/ (accessed October 30, 2010).

^{vi} Wilson, Edward O.. *The Diversity of Life*. Cambridge, Mass.: Belknap Press of Harvard University Press, 1992. Page 164.

^{vii} Mecklenburg County Government. "default." Mecklenburg County, NC Solid Waste and Recycling. <http://www.wipeoutwaste.com> (accessed October 30, 2010).

^{viii} "Recycling | Reduce, Reuse, Recycle | US EPA." US Environmental Protection Agency. <http://www.epa.gov/osw/conservation/rrr/recycle.htm> (accessed October 30, 2010).

^{ix} CNBC. "Trash Inc: The Secret Life of Garbage." CNBC. <http://www.cnbc.com/id/38830389> (accessed November 7, 2010).

^x "Daniel McCormick." Environmental Art Museum. http://www.greenmuseum.org/content/artist_index/artist_id-130.html (accessed October 30, 2010).

^{xi} "Ecological Footprint Quiz by Center for Sustainable Economy." Ecological Footprint Quiz by Center for Sustainable Economy. <http://www.myfootprint.org> (accessed October 30, 2010).

^{xii} "Climate Change News and Actions by SafeClimate | calculator." Climate Change News and Actions by SafeClimate | calculator. <http://www.safeclimate.net/calculator/> (accessed October 30, 2010).

^{xiii} "H2O CONSERVE." H2O CONSERVE. <http://www.h2oconserve.org/home.php> (accessed October 30, 2010).

^{xiv} "Ecological Footprint Quiz by Center for Sustainable Economy." Ecological Footprint Quiz by Center for Sustainable Economy. <http://www.myfootprint.org> (accessed October 30, 2010).

^{xv} "www.footprintcalculator.org." www.footprintcalculator.org. <http://www.footprintcalculator.org/> (accessed October 30, 2010).