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Developing a School Partnership

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Title: **Developing a School Partnership**

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Abstract:

Fulfilling the mission of the Morris Arboretum of the University of Pennsylvania by developing a new educational program with a local school is the focal point of "Developing a School Partnership." In order for the staff of the Education Office to establish a school partnership, a new interdisciplinary, multiple-visit program was created to enrich the eighth grade curriculum of the participating school – Wissahickon Middle School. Although the program in question will be piloted with one public middle school, it may be implemented into the coursework of any school of the Commonwealth that lies within the Wissahickon Creek Watershed. The program designed will allow the students to participate in inquiry and curriculum-based activities that utilize the various resources of the Morris Arboretum. By choosing to reach out to the various schools of the area and to establish this community-based program, the staff of the Education Office will continue to market itself as a reputable and sincere advocate of the importance of educating land stewardship.

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INTRODUCTION

Choosing a project for the Education Office of the Morris Arboretum requires one to consider two major issues - service to the community and/or revenue for the organization. When John and Lydia Morris left their legacy to the Philadelphia community, education and stewardship were their fundamental goals with regards to the future of their institution; however, due to the recent decline in school group visitors to the Morris Arboretum, a project that centers on financial support for the organization had to be considered as well. Piloting a new path for the Education Office by successfully developing a school partnership will lead to more substantial support for the organization and community at large; therefore, "Developing a School Partnership" is a practical project for the Education Office.

IDEALISTIC AND REALISTIC APPROACHES TO DEVELOPING A SCHOOL PARTNERSHIP

Developing a school partnership between the Education Office of the Morris Arboretum and a local school is the main focus of the Education Intern's project. As a liaison, the main responsibility of the Education Intern was to assist in the establishment of a partnership between the staff of the Education Office and the teachers and administrators of Wissahickon Middle School.

Since "Developing a School Partnership" is a new idea for the Education Office, researching other well-established school partnerships at informal educational centers was helpful. Initial planning of the Internship project was made with the help of two quality resources: 1) School Partnerships Manager, Judith Hutton of Wave Hill Public Garden and Cultural Center and 2) key members of Project C.H.A.N.G.E (Children Helping and Nurturing a Growing Environment) program. According to Ms. Hutton, the School Partnerships division of Wave Hill began approximately five years ago when administrators of a local school district approached the educational center. The programs that are designed to establish a partnership require staff members of Education Office to team teach at the school and then conduct another activity on the grounds of Wave Hill. The second school program used as a resource for the Internship project in question includes the partnership of American College Arboretum and Lower Merion School District. This program is said to be ten to twelve years old and also began when an administrator of the school district approached the informal educational center. Project C.H.A.N.G.E. is a community-based program that enriches the kindergarten curriculum of the six elementary schools of the district. Its unique design allows the participating schools to visit once a season and then conclude with a fifth and final visit or "graduation" day celebration. Since the inception of the program, American College Arboretum is said to have absorbed one hundred percent of the costs of the program. The success of the aforementioned programs are said to be the result of considerable contributions made by key members of both parties to the growth and development of the partnerships established.

The initial objectives of this internship project were two-fold: 1) establish a partnership with a local school (public or private/parochial) and 2) co-create a multiple-visit, interdisciplinary program with the school teachers that enriches the formal education curriculum structured by the Commonwealth's academic standards. As the project progressed, the goals set forth were changed in order to complete the overall plan. Receiving input from all five team teachers seemed to be too idealistic of an approach. Interacting with one lead teacher was all that could be achieved and yet, it seemed to be sufficient. To design the program, curriculum maps – detailed lesson plans – posted on the school district's web site were used. Communication was initially made through the use of email and as the project developed further, telephone conversations and visits to the school were made. A

meeting with the principal of Wissahickon Middle School and the lead teacher was a significant step towards solidifying a true partnership between both parties. Overall, the goals set forth were accomplished but not always in the way that was wanted but in the way that was needed in order for learning and growth to occur.

DETAILS OF THE CURRENT PROGRAM

Creating and implementing an enriching multiple-visit program for a local middle school requires addressing the academic standards of the Commonwealth/School District. An outline of Project P.E.A.C.E (Promoting environmental and civil education) follows (Appendix A) and is specific for Wissahickon Middle School's eighth grade curriculum; however, it is subject to change based on input from the teachers and administrators of other schools that also enter into a partnership with the Morris Arboretum.

Project P.E.A.C.E. is comprehensive. It is designed to highlight the resources of the Arboretum for the benefit of the students and teachers. The students will visit the Morris Arboretum three times in the spring semester of the academic calendar year. In order for each session to allow the students to have an optimal learning experience, the program includes subject matter of science, language arts, and social studies (geography). The students will be expected to participate in activities located around various aspects of the Arboretum; therefore, the logistics change from one session to the next. Refining and expanding the program is encouraged due to the possibility that there will be a change in both parties' staff and goals, in addition to the Arboretum's physical facilities.

The overall focus of the first session is to orientate the students to the Arboretum. It includes a general tour of the grounds, which focuses on the mission of the institution as well as its history and transformation from private estate to historic public garden and educational institution. Session one also includes a Language Arts unit entitled "Creating a Food Web." The artistic piece *Wissahickon Food Web* in the Madeleine K. Butcher Sculpture Garden will be the location for this activity and the writing piece reflection that accompanies it. The objective of this activity is to have the students learn about the interdependency of life within nature by allowing them to relate themselves to the world. The students will also be able to personalize their understanding of the subject matter by communicating appropriate terms to observations they have made. One science unit entitled "Travel the World - the Natural Distribution of Trees" (Appendix B) is also incorporated into session one. This activity centers on observing the varying features of the Arboretum's major tree specimens to investigate their adaptation to a particular climate. Analyzing tree rings is also included in the science unit. Orientating the students to Project P.E.A.C.E. is important for it will allow them to discover the resources of the Arboretum and how the program clearly relates to their eighth grade education.

Pollution is the main topic for session two of Project P.E.A.C.E. Three inquiry-based activities that allow the students to investigate the affects of pollution on ecological activity are included in the design of the session. All three activities require the students to gather in the floodplain area of the Arboretum. Two of the three investigations will allow the students to work in small groups, while the third activity will allow for the gathering of all participants of the session. The small group activities are portions of the well-established tour "Understanding Wetlands" and a new two-part investigation entitled "Plants and Pollution." Incorporating portions of the "Understanding Wetlands" tour will allow the students to be able to: 1) learn what a wetland is, 2) gain a better understanding of the history of the Arboretum's wetland and 3) explain the positive and negative implications of the loss of a wetland. The objective of the activity "Pollution and Plants" is to allow the students to observe the impacts of various acids on algae specimens. The impact of acid rain on trees and the environment as a whole is the overlying issue that will be addressed upon during the "Pollution and Plants" activity.

"Death of a River" is the large group activity that it set to take place using Paper Mill Run. This activity is designed to teach the observers about the concept of diffusion and how a pollutant entering a stream will eventually disrupt the marine and plant life of the area. Overall, the curriculum-based activities incorporated into session two of Project P.E.A.C.E. utilize the resources of the Arboretum appropriately.

The theme of the third session of the program is the water. The water cycle and its relationship to the local watershed are the main ideas of the session. The science unit of the session includes portions of the tour, "Understanding Wetlands" as well as two new investigations entitled "Aquatic Ecosystems" and "Land Formations – the Grounds of the Morris Arboretum". The objectives of incorporating the "Understanding Wetlands" tour, is to allow the students to be able to describe the components of a wetland and also to describe the water and soil characteristics typical of wetlands. In "Aquatic Ecosystems," the students will be able to learn about the physical properties of a still body of water and a moving body of water. The discussion will center on how plant growth impacts the make-up of water bodies. The objectives to be reached while the students are participating in the "Land Formations" activity are to apply their knowledge of topographic map analysis to interpret "BG – Base" maps of the Arboretum. The students will also be able to understand the transformation of the area from agricultural use to recreational/educational use. The fourth activity is a Language Arts unit that centers on investigating the topic of the water cycle and the Wissahickon Creek Watershed. The major point that the students will learn as a result of their participation in this activity is that the Wissahickon Creek Watershed is the unifying factor that binds the area surrounding the Morris Arboretum. The four curriculum-based activities of session three require the utilization of key locations of the Arboretum - wetland, outside classroom, the east brook near the Log cabin and the area surrounding the *Two Lines* sculpture.

The details of the current program also include the logistics of each session (Appendix C). Accessibility to the school district's buses used for transportation and the availability of various facilities of the Arboretum are two major issues that had to be taken into consideration while determining the logistics of each visit. The orientation session will take place in the middle or late portion of February. The duration of each activity will be thirty-five minutes and ten minutes will be allowed for the groups to transition from one activity to the next; therefore, the session will last for approximately two hours and fifteen minutes. The second session will occur in early April. The time allotted for each activity will be forty minutes and ten minutes will be allowed for transitioning amongst the four activities, which include a lunch break. The total amount of time the school group will be at the Arboretum will be approximately three and thirty minutes. The final session will take place in early to mid-May. The duration of each activity, which will include a lunch break, will be thirty minutes. Incorporating ten minutes of transitioning time into the logistics of session three will result in the visit lasting approximately three hours and fifteen minutes. Overall, the logistics of Project P.E.A.C.E. contribute to an effective learning environment for the students and supportive teaching platform or the volunteer Guides.

In order for Project P.E.A.C.E to become a beneficial experience for both parties, some issues need to be taken into consideration. Since the program created thus fat is designed specifically for Wissahickon Middle School, further input is necessary from the members of the school. Such input could be suggesting ways to refine the program and/or contributing school supplies.

In addition to the design (activities and logistics) of the program, assistance is also needed to prepare for the sessions. Preparation for the sessions includes the schoolteachers presenting to the students the subject matter related to the various activities prior to each visit. Gathering a sufficient number of chaperones to assist in the organization of the sessions and the supervision of the students is also required. The schoolteachers are also encouraged to inform the students on how to dress and how to behave while at the Arboretum. Appropriate behavior includes considering the Morris Arboretum

as an educational institution, not a park and approaching the sessions with an understanding that each activity is meaningful and has purpose and therefore, should not be approached nonchalantly. To prepare further for the program the teachers are encouraged to organize an essay contest. The purpose of this activity is two-fold: 1) to assess the students' growth due to their participation in Project P.E.A.C.E. and 2) to rename the program. This opportunity to only offered to the students who are on the "Diplomats" team of Wissahickon Middle School of the 2006/2007 academic year. Preparation for each session also requires further input from the staff of the Education Office. In addition to providing the location for the sessions, the staff is also encouraged to consider waiving the cost of admission for all visitors of Wissahickon Middle School who participate in the three Spring 2007 visits. A third and necessary contribution from the staff of the Education Office is the recruitment of an adequate number of volunteer Guides who will conduct the activities and who will direct the school groups. Fully training the Guides is required of the staff as well. Incorporating a teacher orientation session into the Guide training sessions is highly encouraged. Preparing for the three sessions is key to the success of the program.

On the days of each visit, the volunteer Guides and the schoolteachers are encouraged to team teach to allow for a more effective learning experience for the students. The Arboretum's staff is also responsible for allowing the school groups to have easy access to the various areas of the Arboretum (i.e. restrooms, the parking lot and the eating area). Considering the aforementioned issues is important in order to have well-organized, well-staffed, predictable and reliable visits, thus supporting the partnership and encouraging its development.

THE FUTURE OF THE PROGRAM

Project P.E.A.C.E. is the glue that solidifies the partnership of the Education Office and Wissahickon Middle School and all other participating schools, particularly those that within the Wissahickon Creek Watershed. In order for a school partnership to become well established and Project P.E.A.C.E. to be continually effective, active participation and input from members of both parties is essential. Both parties need to agree to support each other with open, constructive communication, an even and continual exchange of fresh ideas and resources and a willingness to be flexible yet committed to the cause.

Transitioning Project P.E.A.C.E out of its experimental phase and onto Wissahickon Middle School's academic calendar also requires financial support. A financial resource to consider is the Wissahickon Educational Opportunities Foundation. W.E.O.F. supports various educational programs used throughout the Wissahickon School District.

A future for Project P.E.A.C.E. is highly possible. The staff of the Education Office developing more school partnerships is highly possible too. Advertising Project P.E.A.C.E to promote the development of school partnerships is strongly recommended In addition to sending a letter of invitation to the many schools that lie within the Wissahickon Creek Watershed, the staff of the Education Office is encouraged to submit an article summarizing the program to the editor of *PSTA Exchange*. All members of the Pennsylvania Science Teachers Association receive this newsletter. Successfully promoting Project P.E.A.C.E. will most likely result in the building a heavy patronage for the Morris Arboretum.

With continued support from the staff of the Education Office, the volunteer Guides and key members of participating schools of the Wissahickon Creek Watershed, this unique program can grow and expand and by doing so it will allow the Morris Arboretum of the University of Pennsylvania to promote its mission of land stewardship while also allowing the surrounding community to become unified.

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APPENDIX A: THE PROGRAM

Overview of program:
This multiple-visit program is designed to enrich the eighth grade curriculum of Wissahickon Middle School. In order for each session to allow the students to have an optimal learning experience, the program includes subject matter to address the Commonwealth/School District academic standards of science, language arts, and social studies (geography).

Session Number One: M3-1"General Tour"
Location(s): Rose Garden, Swan Pond, Log Cabin, Fernery, English Park
Duration: 35 minutes
Objective:
The students will be able to:

- Learn the history and mission of the Morris Arboretum

The following questions are to be incorporated into the tour to generate dialogue:

- How do trees impact our lives?
- Which do you think is more important: growth & development of civilization, or preservation of nature? Do you think that these two goals can be achieved simultaneously?
- Have you witnessed deforestation in your community first-hand? If so, how do you feel about it?
- What action would you like to take to preserve the natural environment in your community?

Language Arts Unit
Academic Standards
1.1.8. Learning to Read Independently
B. Identify and use common organizational structures and graphic features to comprehend information.
C. Use knowledge of root words as well as context clues and glossaries to understand specialized vocabulary in the content areas during reading. Use these words accurately in speaking and writing.
D. Identify basic facts and ideas in text using specific strategies (e.g. generate essential questions as aids to comprehension and clarify understanding through rereading and discussion).
F. Understand the meaning of and apply key vocabulary across the various subject areas.
G. Demonstrate after reading understanding and interpretation of both fiction and nonfiction text, including public documents.
Demonstrate fluency and comprehension in reading.
1.2 Reading Critically In All Content Areas
C. Produce work in at least one literary genre that follows the conventions of the genre (e.g. journal writing)

***Enduring Understandings & Essential Questions* (relative to activity):**
People often define themselves by what others think of them. We define ourselves by the choices we make.
Relationships should focus on how we are similar rather than how we are different.
How do my choices impact others and the world?
What is a relationship and what is my responsibility in a relationship?

Pre-Visit Activity:
Essay contest.

Activity: "Creating a Food Web"
Location: Wissahickon Food Web
Duration: 35 minutes
Objective(s):
The students will be able to:

- improve their comprehension of nonfiction text by using common organizational structures and graphic features
- arrange related sentences in logical order
- personalize their understanding of the subject matter by communicating appropriate terms to observations made
- learn about the interdependency of life within nature by relating self to the world
- understand the concept of a food web within the temperate forest ecosystem.

Material(s):

- A large ball of string or yarn
- Cards with strings attached showing the name or picture of each animal or plant included in the food web; basic facts on the back of each card.

Part One: Group Activity
Each student wears a specific card around his/her neck with the name or photograph in view for others to see. One person stands in the middle of the circle with a ball of string - representing the sun. Using the ball of string given to the sun, the students will then create a food web by stretching the string from one person to the next. Example: The sun stretches the string to a plant, the plant to an insect, etc. Once the web is formed, pollution or a non-native species is then introduced to the web. Students will observe changes to the web. Different students are then asked to pull on their string and observe how many others are impacted by the pull, thus demonstrating how many species are connected.

Part Two: Writing piece
Upon completion of the group activity, the students will independently reflect on the lessons learned and produce a work in one literary genre. The students will relate the *Enduring Understandings & Essential Questions* in their works.

Post-Visit Activity: Expository text structures
The students are to work with a partner on this activity. The expository text structures include prototypical sentence completion task, a modified sentence completion task with related sentences,

arrangement of the related sentences in a logical order and graphic sequence organizer. The topic is the food web.

Science unit

Academic Standards

3.1.10 Unifying Themes

C. Apply patterns as repeated processes or recurring elements in science and technology.

- Examine and describe recurring patterns that form the basis for scientific classification (biological classification, chemical periodicity, geological order and astronomical order).

E. Describe patterns of change in nature, physical and man made systems.

- Describe how fundamental science and technology concepts are used to solve practical problems
- Describe changes in matter caused by heat, cold, light or chemicals using a rate function

3.2.10 Inquiry and Design

A. Apply knowledge and understanding about the nature of scientific and technological knowledge.

- Know that science uses both direct and indirect observation means to study the world and the universe.

B. Apply process knowledge and organize scientific and technological phenomena in varied ways.

- Describe materials using precise quantitative and qualitative skills based on observations.
- Use process skills to make inferences and predictions using collected information and to communicate, using space/time relationships, defining operationally.

C. Apply the elements of scientific inquiry to solve problems.

- Generate questions about objects, organisms and/or events that can be answered through scientific investigations.
- Judge the significance of experimental information in answering the question.

3.5.10 Earth Sciences

C. Interpret meteorological data.

- Describe weather and climate patterns on global levels.
- Evaluate specific adaptations plants and animals have made that enable them to survive in different climates.

3.7.10 Technological Devices

A. Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.

- Apply advanced tool and equipment manipulation techniques to solve problems.

B. Apply appropriate instruments and apparatus to examine a variety of objects and processes.

- Describe and use appropriate instruments to gather and analyze data.

Pre-Visit Activity

The teacher will review with the students the significant features on a globe - Earth's varying surfaces - and how each influences the weather around a particular region (e.g. reflection and absorption of solar energy).

Activity: Travel the world ~ The Natural Distribution of Trees
Location: Widener Education Center
Duration: 35 minutes
Objective(s):
The students will be able to:

- understand that plant species adapt to a particular climate
- understand the concept of albedo (the degree of surface reflectivity) as it relates to woodlands
- observe the effects of climate change on tree growth

Material(s):

- one inflatable vinyl globe
- science journal
- tree cookie
- science journal

Part One: Tour
The guide will begin by asking the students to recall the principal types of climate belts – tropical rainy, dry, temperate and polar. The guide will then relate the weather of the regions to the major forests in which trees grow – deciduous forests, tropical rainforest, and boreal forests. After which, the guide will explain to the students that in general, conifers dominate the colder and drier areas of the world, and broad-leaved trees grow primarily in warmer and wetter regions. The guide will ask the students to compare and contrast the structures of the trees and then explain to them why structure plays a major role in the tree's adaptation to its particular environment. The guide will also mention that the number of daylight hours and the angle of the sun are additional factors that influence both the behavioral patterns of trees and their natural distribution around the world. The guide will then conclude the session by relaying to the students that although trees grow in varying climates around the globe, all trees function in the same way.

Once the students demonstrate an understanding of how climatic conditions affect the growth of trees, a guide will conduct a brief tour of major tree specimens. The following list of trees is to be considered for the tour:

- needle fir ~ *Abies holophylla* ~ native to China & Korea ~ near Widener Center & English Park (86-162*A)
- bender oak ~ *Quercus* x. *benderi* ~ native to N. America ~ near the parking lot (32-0145*A)
- eastern hemlock (Canadian hemlock) ~ *Tsuga canadensis* ~ native to N. America (tree of Commonwealth of PA) ~ near Rose Garden entrance (32-0774*A)
- London planetree ~ Platanus x. acerifolia ~ ~ near Gates Hall (48-8600*A)
- katsura tree ~ *Cercidiphyllum japonicum* ~ native to Japan and China ~ near the Pennock Garden (32-0589*A)
- hardy cedar-of-Lebanon ~ *Cedrus libani ssp. stenocoma* ~ native to Turkey ~ in Azalea Meadow (44-057*B)

- Greek fir ~ *Abies cephalonica* ~ native to Greece ~ near the Azalea Meadow (32-2585*A)
- Nordmann fir ~ *Abies nordmanniana* ~ native to Asia Minor ~ near Pennock Garden (32-0767*A)
- Amur corktree ~ *Phelloadendron amurense* ~ native to S.E. Russia ~ near Springhouse (32-2256*A)
- lacebark pine ~ *Pinus bungeana* ~ native to N.W. China ~ near the Japanese Hill Garden (32-0477*A)
- Shalimar & Kashmir deodar cedar ~ *Cedrus deodara* 'Shalimar' & 'Kashmir' ~ near *John & Lydia Morris* (80-024*A/80-029*A)
- dawn redwood ~ *Metasequoia glyptostroboides* ~ native to Central China ~ near the Swan Pond (48-045*A)
- yellow buckeye ~ *Aesculus flava* ~ native to N. America ~ near the Swan Pond (32-0068*A)
- blue atlas cedar ~ *Cedrus atlantica* 'Glauca' ~ native to N. Africa ~ near the Rose Garden (32-0303*A)

The guide will synthesize the material learned by discussing how human-caused changes to the ecosystem affect the broader Earth system, because such activity modifies the Earth's albedo (surface reflectivity). For example, a dark forest absorbs 95% of the solar energy it receives. The guide will explain to the students that deforestation increases the CO_2 concentration in the atmosphere (much of the carbon stored in trees is burned and rises into the atmosphere).

Part Two: Tree Rings Analysis: A Study of Climate Change
The activity will begin with the guide presenting a few facts about trees and how they function. The guide will then provide basic information about the specimen at hand. Together the guide and the students will analyze the tree rings on the stump to learn the effects of climate changes on the growth of trees. The following information/questions are to be incorporated into the discussion to generate dialogue:

- What are the major ingredients needed for tree growth? Solar energy, water
- How does a tree grow? What are the major parts of a tree that function during tree growth? Cambium, xylem (the flow of water and nutrients upward) & phloem (the flow of water and nutrients downward)
- What are some major factors that can alter tree growth? Drought

Post-Visit Activity:
Analyze the tree rings of a stump in a schoolyard.

Session Number Two: M3-2

Science Unit
Academic Standards
3.1.10 Inquiry and Design
A. Apply knowledge and understanding about the nature of scientific and technological knowledge.

- Know that science uses both direct and indirect observation means to study the world and the universe.

B. Apply process knowledge and organize scientific and technological phenomena in varied ways.

- Describe materials using precise quantitative and qualitative skills based on observations.
- Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.
- Use process skills to make inferences and predictions using collected information and to communicate, using space/time relationships, defining operationally.

C. Apply the elements of scientific inquiry to solve problems.

- Generate questions about objects, organisms and/or events that can be answered through scientific investigations.
- Evaluate the appropriateness of questions.
- Design an investigation with adequate control and limited variables to investigate a question.
- Organize experimental information using a variety of analytic methods.
- Judge the significance of experimental information in answering the question.

3.8.10 Science, Technology and Human Endeavors
C. Evaluate possibilities, consequences and impacts of scientific and technological solutions.

- Relate scientific and technological advancements in terms of cause and effect.

4.3.10 Environmental Health
B. Explain how multiple variables determine the effects of pollution on environmental health, natural processes and human practices.

- Explain how human practices affect the quality of water and soil.

C. Explain biological diversity as an indicator of a healthy environment.

- Explain species diversity.
- Analyze the effects of species extinction on the health of an ecosystem.

Social Studies (Geography) Unit:
Academic Standards
7.3.8 Demonstrate knowledge and understanding of the human characteristics of places and regions
Explain the human characteristics of places and regions by their settlement characteristics

- Current & past settlement patters in PA and the US
- Forces that have re-shaped modern settlement patterns (e.g., central city, decline, suburbanization, the development of transport systems)

Explain the human characteristics of places & regions by their economic activities

- Spatial distribution of economic activities in PA and the US (e.g., patterns of agriculture, forestry)
- Technological changes that affect the definitions of, access to, and use of natural resources (e.g. the role of exploration, extraction, use of the depletion of resources)

7.4.8 Demonstrate knowledge and understanding of the interactions between people and places
Explain the impacts of physical systems on people

- How people depend on, adjust to and modify physical systems on a national scale (e.g. soil conservation programs)

Explain the impacts of people on physical systems

- Forces by which people modify the physical movement (e.g., new agricultural techniques, industrial processes and pollution)

Pre -Visit Activity:
Read "Stop Pointless Personal Pollution"

Activity One: "Understanding Wetlands" ~ Wetland metaphors, wetland history & "Migration headache"
Location: Wetland
Duration: 40 minutes
Objective(s):
The students will be able to:

- understand what a wetland is
- gain a better understanding of the history of the Arboretum's wetland
- explain positive and negative implications of loss of wetland
- identify five or six functions of a wetland
- explain the effects of an oil spill on the wetland

Material(s):

- fifteen (15) paper plates
- eleven "Wetland Metaphor" items
- laminated illustration of Delaware Estuary Watershed
- laminated illustration of Wissahickon Creek Watershed

Procedure:
See attached document entitled "Understanding Wetlands Tour"
Once the activity is complete, the guide will illustrate a scenario that centers on an oil spill in the Delaware River. The following questions are to be incorporated into the discussion to generate dialogue:

- Which items discussed in the "Understanding Wetlands" activity would be impacted negatively by an oil spill?

Activity Two: Pollution & Plants
Part One: Acid rain and plants
Location: Paper Mill Run ~ the Pump House
Duration: 30 minutes
Objective(s):
The students will be able to:

- observe the impact of acids on algae
- recognize how acid rain can affect the environment

Material(s):

- science journal
- worksheets
- Algae specimens
- Microscopes
- sixty (60) glass slides
- sixty (60) slip covers
- Hydrochloric acid
- Lemon juice
- pH paper
- squirt bottle filled with water
- pH scale
- Test kits

Procedure:
In groups of three or four, the students will view a specimen of algae taken from Paper Mill Run using a microscope and an accompanying glass slide. Next, the students will test the pH of a few solutions before applying a small amount to the algae specimens. With a test kit, each group will also measure the pH of the stream water of Paper Mill Run. Once all data is recorded, the guide will discuss and analyze the results with the students. The following questions/information is to be incorporated into the discussion to generate dialogue:

- What is the pH of pure water? ~7.0
- What is the pH of vinegar? ~3.0
- What is the pH of various concentrations of HCl?
- When you applied the acidic solutions to the algae, what did you observe?
- What is the pH of natural rainwater? ~5.6
- Why is rain naturally acidic? Because carbon dioxide reacts with water to form carbonic acid
- What is the pH of water of Paper Mill Run? ~7.9
- What is the pH of Wissahickon Creek? ~7.5

- At what pH level do aquatic plants thrive best? 7.0 – 9.2
- When acidity increases, the growth of submerged aquatic plants increases or decreases? decreases
- What is the pH of acid rain? 4.2 - 4.4
- What are the two kinds of air pollutants that are the major contributors to acid rain and where are they primarily emitted? Sulfur dioxide and nitrogen oxides – "smokestacks", cars, trucks, burning wood
- How can acid rain affect plants? It removes nutrients from the soil. It weakens trees resulting in a higher susceptibility to disease, ultimately contributing to the trees' demise.

Part Two: Salt Pollution: Does salt affect plant growth?
Location: Paper Mill Run ~ Pump House
Duration: Preparation time: 4 weeks, Acquisition of data/Discussion: 10 minutes
Objective:
The students will be able to:

- observe the affects of various concentrations of NaCl on plant growth

Material(s):

- science journal
- clip boards
- pencils

Procedure:
Prior to the session, the staff of the Education Office of the Morris Arboretum will conduct a month long experiment entitled "Salt Pollution: Does salt affect plant growth?" The accompanying guide will summarize the experiment and will display the results to the students during which time the students will record data. The following questions are to be incorporated into the discussion to generate dialogue:

- What variables changed? remained constant?
- What would be a good hypothesis for this experiment?
- Do the results support the hypothesis?
- Would you use sodium chloride to de-ice the roads of this area? Why? Why not?
- What could be an alternative to this material?

Activity Three (Group Gathering): Death of a River
Location: Paper Mill Run
Duration: 40 minutes
Objective(s):
The students will be able to:

- understand the concept of "diffusion" as it relates to a pollutant entering a stream or pond and disrupting the fish, macro invertebrates and plant life

Material(s):

- 5-10mL of Rhodamine Dye
- science journal
- Stopwatch
- Tape measurer

Procedure:
The students will gather near East brook to observe this activity. As a guide introduces a small amount of the groundwater tracer, Rhodamine Dye into the tributary, one student will measure the length of the course that it will travel and another student will keep track of the time it travels its course. Once the measurements are obtained, the guides will synthesis the activity with the students. The following questions are to be incorporated into the discussion to generate dialogue:

- What is diffusion? It is a fundamental process by which material moves.
- Is diffusion a short or long process? Long (depending on space and time)
- What factors would impact the rate of diffusion? Size of particle, temperature (of water) and viscosity (consistency that resists flow).
- It was easy to place the dye in the stream. Would it be just as easy to remove it?
- Relate this activity to a real world situation.
- What pollutants would be easy to remove? Some erosion, grass clippings and twigs, waste and trash; what pollutant would be difficult to remove? Motor oil, pesticides/fertilizers, some erosion
- What could you do to stop pollutants from entering storm drains?
- Do you think the people who are responsible for the pollutant want to damage the environment? Why did they do what they did?
- In your day-to-day activity, what could you do more of/less of that would allow for a safer environment for marine and plant life?

Post-Visit Activity:
Read “Bon Voyage to Bad Boating Habits”
Create graph based from data acquired from Activity Two.
Write a letter to congressman
Complete “The Carbon Cycle” and “The Nitrogen Cycle” Worksheets

Session Number Three: M4 – 1 or M4 - 2

Language Arts Unit
Academic Standards
1.1.8. Learning to Read Independently
E. Identify and use common organizational structures and graphic features to comprehend information.
F. Use knowledge of root words as well as context clues and glossaries to understand specialized vocabulary in the content areas during reading. Use these words accurately in speaking and writing.
G. Identify basic facts and ideas in text using specific strategies (e.g. generate essential questions as aids to comprehension and clarify understanding through rereading and discussion).
I. Understand the meaning of and apply key vocabulary across the various subject areas.
J. Demonstrate after reading understanding and interpretation of both fiction and nonfiction text, including public documents.
K. Demonstrate fluency and comprehension in reading.
1.2 Reading Critically In All Content Areas
C. Produce work in at least one literary genre that follows the conventions of the genre (e.g. journal writing)

Enduring Understandings & Essential Questions **(relative to activity):**
For every action there is a reaction.
Careful reflection can sometimes help a person avoid negative consequences.
Situations are not always how they appear.

What are consequences?
How are consequences a part of daily life
How can truth be determined?

Science Unit
Academic Standards
4.1.10 Watersheds and Wetlands
A. Describe changes that occur from a stream's origin to its final outflow.
Identify Pennsylvania's major watersheds and their related river systems.

Pre-Visit Activity:

Activity: The Water Cycle
Location: the outside classroom
Duration: 30 minutes
Objective(s):
The students will be able to:

- improve their comprehension of nonfiction text by using common organizational structures and graphic features
- arrange related sentences in logical order

- personalize their understanding of the subject matter by communicating appropriate terms to observations made
- describe the process of transpiration and how it relates to the water cycle
- demonstrate an understanding of the Wissahickon Creek Watershed and its related river systems

Material(s):

- laminated illustration of the water cycle
- laminated map of the Wissahickon Creek Watershed
- laminated illustration of Delaware Estuary Watershed

Part One: Group Activity
Using a map of the Wissahickon Creek Watershed, the accompanying guide will explain to the students that the Wissahickon Creek watershed is 64 square miles and stretches from Lansdale to Philadelphia where it drains into the Schuylkill River. The following information/questions are to be incorporated into the discussion to generate dialogue:

- How important are trees to the water cycle?
- What are the related river systems of the Wissahickon watershed?
  In Montgomery County, they are Trewellyn Creek (Springhouse), Haines Run (North Wales), Willow Run (between Springhouse & Ambler), Prophecy Creek (Blue Bell), Rose Valley Run & Tannerie Run (Ambler), Pine Run & Sandy Run (Fort Washington) and Lorraine Run (between Flourtown & Plymouth Meeting)
- What communities lie within the watershed of the Wissahickon Creek? Parts or all of the following twelve: Montgomery Township, Lansdale Borough, North Whales Borough, Upper Gwynedd Township, Lower Gwynedd Township, Whitpain Township, Ambler Borough, Upper Dublin Township, Whitemarsh Township, Abington Township, Springfield Township and Philadelphia
- If some pollutant entered into the watershed, would it impact your home? School?

Part Two: Writing piece
Upon completion of the group activity, the students will independently reflect on the lessons learned and produce a work in one literary genre. The students will relate the *Enduring Understandings & Essential Questions* in their works.

Post-Visit Activity: Expository text structures
The students are to work with a partner on this activity. The expository text structures include prototypical sentence completion task, a modified sentence completion task with related sentences, arrangement of the related sentences in a logical order and graphic sequence organizer. The topic is the water cycle.

Science Unit
Academic Standards
3.2.10 Inquiry and Design
B. Apply process knowledge and organize scientific and technological phenomena in varied

ways.

- Describe materials using precise quantitative and qualitative skills based on observations.
- Use process skills to make inferences and predictions using collected information and to communicate, using space/time relationships, defining operationally.

C. Apply the elements of scientific inquiry to solve problems.

- Generate questions about objects, organisms and/or events that can be answered through scientific investigations.

3.5.10 Earth Sciences

A. Relate earth features and processes that change the earth.

- Interpret topographic maps to identify and describe significant geologic history/structures.

B. Explain sources and uses of earth resources

- Demonstrate the effects of sedimentation and erosion before and after a conservation plan is implemented.
- Evaluate land use (e.g., agricultural, recreational, residential, commercial) in Pennsylvania based upon soil characteristics.

3.8.10 Science, Technology and Human Endeavors

C. Evaluate possibilities consequences and impacts of scientific and technological solutions.

- Relate scientific and technological advancements in terms of cause and effect.

4.1.10 Watersheds and Wetlands

A. Describe changes that occur from a stream's origin to its final outflow.

- Identify Pennsylvania's major watersheds and their related river systems.

B. Explain the relationship among landforms, vegetation and the amount and speed of water.

- Analyze a stream's physical characteristics.
- Describe how topography influences streams.
- Explain the influence of mountains on precipitation.
- Explain how vegetation affects storm water runoff.
- Delineate the boundaries of a watershed.
- Describe factors that affect the quality of groundwater.
- Explain how the speed of water and vegetation cover relates to erosion.

D. Describe the multiple functions of wetlands.

- Analyze wetlands through their indicators (e.g., soils, plants, hydrology).

Social Studies (Geography) Unit:
Academic Standards

7.1.8 Demonstrate understanding of the concepts and tools for basic geographic literacy
Explain and locate places and regions:

- How regions are connected (e.g., watersheds & river systems)

7.2.8 Demonstrate knowledge and understanding of the physical characteristics of places and regions
Explain the physical characteristics of places and regions including spatial patterns of Earth's physical systems

- Climate regions
- Landform regions

Explain the dynamics of the fundamental processes that underlie the operation of Earth's physical systems.

- Water Cycle
- Erosion cycle

Pre-Visit Activity:
Read "Whatzzzzup-stream?"

Activity One: "Understanding Wetlands" ~ "Introducing Wetlands", "Let the Cattail out of the Bag", "Wet 'n' Wild" and "Helping Wetland Habitats"
Location: Wetland
Duration: 30 minutes
Objective(s):
The students will be able to:

- describe a wetland and its components
- describe water and soil characteristics typical of wetlands
- develop an action plan to address a local wetland issue

Material:

- Cloth bag filled with plants/animals
- Notebook with: laminated wetland ID wheel
- Before and after photographs of wetland/meadow
- Index cards
- Pencils
- Field guide of frequently found animals/plants
- cardboard clipboards
- "Wet `N` Wild" worksheets (double-sided)

Procedure:
See attached document entitled "Understanding Wetlands Tour"

Activity Two (Group): Aquatic Ecosystems
Location: Swan Pond, Wetland
Duration: 30 minutes
Objective(s):
The students will be able to:

- demonstrate an understanding of the relationship among landforms, vegetation and the amount and speed of water.
- recognize key areas in the Morris Arboretum that control soil erosion and water contamination

Material(s):

- test kits
- worksheet

Procedure:
Prior to the start of the activity, the teachers and guides will divide the participating students into two groups. One group will conduct research at the wetland to study the properties of still water, while another group will conduct research at the Wetland area to study the properties of moving water. The guide will begin with a discussion of the physical properties of the Paper Mill Run or Swan Pond. The following information/questions are to be incorporated into the discussion to generate dialogue:

- What are the physical properties of an aquatic ecosystem? Turbidity, depth, temperature, pH, and dissolved oxygen
- Are the physical factors independent entities or are they factors that determine which organisms can live in the pond? Determinants
- What plant species would thrive from dissolved oxygen in the water? Algae
- So if the stream/pond is saturated with an abundance of oxygen, would that be an indication that there is little or a lot of algae in the stream? Little
- What is eutrophication? The process by which a body of water becomes enriched with a dissolved nutrient thus stimulating an abundant growth of aquatic plant life (algae) usually resulting in the depletion of dissolved oxygen which other aquatic organisms need for survival
- What causes eutrophication? Using fertilizer incorrectly
- What can be done to reduce it? Soil conservation practices – placing mulch in the area in question and planting vegetation so the roots anchor the soil so it stays in place.
- How does water impact various communities, countries, even planets?
- Has anyone ever been to or heard of Fairmount Park? What is the history of Fairmount Park? The main reason why the city of Philadelphia established Fairmount Park over 200 years ago was to protect the Schuylkill River from pollutants. If we are protecting the Schuylkill River we are also protecting the Delaware Bay. The vegetation along the rivers and banks of water absorbed and continues to absorb pollutants. The plant life growing in the park is also used to prevent runoff.
- How can erosion be controlled in an area? bottlebrush buckeye on slope

Once the students demonstrate an understanding of the relationship among landforms, vegetation and the amount and speed of water, the accompanying guide will conduct a test to measure the turbidity, depth, temperature, pH and dissolved oxygen of the water of the stream/pond. The students will record the data.

Activity Three: Land Formations ~ the Grounds of the Morris Arboretum
Location: *Two Lines Variable*
Duration: 30 minutes
Objective(s):
The students will be able to:

- apply their previous knowledge of topographic map analysis to interpret "BG-Base" Maps of the Morris Arboretum
- understand the transformation of the area of the land from agricultural use to recreational/educational use

Material(s):

- laminated 11" X 17" topographic maps of significant areas of the Morris Arboretum
- laminated 11" X 17" topographic map of the complete layout of the Morris Arboretum and the Bloomfield Farm
- laminated map of Morris Arboretum
- laminated photograph of four geological formations

Procedure:
The activity will begin with the accompanying guide reviewing the history of the grounds and discussing the geological make-up of the grounds of the Arboretum. The guide will explain to the students that there are portions of four major geological formations that make up the grounds and therefore, contribute to the growth of the many plant specimens of the area. The following information/questions are to be incorporated into the discussion to generate dialogue:

- chickies quartizite ~ the ridge upon where *Two Lines Variable* is positioned
- Wissahickon schist and gneiss (metamorphic rocks) ~ the area along Germantown Pike
- Limestone (formed from organic remains) ~ the Bloomfield farm and the area along Paper Mill Run
- Why would it be important to know the geology of an area like this?

After which, the guide will distribute the maps of the grounds and the students will work with a partner and apply what they learned in class to analyze the topographic maps of the grounds of the Morris Arboretum. Once the groups have analyzed the maps, they will present their information to the rest of the students.

Post-Visit Activity:
Read "Improving Old MacDonald's Farm" and "Streams in the City"
"Surf Your Watershed" Internet Investigation

RESOURCES

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"The Source of Earth's Heat." Catastrophic Events: Student Guide and Source Book.
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Russell, Tony. The New Encyclopedia of American Trees. 2005. 44-45.

Montelongo, Jose`. (2005, February). "Teaching Expository Text Structures."
The Science Teacher., pp. 28-31.
http://www.bottlebiology.org/investigations/terraqua_explore.html
http://www.ametsoc.org/amsedu/wes/home.html

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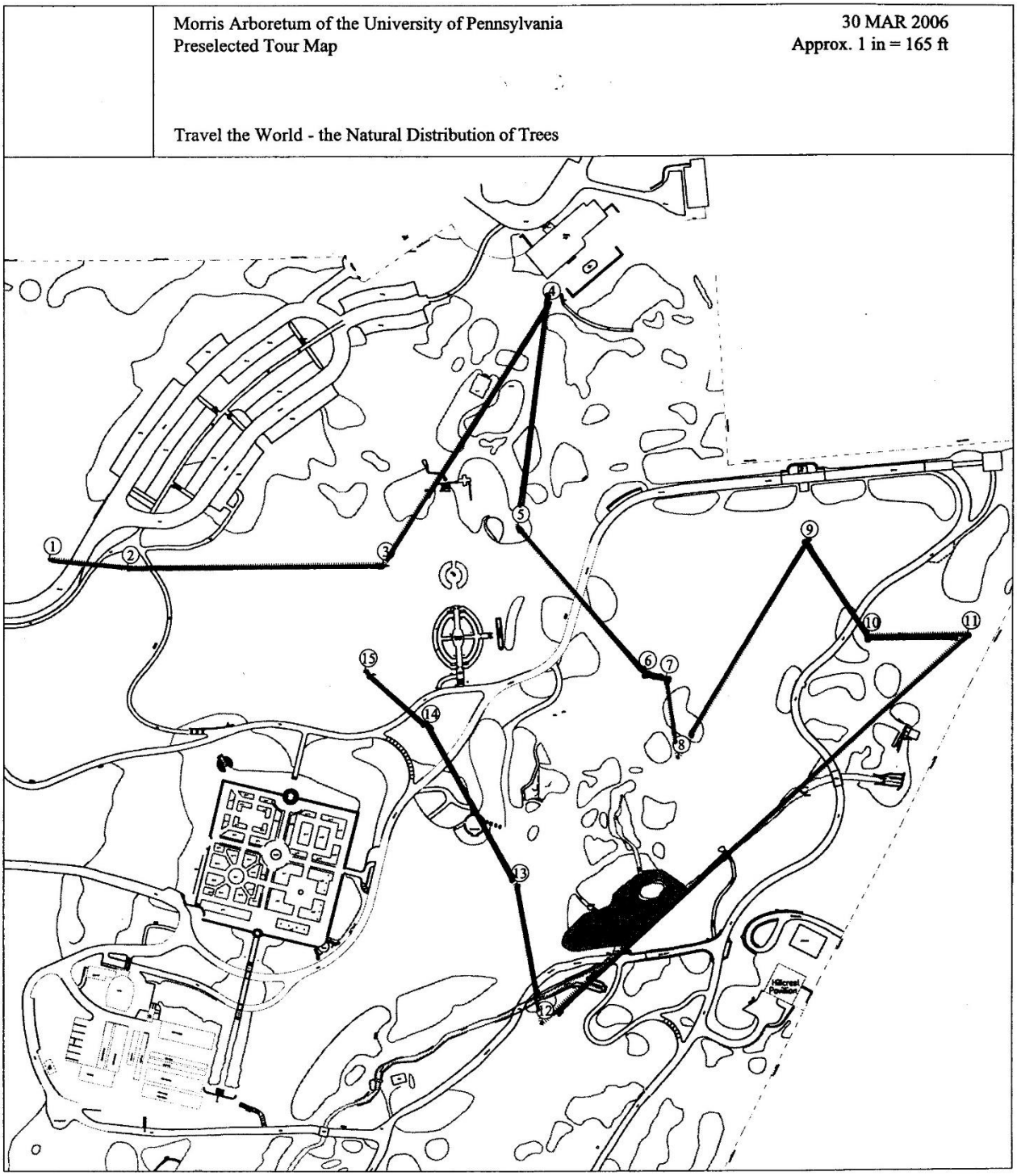
APPENDIX B: MAP



APPENDIX C: THE LOGISTICS OF THE PROGRAM

I. Details

Eighth grade curriculum
Interdisciplinary (Science, Language Arts, Geography)
Multiple visits (3 sessions)

- February, April & May
- 130 students, 13 chaperones, 13 Guides (ac
- tivity) & 5 Directors ~ **161**
- Lunch occurs simultaneously in a designated area (Session 2 & 3)

II. Concerns/Considerations

- Teacher input (material & intellectual)
- Teacher/Administrator's Orientation
- Schedule 6 dates (including 3 rain dates)
- Physical Facilities (tent)
- Appropriate clothing (boots)/ Extra clothing
- Proper etiquette (educational institution not a park; program not field trips)
- Concern for group activity (Session 2)
- Prior knowledge of subject matter
- Teamteaching assistance on day of visit
- Essay contest (name program)
- W.E.O.F. (itemize expenses for grant)

III. Logistics of each session

Session #1: Orientation
February 2007
Arrival time: 10:00am
Departure time: 12:15pm
(2 hours/15 minutes – 135 minutes)

Activity 1: General Tour ~ Rose Garden, Swan Pond, Log Cabin, Fernery, English Park
Activity 2: Creating a Food Web ~ *Wissahickon Food Web* - M. K. Butcher Sculpture Garden
Activity 3: Travel the World ~ The Natural Distribution of Trees (tour) ~ parking lot

# of people per activity: approximately 43 students, 4 Guides, 4 teachers/chaperones (51)
Transition time: 10 minutes (30)
Duration of each activity: 35 minutes

Session #2: Pollution
Week of April 9, 2007

Arrival time: 10:00 am
Departure time: 1:30 pm
(3 hours/30 minutes – 210 minutes)

Activity 1: Understanding Wetlands ~ Wetland
Activity 2: Pollution & Plants ~ Paper Mill Run ~ Pump House
Activity 3 (Group): Death of a River ~ Paper Mill Run

# of people per activity: approximately 43 students, 4 Guides, 4 teachers/chaperones (51)
# of people per Activity 3 (Group): approximately 130 students, 18 Guides/Directors,
13 teachers/chaperones (161)
Transition time: 10 minutes (40)
Duration of each activity: 40 minutes

Session #3: The Water Cycle & Watersheds
May 2007
Arrival time: 10:00am
Departure time: 1:15pm
(3 hours/15 minutes – 195 minutes)

Activity 1: The Water Cycle ~ outside classroom
Activity 2: Understanding Wetlands ~ Wetland
Activity 3: Land Formations ~ the Grounds of the Morris Arboretum ~ *Two Lines Variable* Sculpture
Activity 4: Aquatic Ecosystems ~ Swan Pond, Wetland

# of people per activity: approximately 26 students, 3 Guides, 3 teachers/chaperones (32)
Transition time: 10 minutes (50)
Duration of each activity: 30 minute