About Garden Earth Naturalists

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Why GARDEN EARTH?

Our home, earth, is the only planet currently known to support life as we know it. The complex interactions of organisms and the physical environment of earth’s ecosystems provide life-giving air, clean water and food to eat. If we had a garden that provided all the food for our families to eat, wouldn’t we take care of it? Our planet, our Garden Earth, also needs our care. Through Garden Earth Naturalists, children will learn about how earth’s ecosystems function and what they can do to guard and restore the life-giving, ecological services of Earth.

Key questions in the GEN program include:

- What is the status of Earth's eco-services on your site?
- How can we study our site as citizen scientists?
- In what areas of your site is the ecosystem's health damaged?
- How can we restore the eco-services on our site?

Through GARDEN EARTH NATURALIST after-school clubs, kids learn about the ecosystems that surround them and about ways they can help these ecosystems. By working with their teachers, parents, community volunteers and civic organizations, they develop the cooperative skills to investigate and restore their school site. These skills can then be transferred to restoring other damaged life support systems in their local community.

Overview and Conceptual Framework

The GARDEN EARTH NATURALIST (GEN) clubs integrate scientifically strong curricula with outdoor investigations and stewardship/service learning projects. The program stresses teamwork and thus creates a non-competitive, non-threatening environment for students. The interdisciplinary, learner-centered activities encourage problem solving and critical thinking. The active learning techniques using 'real world' relevant subject matter are consistent with current research about how children learn.

GEN provides an in-depth understanding of an ecosystem. The instructional materials organize content matter into "Departments" which represent the life-support functions or "eco-services" that Earth's ecosystems provide to maintain a quality life on this planet. The Departments include: water purification, air cleaning, climate control, pollination, soil production and maintenance, pest and disease control, biodiversity, and food production. This framework provides a platform for identifying issues that threaten earth's eco-services and stewardship actions that repair each eco-service. (see Figure 3)
The GEN Ecological Content

The GEN conceptual framework helps children understand and value the complex interrelationships in an ecosystem. They discover that every ecosystem, including their school sites and backyards, provide a variety of important eco-services. A brief summary of the content presented in each GEN Department follows.

The GEN Eco-Services or Departments

Air Cleaning
Humans can only live a few minutes without air, yet it is one of the resources that we rarely think about until it is polluted and poses a danger to our health. We are fortunate that nature provides us with a good filtering system that takes most of the dust and poisonous gases out of our air, and releases clean air filled with oxygen, the gas we need to breathe. This filtering system is made up of plants. Trees, shrubs and grasses are the main air filters that you will find on your school site.

Food Production
All species on our planet are interrelated in very complex food webs. The food production department addresses the food needs of all living organisms. To be successful, the workers in this department need a diversity of plant materials to support a diversity of animals. When people cut down forests to plant fields or build houses, and do not leave any trees or ground-covers, they remove entire populations of plants and animals that completed food chains within that ecosystem. When we upset the food web in one place the effects of this will be felt by the other animals and plants that depended upon the removed species for survival.

Pollination
Many people only think of allergies when they hear the word pollen. However, pollination – the transfer of pollen grains from one flower to another flower to make seeds and fruits – is a vital part of a healthy ecosystem including the one on your school site. Over 100,000 species – such as bees, moths, butterflies, beetles, flies and even birds, mammals and reptiles - serve as pollinators worldwide. In the United States alone, pollination plays an important role in the production of more than 150 food crops including pecans, plums, corn, apples, alfalfa, and beans. Almost all fruit and grain crops require pollination to produce their crop.

Soil Production & Maintenance
The soil department produces rich, life-giving soil and maintains quality soils for all creatures. Leaf litter and other living material falls to the ground and decompose with the help of soil organisms. Root systems of plants are very important in holding soil in place and maintaining quality soil. Unfortunately plants have been stripped from many areas on your school site and local community. Without plants and their strong roots, the soil can erode away.

Pest & Disease Control
Nature keeps things in very complex balances. When one organism in a food web multiplies rapidly, other organisms
may increase or decrease in population, depending upon if they are prey or predator. If the condition is good for humans, we usually try to keep it. If it is bad, we try to eliminate it. This is not necessarily good for people. In understanding the ways to control a pest problem, we must understand the ties that these organisms have to each other. If an ecosystem is healthy its species diversity creates control mechanisms for reducing problem populations. If we set up unhealthy ecosystems that have only one species (mono-cultures e.g. thousands of acres of corn or wheat), when a disease condition occurs it is very hard for nature and humans to control the problem.

**Water Purification**
Nature has an amazing ability to purify our water. As it evaporates it leaves impurities behind on the ground or in leaves. Rainwater in unpolluted areas is very fresh and drinkable. As dirty water passes over and through the ground, the soil, rocks and microscopic plants and animals that it flows by help to remove impurities. This valuable purification service is often hampered when people damage the soil structure to grow crops or to site buildings.

**Biodiversity**
There are many different ecosystems on Earth and each is made up of interdependent plants and animals. Collectively, these plants and animals form the biodiversity of the ecosystem. The species in the old growth forests are different from those of a grassland or pond, but within the biodiversity of their own ecosystem, food and shelter is found. Humans can adapt to live in almost any ecosystem, but we must take care not to upset the balances of these systems. If we do, we lose important species that are links for the survival of other organisms. Eventually, this will threaten the availability of food, medicines, wood, rubber, and all the other materials that the ecosystem biodiversity Department provides.

More detailed descriptions of each eco-service are included at the beginning of each Module.
Your School Site Ecosystem

The following chart can help you visualize features and organisms related to each GEN Department on your site.

<table>
<thead>
<tr>
<th>Garden Earth Departments/Eco-services</th>
<th>Features to Look for on Your Site</th>
<th>Related school site organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Cleaning Department</td>
<td>Trees and bushes</td>
<td>Trees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shrubs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other green plants</td>
</tr>
<tr>
<td>Food Production Department</td>
<td>Grasses or trees that produce seeds: Animal signs such as tracks, nests or holes in the ground. A place where an animal such as a bird, a mouse or insect might live. Sign of an animal eating another animal or plant. Bird nests.</td>
<td>Birds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Small mammals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Insects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lizards, frogs</td>
</tr>
<tr>
<td>Pollination Department</td>
<td>Flowers, trees and shrubs that attract pollinators.</td>
<td>Bees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Butterflies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beetles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wasps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hummingbirds</td>
</tr>
<tr>
<td>Pest and Disease Control Department</td>
<td>Damage to leaves from chewing insects. Invasive plant pest such as kudzu, privet hedge or Japanese honeysuckle. Exotic insect pests.</td>
<td>Bats (eat mosquitoes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bluebirds (eat mosquitoes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chewing insects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gypsy moth nests</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire ant mounds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Armadillo holes</td>
</tr>
<tr>
<td>Biodiversity Department</td>
<td>Areas with a lot of vegetation attract more insects and wildlife and hence; have greater biodiversity than areas with just once plant species such as a grass lawn.</td>
<td>All plants and animals on your site.</td>
</tr>
<tr>
<td>Water Purification Department</td>
<td>A wetland or stream on your site. After a rain storm look for areas where water collects in low areas or around downspouts from your school roof. The entire school site is a watershed. Do you know what watershed your school is located in?</td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crayfish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Snails</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Insect larvae</td>
</tr>
<tr>
<td>Soil Department</td>
<td>A wooded area with deep soil A sports field that has a lot of foot traffic.</td>
<td>Worms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Isopods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beetles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Termites</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cockroaches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spiders</td>
</tr>
</tbody>
</table>
## Garden Earth Conceptual Framework

**SAMPLE COMPLETED WORKSHEET 1**

What issues threaten your site and what actions can repair your local ecosystem? Review the following 2 charts and then use the blank one (Figure 5) to analyze your site.

<table>
<thead>
<tr>
<th>STEWARDSHIP Service Learning</th>
<th>CONCEPTS Eco-Services</th>
<th>ISSUES Threats to Life Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>No idling of car drivers</td>
<td></td>
<td>Auto emissions; Air pollution</td>
</tr>
<tr>
<td>Survey car driver drop off system</td>
<td></td>
<td>Asthma- studies about lungs, bodies relation to ecosystem</td>
</tr>
<tr>
<td>Car pooling campaign</td>
<td>Auto emissions; Air pollution</td>
<td>Idling cars with car riders</td>
</tr>
<tr>
<td>Fundraisers for different brooms</td>
<td></td>
<td>Ground level ozone</td>
</tr>
<tr>
<td>Fundraisers for car repairs</td>
<td>Auto emissions; Air pollution</td>
<td>Is there adequate plant material on site?</td>
</tr>
<tr>
<td>Plant vegetation</td>
<td>Auto emissions; Air pollution</td>
<td>Cleaning techniques – pushing dust, chalk, and chemicals</td>
</tr>
<tr>
<td>Investigate indoor air quality and pollutants and dust</td>
<td>Auto emissions; Air pollution</td>
<td>Lack of ventilation in school</td>
</tr>
<tr>
<td>Going beyond S-S to home</td>
<td>Auto emissions; Air pollution</td>
<td>Lack of emission checks by some local community</td>
</tr>
<tr>
<td>Replant vegetation</td>
<td></td>
<td>Lack of money to improve car</td>
</tr>
<tr>
<td>Signs on plants, “These plants provide food please don’t cut”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School gardens with wildlife food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compost for garden soil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant-a-row for the animals; Plant-a-row - humans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of xeriscape plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bird feeders / Window feeders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hands on experience with snakes to sensitize them and reduce fears</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Need for screens on windows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage more use of ESEP kits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theme days to draw attention to issues (Predator Day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bluebird / Bat boxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildflower meadow - no mow zone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop mini ecosystems in school to sensitize children to critters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add flowers to school site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add host plants for insect pollinators such as the Monarch butterfly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education program on how soil is made</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop models of school site– use kit to demo erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compare soil samples and discuss different plants that can grow in different areas interview older community members and learn how ecosystem/community has changed over time – make predictions based on data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education programs on not littering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting planning and planting on erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test local drinking water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigate man-made and city water cycle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigate chemicals used to clean school – does it go in drain or outside?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proactive campaign to pick-up litter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning up litter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add to increases species on site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set up recycling program on site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fundraiser form recycling for more plant species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Re-use of paper (back side)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composting in lunchroom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study how much food is thrown away</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How can we change lunchroom practices?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Figure 2**

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Garden Earth Conceptual Framework
SAMPLE COMPLETED WORKSHEET 1

Study this chart to understand issues that threaten your ecosystem and service learning actions your club members can take to care for your site’s ecosystem.

<table>
<thead>
<tr>
<th>STEWARDSHIP PROJECTS Service Learning</th>
<th>Locations Where eco-services are provided</th>
<th>ISSUES Threats to Life Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant trees in a public area</td>
<td>Air Purification 1.</td>
<td>Acid rain</td>
</tr>
<tr>
<td>Organize car-less (car pool) events</td>
<td>2.</td>
<td>Ozone, sulfur dioxides from vehicles</td>
</tr>
<tr>
<td>Bird feeders</td>
<td><strong>Food Production</strong> 1.</td>
<td>Overpopulation, Over consumption</td>
</tr>
<tr>
<td>Plant several food plants for wildlife on the site</td>
<td>2.</td>
<td>Monocultures</td>
</tr>
<tr>
<td>Remove invasive species; restore with native plants</td>
<td><strong>Pest &amp; disease Control</strong> 1.</td>
<td>Introduced species</td>
</tr>
<tr>
<td>Puppet show on beneficial insects/ the dangers of pesticides</td>
<td>2.</td>
<td>Bioconcentration</td>
</tr>
<tr>
<td>Pollinator garden</td>
<td><strong>Pollination</strong> 1.</td>
<td>Pesticides/herbicides</td>
</tr>
<tr>
<td>Hummingbird feeders in a public place</td>
<td>2.</td>
<td>Endangered species</td>
</tr>
<tr>
<td>Composting/vermiculture project at school</td>
<td><strong>Soil Production</strong> 1.</td>
<td>Erosion</td>
</tr>
<tr>
<td>Plant groundcover on an eroded site</td>
<td>2.</td>
<td>Deforestation</td>
</tr>
<tr>
<td>Puppet show about wetlands</td>
<td><strong>Water Purification</strong> 1.</td>
<td>Groundwater contamination</td>
</tr>
<tr>
<td>Rainwater collection/ water conservation</td>
<td>2.</td>
<td>Wetlands destruction</td>
</tr>
<tr>
<td>Increase awareness of endangered species</td>
<td><strong>Biodiversity</strong> 1.</td>
<td>Loss of genetic diversity/ Endangered species</td>
</tr>
<tr>
<td>Reduce, Reuse, Recycle Programs</td>
<td>2.</td>
<td>Overpopulation/ Over-consumption</td>
</tr>
</tbody>
</table>

Figure 3

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## Garden Earth Conceptual Framework

**INSTRUCTIONS:** Analyze your site by completing the following worksheet with issues that threatened your local ecosystem, locations on your site where the service is provided and service learning projects that can improve your site.

<table>
<thead>
<tr>
<th>STEWARDSHIP PROJECTS</th>
<th>LOCATIONS Where Eco-Services are Provided</th>
<th>ISSUES Threats to Life Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Learning</td>
<td>Air Purification</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>Service Learning</td>
<td>Food Production</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>Service Learning</td>
<td>Pest &amp; Disease Control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>Service Learning</td>
<td>Pollination</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>Service Learning</td>
<td>Soil Production</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>Service Learning</td>
<td>Water Purification</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>Service Learning</td>
<td>Biodiversity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
</tr>
</tbody>
</table>
About the GEN Log, Standards Checks & Baseline Data

The GEN Log  Use your Club log to keep track of your ecological data including your standards checks, citizen science projects and your service learning projects. Future club members can compare data they collect with your data and they can also learn about the projects you implement to improve the health of your local ecosystem. Remember to take lots of photos of your club adventures.

GEN Standards Checks & Baseline Data

Developing an ecological long-term research dataset for your club site

Garden Earth Naturalists (GEN) Standards’ Checks and baseline data help learners address the question: “What is the environmental health of my club site?” Garden Earth Naturalists learn that their club sites are ecosystems that provide life support functions (i.e., generally, these sites are school grounds). These life support functions nurture all life forms. This includes all living things on Earth, even you. We refer to these life support functions as “services” that the Earth provides—free of charge (also referred to as natural capital). But ecosystems are not the same. Healthy ecosystems function better to provide life sustaining support services than degraded ecosystems. How do you know if the ecosystem on your site is healthy? Is it in good shape?

When people want to know if they are in good shape, they go to a doctor and have a “check-up”. The doctor will monitor your heart, look at your eyes, and do various tests. We can also do tests on ecosystems to check how well they provide free services. We hope that with your help, each year your club site will get better at providing free services for Earth’s creatures and continue to reproduce!

During the standards checks activities, GEN Club members conduct tests and collect data to monitor the health of the club site ecosystem. The tests are called “Standards Checks” (SC). The information or data collected the first time is “baseline data”. For example, a set of baseline data for the Pollination Department would include the number and variety of pollinators found at a Standards Checkpoint on a certain date.

Garden Earth Naturalists will conduct the same standards checks each year and compare the new data to the baseline data. This will be a way of knowing whether the club site provides the same eco-services each year. It is anticipated that as club members conduct service projects in conjunction with their site that ecosystem health will improve overall.
What Research Says about the Importance of Children Learning in the Outdoors . . . . . 

GEN Lesson plans take learners outside on their site for the majority of each learning session. Kids love to be outside and that after-school is an ideal time for them to be playing, exploring and learning in the outdoors. And research backs up the importance of taking children out-of-doors!

"Many children today find it easier to stay indoors and watch television. I worry that children do not know what they are missing. Children cannot love what they do not know. They cannot miss what they have not experienced."

-Mary Pipher, The Shelter of Each Other

Children are Becoming Increasingly Disconnected from Nature

For most of human existence, children spent a great deal of their time outdoors, connecting with nature on a regular basis as they explored fields, farms, or wild areas close to their homes. During the last part of the twentieth century, children's environments became increasingly urbanized at a rapid rate. (Chawla 1994) Gradually, children's access to the natural world has been shrinking, with alarming results. Researchers have found that a number of societal factors have resulted in a profound change in the way today's children experience the natural world. In his article, “Children's Interaction with Nature: Its Importance in Children's Development and the Earth's Future,” author Randy White sites some of these factors:

A “culture of fear” has parents afraid for their children’s safety. Due to “stranger danger,” many children are no longer free to roam their neighborhoods or even their own yards unaccompanied by adults (Pyle 2002, Herrington and Studtmann 1998, Moore and Wong 1997). Many working families can’t supervise their children after school, giving rise to latchkey children who stay indoors or attend supervised after-school activities. Furthermore, children's lives have become structured and scheduled by adults, who hold the mistaken belief that this sport or this lesson will make their children more successful adults (Moore and Wong 1997, White and Stoecklin 1998).

The culture of childhood that played outside is gone and children's everyday life has shifted to the indoors (Hart 1999, Moore 2004). As a result, children’s direct and spontaneous contact with nature is a vanishing experience of childhood (Rivkin 1990, Chawla 1994, Kellert 2002, Pyle 2002, Kuo 2003, Malone 2004). One researcher has gone so far as to refer to this sudden shift in children's lives and their loss of free play in the outdoors as a “childhood of imprisonment” (Francis 1991).

Research shows a dramatic decline in the amount of time children spend in the outdoors. Sandra Hoffert and John Sandberg (2000) cite the following statistics: Between 1981 and 1997, the amount of time U.S. children aged 6-8 spent playing outdoors decreased by four hours per week while the amount of time they spent indoors increased by almost 5 hours per week.

Today’s Children Need More Positive Interactions with Nature

The term ecophobia, has been coined to describe a fear of the natural world and environmental issues. David Sobel, in “Beyond Ecophobia,” explains that “what is emerging is a strange kind of schizophrenia. Children are disconnected from the world outside their doors and connected with endangered animals and ecosystems through electronic media.” Sobel
goes on to explain that children are being exposed to unsettling environmental issues at an early age, but are not first being given the opportunity to develop close personal connections with nature.

A cross-cultural research study by J.A. Palmer (1993) found that the single most important factor in developing personal concern for the environment was positive experiences in the outdoors during childhood. Further research by R.A.Wilson (1994) and D.A. Simmons (1994) (based on personal interviews with groups of children varying in age from preschool to age nine) found that the attitudes children expressed towards various aspects of the natural environment (rain, wildflowers, trees, birds) included more expressions of fear and dislike than appreciation, caring or enjoyment. S. Cohen and D. Horn-Wingered (1993) contend that children’s unfounded fears and misconceptions about the natural environment develop when they have very little actual contact with living things and obtain most of their attitudes through the electronic media.

Helping Children Develop a Love for the Earth

“All of us are born with an interest in the world about us. Watch a human baby or any other young animal crawling about. It is investigating and learning things with all of its senses of sight, hearing, taste, touch, and smell. From the moment we are born we are explorers in a complex and fascinating world.” “The wonders of nature are not confined to exotic places like the tropical forests of the world. They are just as accessible in your own garden, if you look for them.” Gerald Durrell, The Amateur Naturalist

“I sincerely believe that for the child, and for the parent seeking to guide him, it is not half so important to know as to feel. If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which seeds must grow. The years of childhood are the time to prepare the soil.” “If a child is to keep alive his inborn sense of wonder... he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in.” Rachel Carson, The Sense of Wonder
- Children with Attention Deficit Disorder (ADD), when provided appropriate contact with nature, show an improvement with their ability to concentrate (Taylor 2001)
- Children who regularly have positive personal experiences with the natural world show more advanced motor fitness, including coordination, balance, and agility (Grahn, 1997, Fjortoft 2001)
- Appropriate interactions with nature help children develop powers of observation and creativity (Crain 2001)
- The development of imagination and a sense of wonder have been positively linked to children’s early appropriate experiences with the natural world (Cobb 1997). A sense of wonder is an important motivator for life-long learning (Wilson 1997).

“If we want children to flourish,” Sobel says, “to become truly empowered, then let us allow them to love the earth before we ask them to save it.”-David Sobel, Beyond Ecophobia

Children today can find out anything in the world on the Internet, but probably don’t know what kind of trees are in front of their houses. They can watch live events on TV, but are oblivious to the life going on outside their windows. They can have amazing (and often violent) adventures by themselves on a video game, but don’t seem to spend enough time having a simple, much more meaningful, adventure with an adult who cares about them. Kids are often just not connecting with nature – in any way. But there’s a new opportunity for kids to enjoy trees, birds, plants and animals, and build lasting bonds with nature and with those adults with whom they share outdoor explorations.
The Garden Earth Naturalist Instructional Model & the ‘Quick Guide’ Lesson Plans

The Garden Earth Naturalist lesson plans were developed using the ‘backward design’ curricula model, Understanding by Design. All Modules are correlated to the Georgia Performance Standards and to the National Science Standards. Although the program is intended as a fun after-school, environmental education and service learning program, we have made great efforts to support instructional learning goals as well.

Overarching learning outcomes focus on developing an understanding of the life support functions (or eco-services) provided by ecosystems, specifically the school site ecosystem.

GEN Learning Plans follow the elements from Understanding by Design as outlined below:

- **W** - Where are we heading with this lesson/module and why we are studying it?
- **H** – Hook student interest
- **R** – Rethink
- **E** – Evaluate

‘Essential Questions’ guide learners in each GEN activity while ‘Enduring Understandings’ provide instructors the overarching goals for each Module.

Overall Essential Questions for the Club programs include:

- Who and what lives on my school site?
- What is the health of my school site ecosystem?
- What can I do to improve the health of my ecosystem?

Modules in the GEN program guide learners through four stages of learning. Following the design of the accompanying wheel, each unit begins by developing empathy or a sense of caring about the environmental topic to be addressed. As much as possible, we try to use the school site as the classroom for these fun after-school learning adventures. In Stage 1, lessons often start with an outdoor activity, a powerpoint or a puppet show to hook student interest and focus their understanding for the topic for-school club session.

Stage II, characterized as the ‘Learning’ phase focuses on grasping concepts and gathering factual information related to healthy ecosystems as well as threats such as erosion or lack of pollinators to fragile environments. Environmental education learning games, demonstrations and school site discovery hunts are featured in Stage II.
Investigation and guided inquiry are key to Stage III. Using processes common to scientific research, students move outdoors again to test their knowledge through first-hand experience. They investigate the health of their school site ecosystem and begin to discover ways to restore damaged parts of their ecosystem. Stage IV centers around reflection, valuing and protecting the environment through stewardship actions and service learning projects on the school site and in the local community. The GEN student take-home packets for each Module and the GEN calendars provide students the opportunity to extend their learning and service to the environment at home.

Through the rich variety of activities and experiences embedded in each GEN Module, multiple learning styles are honored. Opportunities are provided for all children to experience their favorite learning modes as they progress through the four stages of learning.

The stages of the GEN instructional model relate to Bloom’s cognitive hierarchy. In Stage II the emphasis is placed on KNOWLEDGE and COMPREHENSION. With the outdoor inquiry investigation, in Stage III, APPLICATION and ANALYSIS come into play. At Stage IV, SYNTHESIS and EVALUATION are reached. There are opportunities to solve problems and make decisions, to engage in inductive and deductive reasoning and analytical and critical thinking.

Major skills areas are features in GEN including those related to innovative thinking, receptivity, information gathering, research and reference, communication and leadership.

The affective domain is also featured. During Stage I, students are lead to Receive, at Stage II to Respond. By Stage III they are encouraged to Value and Organize and by Stage IV to become sufficiently committed to the environment to change their behavior and to take stewardship action through projects and service learning. In stage IV, science nights provide another opportunity for students to share what they have learned with the entire school community and to involve parents in the learning experience.
How is the GEN curricula packaged for after-school leaders?  
**THE ‘GEN QUICK GUIDES’**

Each of the eight modules has 15 or more activities that are packaged into lessons. Each after-school lesson provides a 75 minute learning plan. The lessons have a convenient ‘Grab & Go’ format to facilitate ease yet quality and depth of after-school instruction. We refer to these as the ‘GEN Quick Guides’. The ‘Quick Guides’ are intended to be taken outside during club sessions; hence, Club leaders are encouraged to laminate these ‘mini’ lesson plans. Each Quick Guide is formatted to fit on a two sided sheet of paper; is printed on cardstock and ‘packaged’ in a three ring binder. There are 4 or 5 Quick Guide lessons for each of the eight modules (about 35 lessons total).

### The ‘GEN QUICK GUIDES’

Each module includes a series of "Quick Guides". These Quick Guides are the ‘mini’ lesson plans that are printed on cardstock and come in a three ring binder. They are intended to be taken outside during club sessions and are also laminated. Each guide includes:  
- Essential Questions
- At a Glance
- Concepts
- Learning Objectives and Concepts
- Procedures and Supply Lists

The back of each Quick Guide includes:  
- ‘Essential Questions’, an ‘At a Glance’ summary statement, a ‘learning wheel’ that highlights lesson components for each of the 4 stages in the GEN instructional model, learning objectives and concepts.  
- The front of each Quick Guide includes ‘Essential Questions’, an ‘At a Glance’ summary statement, a ‘learning wheel’ that highlights lesson components for each of the 4 stages in the GEN instructional model, learning objectives and concepts.  
- Modules can be extended by using additional activities from the module that are not included in the Quick Guide write-ups. Service learning and environmental stewardship activities can also extend the GEN learning sequence and program.
QUESTIONS & COMPONENTS FOR EACH ‘GEN QUICK GUIDE’

Below is a general description of the focus of the five lessons in each GEN module.

Lesson 1
Questions:
- What is (the life support function)?
- Who are the eco-service workers?
- Where do they live and work on my site?
- Why should I care about this department and the eco-workers?

Components:
- Powerpoint
- use of eco-service worker cards
- puppet shows
- discovery hunt or game to introduce and/or investigate the eco-workers

Lesson 2
Questions:
- What background info do I need to understand this life support function?

Components:
- An investigation - such as ‘parts of a flower’ in the Pollination Module
- Subversive Focus: ‘it’s fun and cool to be a naturalist’

Lesson 3
Questions:
- How does this life support function operate on my site?
- How (and why) do the workers do their work?
- How can I collect data about how this life support service functions on my site?
- How do ecologists investigate the environment?

Components:
- Standards check or other inquiry science activity

Lesson 4
Questions:
- What are global issues related to this life support function?
- How are ecosystems in other locations affected?
- How healthy is this life support function in other parts of the world?
- What can I do to help?

Components:
- No standard component – but a global focus; The ‘reflection’ focuses on what can be done to improve local ecosystem i.e. environmental stewardship.
- Possibly reference ‘Eco-justice’ in some way.

Lesson 5 A national or global Citizen Science project (ie Monarch watch, Backyard Feeder Watch) related to the theme of the module.
GEN CLUB TIMELINE
TWO YEAR PLAN FOR IMPLEMENTING GEN MODULES

THE 8 GEN CURRICULA MODULES
Project materials include a two year sequence of Club Modules. Topics follow:

Year 1

1. What is an Ecosystem?
2. Food Production
3. Air Cleaning
4. Pest & Disease Control

Year 2

1. Pollination
2. Soil
3. Biodiversity
4. Water Purification

The suggested timeline corresponds to seasonal activity on the school site. For example, Pollination and Pest Control are the first modules in each school year because fall is the best time of the year to study insects. Food production is featured in late Fall when many creatures are preparing for winter and hence, it is an ideal time for club members to provide food for local wildlife. There is also a Service Learning module that can be implemented whenever club leaders decide to plan their service learning project.

Timeline

Year 1

- Publicize Clubs – August
- What is an Ecosystem? Module – September/October
- Food Module – November/December
- Air Module – January/February
- Science Night – February/April
- Pest Module – March/April
- Service Learning Project - Winter/Spring
- Awards Ceremony - May

Year 2

- Publicize Clubs – August
- Pollination Module – September/October
- Soil – November/December
- Warehouse Module - January/February
- Water Module – March/April
- Service Learning Project Completed And Awards Ceremony - May

A SAMPLE GEN MODULE

Welcome to the Pollination Department!

Each after-school module is research based, tailored to varying delivery methods, engaging and fun for the learner, as well as relevant to today’s youth. To learn about pollination, students participate in these activities:

- Pollination Relay Race
- Flower Inquiry: I wonder/ ID of floral parts
- Pollinator Insect Count
- Pollinator preference experiment
- Ecological Standard’s Check
- Suga’s Helpful Pollinators! - Puppet show and role play game
- Service learning project
STORYLINES AND CHARACTERS

Designed for youth, grades 2-6, GEN appeals to young people’s imagination, and to their openness to perceive the world in new and different ways. While GEN activities develop student understanding of the environment, the use of storylines gives the student a reason to learn and instills the motivation and caring needed to safeguard our planet.

GEN characters capture children’s imagination while involving them in quests to restore the health of their planet. Through stories and puppet shows they meet characters including Dr. Stewardship and Foreco, the forest ecosystem). These characters and others guide learners to discover information about the status of their environment and introduce them to meaningful ways to help the planet.

Students also meet the managers of Earth’s Eco-services Departments such as Old Man Spruce, a spruce tree from the boreal forest of Germany who manages the Air Cleaning Department, and Oli Earthworm, an earthworm from North America who manages the Soil Production Department. They learn that acid rain is hurting Old Man Spruce’s department and that trash from a nearby dump has made many of Oli Earthworm’s department workers sick. Students develop empathy for these characters and hence, have a reason to prevent acid rain and to recycle their trash.

The GEN Eco-service Departments represent the vital life support functions provided by all healthy ecosystems. While life support processes such as air purification, soil production and climate control may seem complicated and irrelevant to students, they become meaningful as they meet and try to develop way to help these characters. As students perceive the environment in new ways, they see the importance of maintaining the health of Earth’s ecosystems.
Service Learning Projects for GEN Clubs

An important component of GEN clubs lies in students understanding threats to the school site ecosystems and developing plans to improve their sites. For example, if erosion is damaging the Soil Department, students may decide that they should plant ground covers to restore the soil and prevent further erosion. If there are not enough pollinators in the Pollination Department, Garden Earth Naturalists may plant host and nectar plants to meet the needs of native pollinators.

In the service learning component, students apply knowledge and skills learned through GEN classroom activities and after-school clubs to real-life needs within the community. Service learning can aid in improving student’s communication skills, confidence, motivation, citizenship, and awareness of community issues.

Developing Ideas for Service Learning Projects

Ideas from service learning activities arise from school site investigations. After monitoring pollinator populations by conducting a pollinator count, students may decide to plant flowers to attract more pollinators to their site and then monitor the pollinator population.

There are numerous service learning projects that relate to each of the GEN department lessons. The following diagram provides ideas related to each GEN Module.

Plan to utilize the GEN Service Learning Module to guide your students in developing their project.
Insert Service Learning diagram here
Garden Earth Naturalist Reflection Ideas

"Students are thinking all the time, but experience teaches us that, without reflection on what we do, we are not likely to benefit from our good thinking."  
(Author Unknown)

Why Reflect? We do not learn from doing, we learn from thinking about what we do. Reflection activities not only help students draw connections between the lesson experience, but also challenge students to synthesize concepts with observations and address challenging questions. Reflection fosters life-long learning skills and enables students to develop an ability to learn from experiences. There are many ways to reflect. Reflection may occur individually, in groups, in teacher-led discussion, or during student-to-student dialogues. Following is a collection of reflection activities you can use with the Garden Earth Naturalist activities.

Reflection Strategies

Reflection Journals
Journals are a snapshot filled with sights, sounds, smells, concerns, insights, doubts, fears, and critical questions. Students write freely about their learning experience.

Structured Class Discussions
Structured reflection sessions can be facilitated if all students are involved in the learning experience. It is helpful for students to hear stories of success from one another. Discussing real-world issues and themes that are relevant to the learning experience provides students with an opportunity to explore critical thinking skills, and communication skills with their peers. Here are a few suggestions for making classroom discussions more exciting and productive:

- Have each student take a turn at leading the discussion
- Videotape each discussion and make a reflective video at the end of the project, so that students remember the issues discussed and the results of each discussion.

Sentence Stems
Ask participants to finish sentences that you start, either verbally or on paper.

- Today I hope…
- Today I am most anxious about…
- Today I felt…
- Today I was surprised by…
- Today I learned…

One or Two Words
Each student shares one to three words to describe the learning experience or how they feel about the learning experience.

Yarn Web
Students stand in a circle with a ball of yarn. Each person throws it to another and says a word or phrase that explains what they have learned from the learning experience.

Paper on the Wall
Put a large piece of paper up on the wall. Students write or draw their feelings/thoughts/leanings on the paper. Facilitator leads discussion based on writing.
Interviews
Break the group into two or three and have them interview each other about the learning experience, take notes, and summarize a couple of things to the group.

Cluster Journaling
Have students shout out words or phrases that describe the learning experience. Ask each student to take two minutes to write five or six words in random spaces on a page in their journal. Have students connect the words and do a free write on how the words are related.

Fly on the Wall
Ask students to take a couple of moments to reflect on the learning experience (where they’ve been, what they’ve done, whom they’ve worked with, tools they used, etc.). Then ask them to pretend they were a “fly on the wall” observing but not participating in the scene, and write a short descriptive passage based on their observations.

Compare & Contrast
Pre-Learning Experience: Ask participants what they anticipate from the experience:
- What do you expect to encounter?
- How do you expect to act/interact?
Post-Learning Experience: Ask participants what they experienced, and compare this to their expectations:
- What surprised you about your experience?
- Is there anything you would do differently in the future?

Reflection Drawing
Ask students to draw a picture of something they did that they would like to tell their parents or family members. On the opposite side of the page, have students write a description about their picture. Send these drawings home with the students to share with their family members.

Grab Bag
Place a number of items related to the learning experience in a bag or box that conceals their identity but allows students to reach in and explore the objects. Taking turns, have students reach in and feel an object, use descriptive language to describe it to their classmates and try to guess what the object is. Take out the object and discuss what the object is and how it relates to their learning experience.

Graphing
Incorporate students’ reflections and impressions of their learning experience with an introduction to graphs and histograms. As a group, come up with several questions students would like to know about their classmates’ learning experience (i.e., what did students like best). Have students poll each other for results (this can also be done as a group with students raising their hands). Students can then decide what type of graph they should use to display their results (bar graph, etc.). Have students create the appropriate graph and display it in the classroom. Students should explain what their graphs represent.

List-Group-Label
Have students list as many words as possible about the learning experience. Once the list is generated, have them group the related items in the list. Label the grouping and have them jointly write a reflection about what was learned using the groupings as key themes.

Heads-Hearts-Hand
Throughout the learning experience, ask students to keep notes that address three areas: what they are thinking (heads), what they are feeling (hearts), and what they are doing or will do (hands). Share feelings and thoughts at various times, but only share a few at a time. Build in sharing at various times during the learning experience. Following the experience, ask students to review their notes and discuss similarities and differences in what students thought, felt, and did. Discuss possible reasons for differences.

Timeline
Constantly reminding students about the learning experiences helps them remember and reflect on the experience. Allow students to create their own reminders of events by creating a timeline of their learning experience.
L.I.F.E. Reflection
Make a L.I.F.E. chart to address four areas for student reflection: Learning, Ideas, Feelings, and Excitement. Provide students copies of the chart and encourage them to write in as many answers as possible to the following questions: What did you learn? What new ideas do you have? How did you feel about the learning experience? What were you excited about? This works best when students are first given time to think about answers themselves, and then work with others to share and brainstorm more.

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<thead>
<tr>
<th>L</th>
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</tr>
</thead>
<tbody>
<tr>
<td>LEARNING</td>
<td>IDEAS</td>
<td>FEELINGS</td>
<td>EXCITED</td>
</tr>
<tr>
<td>What did you learn?</td>
<td>What new ideas do you have now?</td>
<td>How did you feel about your experience?</td>
<td>What did you get excited about?</td>
</tr>
</tbody>
</table>

Questions from a Hat
Ask participants to answer randomly chosen reflection questions. Encourage participants to use these questions to begin a dialogue.

What? So What? Now What?
Ask participants to respond to the following questions in any format you choose.
- **What?** (Reporting what happened, objectively) Describe what happened, what you saw, what you felt, the interactions you had.
- **So What?** (What did you learn?) Students discuss their feelings, ideas, and analysis of the learning experience.
- **Now What?** (How will they think or act in the future as a result of this learning experience?) What more needs to be done? What will you do now? Did this change you?

Pick an Emotion
Give participants a set of emotions to consider (from pieces of paper, pictures of faces, etc.). Ask participants to identify an emotion they are experiencing, and discuss why.

Concentric Circles
- Divide participants into two groups and place them into two circles (one facing out, one facing in, so there are pairs of people).
- Ask participants to respond to specific questions, giving each half of the pair two minutes.
- Ask the outside circle to rotate once to face a new partner, and continue with a new question.

Photographic Journal
Instead of having students simply write in journals, have them take photographs of the learning experience and write journal entries in response to the photographs they've taken. Or you can take photographs of the students doing the activities. Give each group of students one or two pictures and tell them they are in charge of describing something about the photo in one sentence. Then discuss the action occurring in the picture, something they learned in or as a result of the project, something they enjoyed, surprised them, excited them, and so on. Attach the picture to a piece of construction paper and have students write a short summary. After all the pages are made, purposefully put them in non-sequential order. Have the students put them in sequential order.

QAD (Question-Answer-Detail)
Question-Answer-Detail (QAD) is a reflection activity to help students retain information, comprehend what was learned, and understand the relationships among details. Teachers and students jointly formulate questions about the learning experience before it occurs. After engaging in the learning experience, individuals, pairs, or small groups of students answer the questions with supporting details.
**Wordless Books**
Wordless books tell a story through illustration. The author needs to understand the plot, and illustrations need to be selected and/or drawn carefully to be effective. Have the students construct their learning experience around a historical timeline, noting key events that occurred during their experience. Then have them individually, or in small groups, create a wordless book that illustrates their learning experience.

**Possible Sentences**
Possible Sentences takes what students know of a topic and their familiarity with the English language sentence structure to activate prior knowledge of a topic. After new information is introduced through the use of cognitive teaching strategies, possible sentences are re-evaluated for accuracy.

**Procedure:**
1. Generate a list of 10 words related to your lesson. These words should represent concepts that are both familiar and unfamiliar to students.
2. Have students create 5 possible sentences by using two words in each sentence until all words are gone.
3. Teach your lesson on the topic.
4. After the main instruction is over, have students go back and evaluate the accuracy of their possible sentences by placing a + (for correct), - (for incorrect), or a ? (for cannot determine) beside each sentence.
5. For sentences marked incorrect, students should write a corrected sentence. Sentences whose accuracy cannot be determined can be researched by utilizing outside resources.

**Carousel Brainstorming**
Students will rotate around the classroom in small groups, stopping at various stations for a designated amount of time. While at each station, students will activate their prior knowledge of different topics or different aspects of a single topic through conversation with peers. Ideas shared will be posted at each station for all groups to read. Through movement and conversation, prior knowledge will be activated, providing scaffolding for new information to be learned in the proceeding lesson activity.

**Procedure:**
Generate X number of questions for your topic of study and write each question on a separate piece of poster board or chart paper. (Note: The number of questions should reflect the number of groups you intend to use during this activity.) Post questions sheets around your classroom.

1. Divide your students into groups of 5 or less. For example, in a classroom of 30 students, you would divide your class into 6 groups of five that will rotate around the room during this activity.
2. Direct each group to stand in front of a home base question station. Give each group a colored marker for writing their ideas at the question stations. It is advisable to use a different color for tracking each group.
3. Inform groups that they will have X number of minutes to brainstorm and write ideas at each question station. Usually 2-3 minutes is sufficient. When time is called, groups will rotate to the next station in clockwise order. Numbering the stations will make this easy for students to track. Group 1 would rotate to question station 2; Group 2 would rotate to question station 3 and so on.
4. Using a stopwatch or other timer, begin the group rotation. Continue until each group reaches their last question station.
5. Before leaving the final question station, have each group select the top 3 ideas from their station to share with the entire class.

**Talking Drawings**
Students will activate prior knowledge by creating a graphic representation of a topic before the lesson. After engaging in learning about that topic, students will re-evaluate their prior knowledge by drawing a second depiction of their topic. They will then summarize what the different drawing say to them about what they learned.

**Procedure:**
1. Ask students to close their eyes and think about topic X. Using the Talking Drawings worksheet, have students draw a picture of what they saw while they were thinking about topic X.
2. Teach cognitive portion of your lesson.
3. At the end of the lesson, ask students to elaborate upon their initial drawing by creating a new drawing that incorporates what they learned about topic X.
4. Have students share their before and after drawings with a partner. Students should discuss the differences between the two depictions of topic X.
5. Finally, have students respond in writing at the bottom of their Talking Drawings worksheet. What do the two drawings tell them about what they learned during the lesson?
Ever wonder about the plants and animals that live near your school... and what they do there?

Join your friends in the Garden Earth Naturalist Club. Play games, explore your schoolyard, and participate in a community project you can be proud of!

First meeting:
Date:
Time:
Location:

Club will meet the (second Thursday etc.) of every month. Enrollment is limited to the first 25 children who sign up. For grades 3 - 5.

Club leaders are Mrs. _____________________ & Mr. _____________________

GARDEN EARTH NATURALIST CLUB

Sign my child up! ____________________________________________________________

Name ________________________________ Class ________________________________

______________________________ Date ________________________________

Parent signature ___________________________ ________________________________

Phone number (home) ___________________________ Cell or work ________________________________

I will pick my child up in front of the school at 4pm.
Getting your Club Rolling!
Below is a Draft Letter for Parents

September 200_.

Dear Parents,

We are off to a great start with our new science club! It is an initiative of our school in collaboration with the State Botanical Garden of Georgia, The Georgia Museum of Natural History and the Partnership for Reform in Math and Science Education (PRISM). The Club is designed to introduce children to their local ecosystems through fun instructional games as well as outdoor exploration activities and environmental stewardship projects.

Over the coming school year we will explore four different club modules that represent different ‘services’ provided by earth’s ecosystems. These include Soil, Air, Food and Pollination. In September we will begin with the Pollination Module.

Your support is key to your child’s success in this project. For each Club topic, your child will receive a 6 page GEN Activity Pamphlet that complements the topic of the month. For example the Pollination Pamphlet contains a pollinator matching game, a story, an outdoor pollinator hunt and ideas for stewardship activities to help local pollinators. They might do this by planting milkweed, the host plant for monarch butterflies, at your home. We encourage you to work with your children to complete these activities. After children have completed activities in each pamphlet please sign the form below and return it at the next meeting.

Dates for upcoming events in the GEN Clubs include:

- 
- 

Thank you for your support.

Sincerely,

Name

---

**Garden Earth Naturalist’s Club**

**Pollination Module**

Child’s name __________________________ Parent Signature ____________________________

Wow! My child taught me about pollination! It was neat! We did the following things:

___ read and completed the 6 page pamphlet, Welcome to the Pollination Department
___ looked for pollinators in our yard as we completed 1, 2, 3, A butterfly, a beetle a bee!
___ made a hummingbird feeder
___ talked about what we could do make our yard a better home for pollinators

Other _________________________________________________________________

Comments _____________________________________________________________
4-H DRAFT LETTER TO PARENTS

September 200_

Dear Parents,

Through _____ County 4-H, your child will participate in a new initiative called The Garden Earth Naturalist Club (GEN). The Club is designed to introduce children to their local environment through fun instructional games as well as outdoor exploration activities and stewardship projects.

This new 4H program, which reinforces the state mandated science curriculum, helps children understand that nature’s ecosystems provide “free services” that support all life on what we refer to as ‘Garden Earth’. Over the coming school year we will explore four different modules that represent different ‘services’ provided by earth’s ecosystems. These include Soil, Air, Food and Pollination. In September we will begin with the Pollination Module.

Your child will have the opportunity to participate in both in-school after-school programs that focus on the importance of our local ecosystems. The optional after-school meetings (at the 4H office?) that will take a closer look at each topic.

Your support is key to your child’s success in this project. Each month your child will be receive a 6 page GEN Activity Pamphlet that complements the topic of the month. For example the Pollination Pamphlet contains a pollinator matching game, a story, an outdoor pollinator hunt and ideas for stewardship activities to help local pollinators. They might do this by planting milkweed, the host plant for monarch butterflies, at your home. We encourage you to work with your children to complete these activities. After children have completed activities in each pamphlet they return it at the next meeting and receive points toward . . .

Your child will have the opportunity to become involved in a service learning project through his or her 4-H club. Students who complete a service learning Project will present their projects at DPA at Rock Eagle in (month) as well as at Awards Day in our county in May 200_.

Dates for upcoming events in the GEN program include:

Thank you for your support.

Sincerely,

Name

_______ County 4H Extension Agent         cut here

Garden Earth Naturalist’s Club - Pollination Module

Child’s name __________________________ Parent Signature ____________________________

Wow! My child taught me about pollination! It was neat! We did the following things:

___ read and completed the 6 page pamphlet, Welcome to the Pollination Department
___ looked for pollinators in our yard as we completed 1, 2,3, A butterfly, a beetle a bee!
___ made a hummingbird feeder
___ talked about what we could do make our yard a better home for pollinators
Parents as Club Partners

Research demonstrates that when parents are highly involved in their children’s education, children perform better in school (Henderson and Berla, 1995). The Garden Earth Naturalist program encourages children to extend their learning at home by sharing what they have learned with their families. Home-based activities include monthly take-home packets and Club Calendars that include suggestions for family activities. GEN Clubs encourage active participation by parents through sponsoring science nights or end of the year reward days.

Family Science Nights

GEN Science Nights add another dimension to the overall learning experience. Science nights provide a tool for bringing families, school communities, and additional local collaborators together to celebrate and experience science. A Family Science Night is an evening program of science activities in which students and their parents can work together on simple, age-appropriate science activities. The program uses readily available, low-cost materials.

The GEN Science Night Kits were developed to encourage the entire school community to become engaged in “doing science.” Creative learning tools known as “Department Stations” and a “Passport” allowing youth and their parents to enter an experiential learning situation, processing science through doing science, thus generating a more applicable “take away” message of the urgency to be good stewards of our Garden Earth. The Science Nights lead Georgia in demonstrating how local collaboratives can work to begin a grassroots movement to encourage better stewardship of our precious environmental resources.

GEN Clubs encourage active participation by parents through sponsoring science nights or end of the year reward days. Research demonstrates that when parents are highly involved in their children’s education, children perform better in school (Henderson and Berla, 1995).
Parents and students will:

GARDEN EARTH
- understand that Garden Earth provides many different eco-services.
- name some Garden Earth eco-services.

POLLINATION
- describe the process of pollination.
- understand why pollination is important to their daily existence on Earth.
- name 3 pollinators who pollinate flowers in their local environment.

SOIL PRODUCTION AND RECYCLING
- investigate what makes up soil.
- name materials which can be recycled into soil.
- name some decomposers.
- describe the process of decomposition.
- investigate a decomposer in detail (worm).

FOOD PRODUCTION
- create food chains and webs.
- understand the concept of camouflage and warning colors.
- role-play the journey of a migrating bird.
- name some local wildlife and learn how they survive the winter.

AIR CLEANING
- investigate why trees are important.
- describe some causes of air pollution and acid rain.
- describe how ecosystems clean the air.
- name the components a seed requires to germinate.

PEST AND DISEASE CONTROL
- name 2 invasive plants in Georgia.
- investigate some common pest behavior (termites).

WATER PURIFICATION
- describe the water cycle process.
- investigate water conservation.

BIODIVERSITY
- describe the term biodiversity.
- name some endangered/threatened species in Georgia.
The Garden Earth Naturalist program offers science content and inquiry based material to be used in the co-curricular delivery model of 4-H, as well as the after school delivery model of 4-H. The joint delivery of co-curricular GEN lessons and after school clubs creates the perfect environment for the 4-H Essential Elements context to manifest. Through in school or co-curricular delivery, learners are exposed to rich content and research based information allowing the 4-H and Garden Earth Naturalist program to serve as a bridge between the formal and non formal learning environment.

Through this delivery style, youth are exposed to quality content with a relevant ecological message and can make their own meaning of

The 4-H Essential Elements and GEN

<table>
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<tr>
<th>BELONGING</th>
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<tr>
<td>Clubs members work together investigating and restoring their local environment</td>
<td>Engagement in Learning</td>
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<tr>
<td>Positive relationship with a caring adult</td>
<td>Club members master content about local ecosystems</td>
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<tr>
<td>An inclusive environment</td>
<td>Opportunity to lead science night or summer camp activities</td>
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<td>A safe environment</td>
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<th>INDEPENDENCE</th>
<th>GENEROSITY</th>
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<td>Opportunity to see oneself positively affecting the environment at present and in the future</td>
<td>Opportunity to provide service to others and to the environment</td>
</tr>
<tr>
<td>Encouraged to investigate ecosystem in their own backyard</td>
<td>Opportunity to share knowledge with other students and with parents</td>
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<tr>
<td>Opportunity for CPA and DPA related to the 8 GEN modules</td>
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Georgia 4-H ascribes to a set of core program themes known as: Agricultural and Environmental Sciences, Family and Consumer Sciences, Citizenship, Leadership, and Communication. Garden Earth Naturalists complements these core values by allowing the 4-H'ers to experience Environmental Science and practice Citizenship and Leadership through serving as change agents in their classroom, school, and community. Through GEN, 4-H has impacted communities in unique and effective ways. Service learning grants have helped to plant a community garden in Walton County and recycle agricultural by products to use as fertilizer for a community garden in Madison County.

**SERVICE LEARNING** affects the head, hand, heart and health of our environment.

Some of these components follow:

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<td>Cognitive Development</td>
<td>Problem solving</td>
<td>Efficacy</td>
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<td>Test scores</td>
<td>Navigate local governance</td>
<td>Civic pride and responsibility</td>
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<td>Attendance</td>
<td>Research</td>
<td>Sense of right and wrong</td>
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<td>School engagement</td>
<td>Collaboration</td>
<td>Valued by adults &amp; community</td>
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<td>Community awareness</td>
<td>Communication &amp; deliberation</td>
<td>Self concept</td>
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<tr>
<td>Career exploration</td>
<td>Community &amp; political involvement</td>
<td>Intergenerational</td>
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The GEN program also encourages 4-H'ers to participate in a project achievement activity. Project Achievement is another core educational opportunity provided by Georgia 4-H. Through Project Achievement, youth develop both oral and written communication skills.

The key components of the project achievement teaching tool are research, organization, summary, and expression. The GEN Modules provide a "springboard" on a myriad of topics that can be pursued through research and organization and culminate in expression. The material and information shared through GEN programming are designed to extend the learning through participation in Project Achievement. This learning extension serves as another tool to encourage independent thinking and an opportunity to gain a greater understanding of relevant ecological messages.

The Project Achievement process begins with curiosity about a subject. Once the student selects a topic to research, true knowledge gain begins. The student gathers materials based on his or her subject area and reads to gain understanding of the subject matter/area he or she has chosen. This material is absorbed and summarized by the student and organization of the ideas begins. This part of the learning process allows exposure to new vocabulary and reinforces reading comprehension skills.

Next the learner generates a speech on his or her chosen topic. The opportunity to speak publicly provides a great opportunity to practice and solidify their new understandings. Garden Earth Naturalist co-curricular and after school delivery encourage fifth and sixth grade 4-H'ers to participate in both county and if selected, District Project Achievement.

The Garden Earth Naturalist and Georgia 4-H partnership demonstrates many beneficial experiences for 4-H youth. The GEN Science Night Kits were developed through the State Botanical Garden and Georgia Museum of Natural History and have been a key resource for
Cooperative Extension Faculty and formal classroom teachers as they work to encourage the entire school community to become engaged in "doing science."

The value of working collaboratively with classroom teachers, 4-H County Faculty and staff, and local after school providers creates an ideal learning environment and structure for a young person. One of the most significant components of the GEN and 4-H partnership is the opportunity for County Extension Faculty and Staff and Classroom teachers to train side by side in a professional development workshop. The dialogue and modeling that occurs in these four days can significantly impact the way in which the program is delivered. The opportunity to learn and share with one another as non formal and formal educators, to be immersed in the curriculum, and to actually move through the experiential lessons creates a momentum that guides the implementation of the program. This joint training is a model for other curriculum and programs around the state as formal and non formal educators begin to understand how seamless a youth’s education should and can be.

Georgia 4-H is proud to partner with the State Botanical Garden of Georgia, the Georgia Museum of Natural History and the Project for Reform in Science and Math to deliver a model national collaborative. Through GEN programming, youth are inspired, challenged and empowered to become agents of change. With four key components: a solid curriculum correlated to formal education standards, teaching that adheres to best practices in youth development, opportunities to develop written and oral communication skills through Project Achievement, and empowerment through service projects and science nights - Garden Earth Naturalists takes Georgia 4-H to the next level in developing our state’s most precious resource - our youth who will be prepared to be the leaders of tomorrow!
EDUCATOR QUOTES ABOUT GARDEN EARTH NATURALISTS

"The training program has been great and a lot of fun! We participated in many of the hands-on activities just the way we would do them with the children at our school clubs. I was truly excited to be selected as a pilot instructor of the GEN program.”
Susan Goldman, Madison County Extension Agent

"As a participant in our 4 day GEN workshop I have seen the excitement and enthusiasm as teachers experience the science activities and discuss ways in which they can be used in lessons and applied in service learning projects. When teachers don't mind collecting organisms from a stream in rainy 40 degree weather, you know they are intellectually engaged in work!"
Dava Coleman, Director of PRISM, the Partnership for Reform in Math and Science

“Garden Earth Naturalist materials empower 4-H to serve as the bridge between the formal and non-formal learning environment. Through these materials Georgia 4-H has an opportunity to bring research based information, with a relevant ecological message, to Georgia's youth. The potential for GEN with 4H is tremendous!"
Mandy Marable, Georgia 4-H Curricula Director

“The GEN curriculum for 5th grade has been a direct complement to the school curricula. Mrs. Jones, 5th Grade teacher at Washington Wilkes Elementary School, was delighted that our Fall 4-H club meetings were a timely review of the materials she had addressed in her classroom. This is an excellent example of 4-H complementing the school curriculum.”
Marci Simpson, Wilkes County 4H Agent

“Here at Fowler Drive we have had as many as 33 on the roster at a time. I still have a waiting list and students ask me every day if they can get in "science club." …. It's great to see students and teachers having "fun" doing science. One of my students, while planting milkweed as part of our Pollination Module exclaimed, “this is the most fun, I've ever had!”
Halley Page, Fowler Drive Elementary, Clarke County

“The club is great equalizer; it allows children of various ages and abilities to learn in a relaxed, non-competitive atmosphere—to enjoy science for its own sake rather than simply tolerating it for the sake of a grade. Kids who might have initially used their club membership as a ticket out of the after school program are now fully engaged in learning.” “Club activities are focused on interactive, outside, exploration—which is science at its best!
Brandis Hartsell, Teacher, Whitehead Road Elementary School, Clarke County.
BELOW IS EXTRA ABOUT SERVICE LEARNING
GARDEN EARTH NATURALIST

School Site Stations

You and your students can choose stations and landscape features to improve your school sites. Activities covered later in the manual provide suggestions for learning plans to carry out at these learning stations. Below is a list of ideas for stations for each GEN Department.

I. Aesthetics Stations:

Herb Garden
Many of the foods that we eat are flavored with herbs that originated in Europe and Asia. An herb garden is an excellent way to safely explore the senses of smell and taste, while learning about the cultural diversity of our country, and investigating soil requirements of plants from other ecosystems. Herbs can be gathered to be used in cooking, preserved for projects or just enjoyed in the garden.

Sensory Trail
A walk constructed through a natural area on the school grounds, or one created through landscaped plantings and other study stations, can serve as a sensory trail with a variety of themes. By exploring this trail with blindfolds or earplugs, or through textural exercises and temperature studies, an appreciation of the world we live in can be heightened.

Spring Beauty Native Flora Garden
The forest floor in the Eastern deciduous forest was once covered with carpets of wildflowers in the spring. In logging these woods and then planting cotton, the habitat for shade-loving plants was lost and they died out. The forests surrounding our schools today are most likely composed of young deciduous trees or planted pine and usually contain only a handful of the native wildflowers. By planting a native flora spring garden at the school, seeds will become available to be dispersed by birds and other animals, restoring some of the natural understory to the surrounding area. Even highly impacted school grounds can be prepared by students to become a wildflower habitat. The spring ephemeral wildflowers will bloom while students are in attendance at school and can enjoy and maintain them.

Spring/Fall Color Garden
Special attention should be given to planting trees and shrubs (especially native species) which will supply aesthetic enjoyment during the school year. Trees and shrubs with colorful spring flowers or fall foliage displays are most appropriate for schools. This plant material will heighten the students’ knowledge of seasonal change.

Tape Collection of Animal or Environmental Sounds
A collection of bird and other animal sounds and background environmental tapes (ocean waves, rain falling, etc.) can be used by teachers as a supplement to lessons and as mood settings for a class investigation. Taping some of these at the school ground and comparing them over time, can document the changes created on the school site.

II. Air Cleaning Department Stations:

School Arboretum
A collection of trees, called an arboretum, will improve the air quality around the school, while providing shade to cool the soil, people, and buildings. The students can be actively involved in selecting, planting and caring for the tree collection which may be used on the school grounds in landscape plantings or clustered in a forest environment. Planting native species of trees rather than exotic species is highly encouraged, as is a good labeling program. Students will explore the role these plants have in supplying oxygen, food, and shelter to people and many other animals through a variety of investigations and activities while they restore a bit of forest to their school site.

The Stomata Experience
A stomate is a small opening on the underside of a leaf through which gas exchange takes place. A large stomate is constructed that students can climb through and trace the path of carbon dioxide water and oxygen through a green plant. How does a tree act as a giant air filter? What new substances is the Air Purification department currently filtering? These questions will be answered as the children use many of their senses to explore the anatomy of a green plant.

Interiorscape
The role of plants in providing oxygen and decreasing dust particles in our air is often overlooked in the areas where we spend the majority of our time - inside buildings. "Houseplants" which are exotic plants that require warmer winter temperatures than our native plants, are used indoors year-round to improve the aesthetics of the environment. Studies now show that some of these plants are also beneficial in removing noxious fumes that can be found in our buildings from things like cleaning supplies, copy machines, the deterioration of plastics and inefficient filtering systems. A collection of tropical plants can be a tool for tying in global issues and plant climatic adaptations. The variety of floral beauty and leaf textures, colors and shapes can provide a great resource for study during inclement winter weather.

III. Climate Control Stations:

Weather Station
To understand some of the principles involved in climate and its effect upon Earth's living organisms, weather data may be collected on a regular basis by students. If compiled over time, this data can document the effects that the school site restoration will have on the local climate. Data may be related to current issues such as global warming and acid rain as well as to gardening and energy savings at the school. Permanent weather equipment can be securely stored in a locked weather box, and activity kits can be checked out for class-wide investigations.

Temperature boxes
To help explain the important concept of global warming, students will investigate albedo (reflection of light and heat energy) and the greenhouse effect by measuring temperatures inside a series of boxes. The boxes can be securely attached to posts at the service station.
Microhabitats
Climatic conditions are usually discussed in general terms such as regional areas of the country, plant growth zones, county wide rainfall maps or average temperature at the local airport. Plants and animals are affected by general trends in climate, but they respond on a daily basis to microhabitats, the exact amount of rainfall, temperature or soil conditions that they come in contact with daily. (This is observed when a bed of flowers on one side of a walkway grows more profusely than those on the more shaded side of the walk, etc.) Since people are mobile and can generally move away from an unfavorable climatic condition, they forget that plants and some animals are tied to specific sites. Students can investigate the subtle differences and changes in conditions at various sites around the school grounds. This data can be related to what is currently growing or to what might be planted.

IV. Food Department Stations:

Native Foods for Wildlife Garden
Since the majority of our land was planted in cotton, many native trees, shrubs and herbs have died out in areas where they were once plentiful. Planting a variety of native flora will attract native species of birds and animals to the school site for observation and study. As the animals disperse the native plants, seed sources and genetic diversity of the native flora will increase throughout the area.

Animal Feeding Stations
Global issues can be more easily addressed when children watch birds that are migrating through the South stop at the feeders outside their classrooms. Night time visitors can be also documented by footprint pans of mud placed at feeding stations.

Wildlife Food Garden
In attracting wildlife to the school site, feeding stations will be established. To supply seed for these stations, the children can grow a number of food crops (corn, millet, sunflowers), and explore the different pollination mechanisms, harvesting techniques and animal feeding adaptations involved in each of these crops.

Biodiversity Garden
In this garden students plant a variety of potatoes, beans or other food crops. They learn of potential problems associated with planting monoculture crops and spread their understandings to the community by giving potato eyes or seeds to community members and explaining the importance of maintaining biodiversity.
Wild Edibles Garden
All of our cultivated varieties of food plants were once wild, and planting a garden with wild edibles can be a tool for teaching about the lifestyle of Native Americans, basic plant breeding, or survival skills. Wild edibles may be planted in a garden bed. *Caution should be exercised about harvesting and consuming any wild edibles. Identification should be absolutely positive. Children should be discouraged from eating wild edibles unless they have the permission of both their parent and a knowledgeable adult.*

International Food Crops
People in many countries of the world live on sustainable agricultural systems, much different from the large mono-culture practiced in the U.S. A small garden of foods from other countries can provoke discussion on the ways people live on the land, and the adaptations they make towards their ecosystem.

Heritage Plant Garden
Genetic engineering and selective breeding of plants has become a big business. Unfortunately, breeding for easy harvest or disease resistance has in some cases taken priority over flavor and nutrition. Seed from old varieties can be ordered, planted and harvested for next years crops as students do comparison studies between modern varieties and the "old fashioned" plants our grandparents knew.

V. Pest Control Stations:

Organic Gardening Test Beds
On a home garden scale simple integrated pest management techniques can be used to effectively fight the majority of garden pests. These methods allow us to grow food without adding chemicals which are dangerous to apply and may produce allergic reactions in some children. A variety of experiments on integrated pest management can be carried out in the school garden, and issues such as species’ diversity and mono-culture can be introduced.

Bat Boxes
Saddled with an undeserved bad reputation, bats are harmless nocturnal mammals that consume a large number of flying insects daily. These creatures are very important to healthy ecosystems, providing food to owls and other night predators. Students can encourage bats to roost in the area by providing them with bat houses.

Martin and Bluebird Houses/Swallow shelves
Having daytime insectivores on the school site gives children examples of the food chain in action. Both martins, swallows and bluebirds are effective insectivores. Students can encourage them to nest in the area by providing them with houses in the forms of gourds, shelves and boxes.

Ant Farm
Ants are amazing creatures. They have a social and structural organization that rivals humans. To investigate this complex world, an ant farm can be an effective teaching tool. Kits can be purchased for a school ant colony. Fire ants are becoming a nuisance and danger on many school grounds. They are an example of effective adaptation and competition for habitat. Investigations of the methods of eradicating fire ants on the school site will explore the issues of using pesticides at school and in the home. The dangers of chemicals, how to read labels and . . . finding safe home remedies that can be effective on a small scale . . . can be explored using this study station.
Visiting Animal Habitat
A cage designed to temporarily house a variety of animals will allow the children to study up close some of the animals they would otherwise only see in pictures. Small mammals, reptiles and birds who are important workers in the Pest and Disease Control Department could be some of the school visitors staying in this habitat.

VI. Pollination Stations:

Butterfly Garden
As the rainforest is being destroyed, so is the winter habitat for many of our migratory butterfly and moth species. Summer butterfly habitat is also in peril as many “weedy” plants that butterflies depend on are mowed or sprayed with herbicide. A butterfly garden can be established on the school site, allowing students to become intimately involved with these important pollinators. Students can plan and plant a butterfly garden that will supply the habitat needs for local species of butterflies and moths through all stages of the life cycle. It should contain water, shelter and both larval and adult food sources.

Hummingbird Garden
Hummingbirds, one of Nature’s more amazingly adapted creatures, can be attracted to the school grounds with hummingbird feeders or by plants with specially shaped nectar bearing flowers. These active animals can be a good resource for discussion of territorialism and the competition for resources that plants and animals are engaged in daily.

Pollination Garden
At one time the school site was place of wide plant diversity. The forest provided many types of food for many species of animals. To help restore this diversity, a variety of plants may be cultivated which would attract many of the workers of the pollination department. Plants should be labeled to note the special adaptations and relationships between the flower and the pollinator. A wildflower meadow or vegetable garden could be constructed for this purpose.

The Birth of a Forest - A Succession Study
The Earth has an amazing ability to heal itself when it is not overtaxed. In the Southeast, a field will eventually develop into a mature hardwood forest if fertile soil and local seed sources are available. Students learn about this process (called ecological succession) as they observe and record changes on a piece of their school site that is not mowed and allowed to develop naturally. Pollinators on the school site will become more abundant as the plant species diversify in this process.

VII. Recycling Stations:

Compost pile
Due to poor farming practices, most of our topsoil in the southeastern United States has been eroded into our streams. As it takes over 500 years for Nature to make an inch of fertile topsoil, we should all do what we can to preserve the good soils we have and improve those that are deficient. Students can easily create a compost pile on the school grounds. If properly constructed and maintained they should not create an odor or health problem. Maintaining a compost pile will: 1) allow students to learn first-hand about the process of decomposition, 2) provide a place for the school to recycle some of its wastes and 3) produce compost which can be used to enrich the soil throughout the school site, all while saving the school money on soil amendments.
Recycling bins
People through the ages have worked hard at finding materials that would not break down under natural conditions. Thus, we have created aluminum, plastics and glass. Now we must learn how to manage those materials after their use is over. A recycling center can provide a valuable community service while teaching lessons about landfills and recycling. This could be community wide or just within the school itself. Proceeds from the recycling effort can support other stewardship activities and school site projects.

Rotten log
The natural process of decay performed by some of the workers in the Recycling Department can be investigated in a fallen log on the school site. If this resource is not available, it can easily be created by bringing a log or two onto the school site. A partially rotted log can even be used as an attractive planter or as a component of a native garden.

Garbage Graves
The theory that items in landfills will decompose and return to the Earth is being challenged. To understand the long term effect of burying our trash, students can investigate and record the decomposition rates of certain materials that are commonly put in landfills. By creating a "garbage graveyard" the buried material can be dug up after prescribed lengths of time. Old "graves" may be kept for years and new ones added as their contents decompose.

Mushroom Garden (domestic - edible)
In investigating the decomposers we can use the common meadow mushroom (Agaricus biflora) which we purchase in the grocery store. It is quite easy to grow, and this station can demonstrate the role of fungus in the nutrient cycle. Kits with the compost medium for growing the mushroom and the mushroom spore are available through science supply companies.

Decomposers Garden
There are many native species of fungi and lichens that are seen throughout the forest. By encouraging these to grow in a well composted and shady garden, the examples can be identified, labeled and investigated further as to there relationship to each other and their role as decomposers.

VIII. Soil Department Stations:

Geology Station
Soil is made up of parent rock weathered to create sand, silt or clay. The fertility of the soil is tied to the minerals found in the parent rock. To help understand the different materials in rocks, and soil composition, a geology station can be constructed from rocks gathered locally or outside the community. This station can be constructed as a wall, a column or a rock lined swale.
**Earthworm Bins**
In the construction of school sites, the topsoil is often removed or plowed under during grading. What can remain is compacted subsoil that needs aeration and nutrients to become fertile. Earthworms are effective soil aerators and can be raised easily in covered bins of sphagnum peat moss, or soil and compost. Being androgenous they multiply rapidly, and when overcrowded can be released into gardening beds to improve the soils. Kits for raising worms are available through scientific supply companies. Earthworms and red worms are usually available at local bait shops.

**Testing Soil**
Understanding the components of soil and why soils can vary on a school site, helps children in their understanding of plant communities and the plants’ soil requirements. Sites can be identified throughout the school grounds for collecting soil samples, and the results of simple pH and nutrient tests can be recorded and compared. If the sites are permanently identified, then comparisons may be made in succeeding years to gauge soil improvements.

**Ground Cover Garden**
Erosion is a problem on many school sites. Mulch and grass can be a temporary solution, but plant materials that need low maintenance can provide better long term erosion control. Students can select and plant a variety of groundcover plants on an eroded site of the school ground or on a newly exposed site to protect it from erosion. Through such an activity, students are helping to prevent a serious soil problem or to restore an already eroded condition.

**Native Grass Garden**
Native grasses are usually one of the first colonizers on an open field. They have the ability to seed and grow on both fertile and poor soils. Tough root systems hold the soil onto the site, while their generally clumping forms keep small areas open for wildflowers, pines and other early successional tree species to germinate and grow. By collecting seed from roadsides and fields, a native grass garden can be established at the school to control erosion on a difficult bank or area that would benefit from only an annual mowing.

**Compaction Plots**
Plants cannot grow in soils that are so compacted that air and water cannot penetrate down to the root zone. Students can investigate soil compaction at a number of sites around the school ground. Plots can be set up to compare how well plants can grow in compacted versus uncompacted soils. Studies can also be done to see how Nature will restore the structure of the soil through the action of weather, plants and animals.

**Impact / Splash Test Plots**
The impact of raindrops on bare soil can cause serious erosion. The force of the impact can not be easily measured by students, but an indirect effect of the impact - the height of mud drops spattered up on walls - can be measured. Stakes to measure this effect may be placed in a variety of mulched and unmulched conditions to teach the children the importance of covering the soil.
Butterfly Garden
The larval food source of the monarch butterfly - milkweed - gives larvae a toxicity which protects them from predation. By planting milkweed and other plants that provide food and shelter for the various stages in the life of migrating butterflies and moths, students can expand the number of species that live in their local warehouse.

Georgia's Tropical Visitors
How can you make your school site a better home for birds that migrate from your local warehouse to the South and Central American forest warehouse? Investigate these species and find out what are their preferred food and nesting conditions. Keep track of all the species spotted on your school site; then add nesting boxes and feeders and record any newcomers the following year. Prepare a weatherproof sign to welcome these 'Tropical Visitors' to your school site in the spring.

Successional Field Species
If left unmowed, most fields will return to forest. As the vegetation changes from grassland to grass/forb meadow to trees, the animal species diversity also increases. Keep yearly records of the insects, birds, reptiles and mammals sited over a particular month in the fall and spring. Make charts that record the changes as the flora and fauna develop in your field warehouse.

Medicinal Plants and Herb Garden
To make connections about how important other ecosystems are to the health and well being of students in the southeastern U.S., a garden that features medicinal plants and where they originate can be planted. Students can select and plant species that are known for their historical or current medicinal value.

Economic Botany Plots
Plants that are commercially important to your area can be grown in a garden. By tracking the products through their commercial processing to the retail outlet, children can make connections between farming and the shopping center. Comparisons can be made between the process in this country and in other countries worldwide, opening up opportunities for discussions of different
climates and plant growth, mono-culture vs. species diversity, international trade regulations and many more issues.

X. Water Purification and Storage Stations:

Evaporation Wall
To observe a portion of the water cycle or evaporation - students armed with buckets of water and large paintbrushes try to "paint" any concrete, rock or brick wall on a warm sunny day. Is it easier to accomplish if the wall is in the shade? Does color make a difference? Does ambient air temperature? Where is the water going? Why?

Dams, Deltas and Ponds
A slanted wooden table can be constructed and equipped with sand, movable wooden walls and a water source for experimentation with levees, dams, deltas, pond formation, etc. Students learn how water features are formed and how humans can disrupt the normal activities of the Water Purification and Storage Department. On a laminated topographic map students locate their school and construct their local watershed. Problems that might affect this watershed are discussed.

Soil Percolators
Soil is made up of four components - sand, silt, clay and organic matter. The soil texture, its ability to hold water, its tendency towards compaction and other features are based upon the percentages of each of the four materials. To test soil porosity a study station can be set up with a series of large cans or buckets with holes punched in the bottom. These are hung up and measured amounts of water poured into them and captured in a bucket below. As water travels through each of these soils, it can be likened to watersheds and their ability to clean the water prior to storing it in nearby ponds and streams.

Water Holes to Mini-Ponds
Many algal species thrive when soluble plant nutrients build up in water. This can cause an algal "bloom" where the plants grow rapidly and cover the entire surface of the water. When this happens water plants that grow below the water surface can be shaded out and decline, thus decreasing the food for fish and other aquatic species. When the algae use up all the available nutrients, they will begin to decline too, producing a foul odor and using up the oxygen in the water as they decompose. The decrease in oxygen can further endanger the animals that inhabit this water body. To prevent algal blooms it is important to keep the soluble salts, like fertilizer runoff from farms, out of our water systems. To study rapid colonization in water, buckets can be put outside filled with fresh water to mimic a pond or water hole. In this activity, students observe and compare changes that take place in fertilized and unfertilized water holes. This activity requires regular visits to monitor the water holes for eight to ten weeks.
Create a Water Feature
Small wetland areas can be established on school sites where consistent or ephemeral water sources are available. This study station will provide access to plants and animals that are adapted to wet soils and environments, and the important issues surrounding wetland preservation can be investigated using this station.
investigate the greenhouse effect. **GEN IN 4H PROGRAMS ACROSS OUR STATE**

4H delivers programs in 5th and 6th grade classes throughout Georgia. GEN is a new environmental program strand for Georgia 4H. 4H agents can elect to implement GEN at their monthly school programs and club meetings.

4H GEN Club modules include both an in-school program component and an after-school program component. Ample opportunities are available for students to prepare District Project Achievement (DPA) and County Project Achievement (CPA) projects based on the content of the GEN programs.
Pollination Department

Kids in Action
Your GEN club can help the Pollination Department in many ways. Whether it is planting a garden or protecting migrant pollinators, flowers everywhere are sure to sing your praise. Here are just a few ideas and web links to learn more about how your club can start helping out the Pollination Department.

Start digging in the dirt!
Here’s a list of plants that pollinators just love! Try planting these in the outdoor classroom or garden at your school and get ready for the pollinators. Have the children do a pollinator observation in the garden. What types of plants are different pollinators attracted to? How often does a bee land on the same type of flower?

**Butterflies**
- Swamp milkweed
- Aster
- Thistle
- Daisy
- Purple coneflower

**Bees**
- Marigold
- Daisy
- Aromatic herbs

**Hummingbirds**
- Cardinal flower
- Bee balm

** Beetles**
- Century plant
- Honeysuckle
- Sage

**Bees**
- Rose
- Aster
- Sunflower

**Caterpillar Host plants**
- Fennel (Swallowtails)
- Thistle (Painted lady)
- Milkweed (Monarch)
- Plantain (Buckeye)

*NOTE: 1, 2, 3... A Beetle, A Butterfly, A Bee! is a great activity to do once your Pollinator Garden is established.

Pollinator Protectors
There are many organizations that are devoted to protecting pollinators. Your club could learn more about one of these organizations and present this information to the rest of the school. Posters, announcements, and skits are a great way to educate other classes and students.

Journey North is one such program that tracks migrant wildlife on a global scale, including many pollinators. This site has activities, lesson plans, and class projects for. [http://www.journeynorth.org/](http://www.journeynorth.org/)

The North American Pollinator Protection Campaign is an organization committed to education and protection of different pollinator species. Their website provides good teacher background information on pollinators and the efforts needed to protect them. [www.nappc.org](http://www.nappc.org)
Monarchs Across Georgia has a Pollinator Habitat Certification Program. This website has great information on developing a Pollinator Garden. Once your club’s garden is established, the school could get certified in the Pollinator Habitat Certification Program. http://www.monarchsacrossga.org/MAGCertification.htm

Air Cleaning Department

Kids in Action
There are many service learning activities that can help improve the quality of the Air Cleaning Department. Rainforests are being destroyed at drastic rates; therefore many organizations are taking action to protect the remaining areas. Planting trees in your area helps clean the air and provides habitat for wildlife. Reducing your impact through recycling and other actions is one of the best ways to prevent further destruction of forests all over the world. Here are just a few ideas and web links to learn more about how your club can help the Air Cleaning Department. Also read about some kids that are already making a difference.

Protect the Rainforest
There are many organization which help protect the Rainforests. Have the students talk to their family and friends to try to raise money to save an area of the rainforest. You can save your own piece of forest from being destroyed. Check out these websites for more information.
http://www.rainforest-alliance.org/programs/education/kids/index.html Learn about rainforest animals and plants; play exciting games; and find out how to adopt a rainforest.
http://www.rainforestrelief.org/documents/Do_I_Dare.pdf Learn about different products whose production can harm the rainforest and what you can do to help!
http://rainforestheroes.com/ Learn about kids who have made a difference by protecting the rainforest. Also find out what you can do to be a Rainforest Hero.
http://www.arborday.org/programs/rainforest/

Service Project Ideas and Activities for Kids
http://www.arborday.org/kids/teachingYouth.cfm Fun activities for children and many useful resources for teachers and parents.

Plant a tree!
One way to help the forests is to plant more trees to make up for those that are being cut down. Trees help absorb carbon dioxide, reducing greenhouse gases and global warming. Around Arbor Day many garden shops and nature centers give out trees for the public to plant. Arbor Day in Georgia is celebrated the 3rd Friday of February. There does not need to be a special day to plant a tree though. Check with the Georgia Forestry Commission to see if they will donate a seedling for you to plant with your class.

Recycle, Reduce, and Reuse!
The fewer wood and paper products we use the fewer forests that will be destroyed. By recycling your newspapers, and other paper products, you can make a difference.

**Here’s some information about kids who made a difference:**

- **Tree Musketeers** in El Segundo, California, revived Arbor Day in their community, started a community recycling program and launched an environmental quiz show for their local cable channel. Today, the Tree Musketeers programs serve youth nationwide. Find out how you can participate in their new "Count On Kids" campaign.  
  www.treemusketeers.org

- **Kids For A Clean Environment** kid-founder, Melissa Poe, of Nashville, Tennessee, launched an organization that now boasts 300,000 kid-members worldwide. Read her story and how one person can make a huge difference.  
  www.kidsface.org

**Water Purification Department**

**Kids in Action**

There are many service learning activities that can benefit the water Purification Department. Whether it be changing personal water use habits or making larger impact through improving school water use, there are many ways to conserve water. Here are just a few ideas on how your club can start helping out the Water Purification Department.

**Can you think of any ways you can conserve water?**
- If using a biodegradable soap, you can catch the extra water when you are washing your hands and then use it to water your plants.
- Turn the water off while foaming the soap to wash your hands and when brushing your teeth.
- Don’t let water run while washing dishes by hand.
- Repair dripping faucets or toilets.
- Take shorter showers (5 minutes or less).
- Water your lawn and plants in the morning or night to avoid evaporation.
- Only wash full loads of dishes and laundry.
- Catch rainwater in a rain barrel or some other type of catchment to water plants. (County extension offices often have rain barrels)

*Make Your Own Water Meter is a great activity to talk about water conservation.*

**Water on School Grounds**

Some ways to conserve water on school grounds include: using drip irrigation systems rather than conventional sprinklers; planting drought resistant "xeriscape" gardens; and capturing rainwater in cisterns and rain barrels for future use on school gardens, trees, and other planted areas. Find out more about these different methods and see if they could be implemented at your school. Rain barrels are often available at county extension offices and are a great way to conserve water when taking care of a garden.  
http://www.rainbarrelguide.com/
Food Production Department

Kids in Action
Providing and protecting habitats for wildlife are very important jobs in the Food Department. Here are some service learning ideas on how your club can provide food and habitat for critters around your area.

What Can You Do?
- Buy shade-grown coffee and chocolate, available at many natural food stores and some supermarkets. Learn more about shade grown coffee fundraisers at http://www.chocoandes.org/
- Put out bird feeders with a variety of types of birdseed.
- Plant native shrubs and trees for birds to nest in. The Georgia Native Plant Society gives good information on native plants for wildlife. http://www.gnps.org/
- Avoid using pesticides that can make birds sick from eating insects and plants that have been exposed to these chemicals.

Make a Pinecone Birdfeeder
Supplies:
- Pinecones – 1 per child (larger ones with the cones open are best)
- Peanut butter (can use lard or shortening in case of food allergies)
- A variety of birdseed
- String (long enough to wrap around the pinecone and hang from a tree)
- A knife or spatula (something to spread the peanut butter with)
- A plate or tray for the bird seed

Directions:
1. Tie the piece of string around your pinecone, leaving a long tail to tie to the tree limb.
2. Spread peanut butter (or substitute) all over the pinecone, making sure to cover it all over.
3. Pour the birdseed on the plate or tray and then roll the pinecone in the seed until it is completely covered.
4. Find a good tree to hang your birdfeeder from. Make sure it is away from any dangers like cats or other predators.
5. Watch to see what kind of birds come to your feeder. You can make a study out of it by recording which types of birds visit the feeder and how often. Use the table below to record your data.

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<th>Bird Type (write description or look it up in a field to identify what kind of bird it is)</th>
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Soil and Recycling Department

Kids in Action
There are many service learning activities that your club can get involved in to help out the Soil and Recycling Department. Composting and vermiculture are great ways to help break down waste and amend the soil in your garden (maybe your Pollinator Garden!). Learn more about how your club can incorporate one or both of these methods at school and at home. Don’t forget how important recycling is too! How much waste does your school recycle? How could you recycle more?

Composting!
Composting is a great way to amend the soil and cut down on waste. Synthetic fertilizers are not needed when you have healthy compost to add to the garden. Kids could be taught composting for home or at school. It’s easy! Just have an extra bin next to the trash cans. Any plant products can be composted. This means any fruit and vegetables. No meat or fatty foods. Have an area outside to collect the compost. There are many different types of bins and methods. Here are a few websites to learn more about how to compost and the benefits of this method. Worm bins (Vermiculture) are another method of composting that do not take up as much space and can be used inside the classroom. The websites below give more information.

- http://sustainable.tamu.edu/slidesets/kidscompost/cover.html This slideshow gives a lot of good information on how and what to compost.
- http://www.epa.state.il.us/kids/fun-stuff/wormbin.html Kids site about vermiculture. There is also a link to worm bin supplies.

Pest and Disease Control Department

Kids in Action
An important way to help out the Pest and Disease Control Department is to prevent the spread of invasive species. Club members can learn more about exotic and invasive species through the web links below. There often are projects to remove invasive species such as kudzu or privet. Check with the Georgia Exotic Pest Plant Council or other local agencies to see how your club can help. Try and think of other creative ways to control pests in your area.

- http://www.nationalgeographic.com/ngkids/0304/identify.html Be a Habitat Hero by preventing the spread of invasive plants.
- The Georgia Exotic Pest Plant Council http://www.gaepc.org/ Lots of good information about Georgia invasive plants.
- *Bluebirds and Bats are a great way to control mosquitoes around your school. There are many places to buy Bluebird or Bat boxes or get creative and make your own!
Biodiversity Department

Kids in Action
There are many ways to protect biodiversity in your area. Clubs can get involved by providing habitat for wildlife, cleaning up an area, and protecting endangered plant and animal species. There are many organizations that are working to protect biodiversity. Have the students learn about these organizations and then brainstorm how they can get involved.

*There are many organizations that work hard to protect biodiversity around the world. Some of these are:
  - Defenders of Wildlife
  - U.S. Fish and Wildlife Service
  - Viva Natura (Mexico)
  - The Environmental Protection Agency

What can you do to protect biodiversity and prevent species from becoming extinct?
  - Build a bird or bat house.
  - Plant native trees and flowers to attract wildlife, birds, and butterflies.
  - Help clean up an area to make a better habitat.
  - Stay on trails when hiking so small plants and animals do not get trampled on.
  - Recycle so more habitats do not have to be destroyed.

Kids Making a Difference!
A group of 4th graders in Northwest Georgia wrote their state representatives, asking to make the green tree frog the Official State Amphibian. It took the students two years to get the law passed, but they kept to it. In November of 2005, the Armuchee Elementary School students could finally celebrate their victory!

Service Learning Websites
  - [Community Works](http://www.communityworks.org): online resource center with a list of service-learning specific tools.
  - [Do Something](http://www.dosomething.org): An extensive service learning curricula which has been aligned with NAEP standards and can be incorporated into a broad range of subject areas.
  - [KIDS Consortium](http://www.kidsconsortium.org): [www.kidsconsortium.org](http://www.kidsconsortium.org)
  - [Learn and Serve](http://www.learnandserve.org): A program of the Corporation for National and Community Service.
  - [National Service-Learning Clearinghouse](http://www.nslc.org): Supports Learn and Serve America grantees, as well as other programs engaged in service-learning, through the collection and dissemination of information and materials.
  - [National Service-Learning Partnership](http://www.nslp.org): Visit this website to learn more about service-learning and order the latest videos and reports about service-learning from the National Commission on Service-Learning. [http://service-learningpartnership.org](http://service-learningpartnership.org)
  - [Project Plan-It!](http://www.planningpartnership.org): An Online Planning Tool: An easy interactive series of questions and templates guides individuals through the project planning process. This innovative online tool allows project planners to print out their own project plan, funding proposal, press release, service-learning reflection plan, and other helpful resources.
IDEAS FOR SCHOOL SITE PROJECTS

Air Purification Department
- Arboretum
- Stomata Structure
- Shrub Collection
- Interior Plants
- Leaf Walkways

Climate Control Department
- Weather Station
- Temperature Boxes
- Microhabitat Sites
- Sundial

Pest and Disease Control Department
- Bat/Bird Houses
- Visiting Animal
- Animal Cages
- Ant Farm
- Organic Gardening

Soil Production Department
- Compost Pile
- Recycling Bins
- Rotting Log
- Garbage Graveyard
- Lichen/Fungi Garden

Biodiversity Department
- Geology Wall
- Worm Farm
- Ground Covers
- Compaction Plots
- Percolation Test
- Soil Profile

Pollination Department
- Succession Plots
- Medicinal Plants
- Herb Garden
- Economic Botany Plots

Food Production Department
- Wildlife Garden
- Feeding Station
- International Food Heritage Garden
- Biodiversity Garden
- Animal traps
- Vegetables/Orchards

Recycling Department
- Butterfly Garden
- Hummingbird Garden
- Ornamental Grasses

Water Purification Department
- Evaporation Wall
- Transpiration Exp.
- Dams and Deltas
- Pond/Wetland Site
- Water power wheels

Figure 8