

PA Chesapeake Bay Meaningful Watershed Educational Experience Grant Program for Conservation District – School Partnerships

Funding provided through the Federal NOAA B-WET Program

Project Update: January 1, 2010 – June 30, 2010

Nineteen projects were completed during this period (final reports start on page 2)

- MWEE0901 Make a Splash – Bradford Conservation District partnered with Towanda & Wyalusing School Districts' Towanda Area Elementary and Wyalusing Area Elementary Schools
- MWEE0902 Trout in the Classroom – Bradford Conservation District partnered with Troy School District's Troy Area High School
- MWEE0903 Contributory Systems of the Bay – Cambria Conservation District partnered with Cambria Heights School District's Cambria Heights Middle School
- MWEE0904 Stream Monitoring - Cameron Conservation District partnered with Cameron County School District's Cameron County High School
- MWEE0905 Pond Habitat Study & Restoration - Centre Conservation District partnered with Bald Eagle School District's Bald Eagle High School, Middle School, and Elementary Schools
- MWEE0906 Briar Creek Restoration & Festival - Columbia Conservation District partnered with Berwick School District's Berwick Middle School
- MWEE0907 Fishing Creek BMPs for Stream Improvement & Fair - Columbia Conservation District partnered with Central Columbia School District's Bloomsburg Christian School
- MWEE0908 Mud Run BMPs for Stream Improvement - Columbia School District partnered with Millville School District's Greenwood Friends School
- MWEE0916 Limestone Run Case Study - Northumberland Conservation District partnered with Milton School District's Milton Area High School
- MWEE0924 Focus on Floodplains - Perry Conservation District partnered with Newport School District's Newport School
- MWEE1001 Trout in the Classroom as a Bay Learning Tool - Adams Conservation District partnered with Fairfield Area High School in Fairfield Area School District.
- MWEE1002 Turf Grounds Nutrient Management in the Chesapeake Bay - Bradford Conservation District partnered with Troy Area Elementary School East in Troy School District.
- MWEE1003 Dairy Farms, Watersheds and NPS Pollution - Bradford Conservation District partnered with Athens, Canton, Troy, Northeast Bradford High Schools in Athens, Canton, Troy, Northeast Bradford School District.
- MWEE1004 Stormwater Conservation Education - Cumberland Conservation District partnered with Cedar Cliff High School in West Shore School District.
- MWEE1005 Chesapeake Bay Unique Habitats Exploration Project - Dauphin Conservation District partnered with Circle School in Central Dauphin School District.
- MWEE1006 Farming and Local Streams - Lancaster Conservation District partnered with Clay Elementary in Ephrata School District.
- MWEE1007 Human Impacts on the Bay - Lebanon Conservation District partnered with Elementary Schools and their Envirothon Advisors in Annville-Cleona, Cornwall Lebanon, Eastern Lebanon County, Lebanon, Palmyra; Lebanon Catholic School District.

- MWEE1008 Outdoor Education Program - Snyder Conservation District partnered with Selinsgrove Area Intermediate School in Selinsgrove School District.
- MWEE1009 Schoolyard Habitat Establishment Project - Wyoming Conservation District partnered with Evans Falls Elementary in Tunkhannock School District.
- MWEE1011 Wetlands Restoration Project - York Conservation District partnered with Spring Grove Area High School in Spring Grove School District.

Final Reports for Completed Projects:



Project Title: MWEE0901 Make a Splash

Funding: \$1977

Conservation District: Bradford

School District: Towanda & Wyalusing

School: Towanda Area and Wyalusing Area Elementary

Summary: In addition to integrated classroom curriculum, the Bradford County Conservation District hosted 2 "Make A Splash" (Aquatic Field Days) for Towanda Area Elementary School – 5th grade and Wyalusing Area Elementary School – 4th grade. The events were held at the French Azilum Historic Site located on the banks of the Susquehanna River.

Students:

How many students in which grades were targeted through this project?

4/30/2009 – Wyalusing – Fourth Grade – 114 Students, entire class

6/8/2009 – Towanda 5th Grade – 110 Students, entire class

9/25/2009 – N.East Bradford – 6th Grade – 86 Student, entire class

5/6/2010 – Canton – Trout in Classroom (High School)

What percentage of each grade's total student body do these numbers represent? 100%

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

There were a variety of hands on activities that were used to strengthen a student's connection to the Chesapeake Bay, their local rivers and streams, and instill a stewardship ethic. Activities included soils & soil erosion, water usage over time, fish & reptiles, aquatic wildlife, crayfish biology, energy production, watersheds, watersheds & wetlands, historic use of the Susquehanna River, fish migration, recycling and bald eagles. Each activity had a connection to aquatic life sustained by rivers & streams in Bradford County. At the 2 French Azilum events students also had a rare chance to view a pair of nesting Bald eagles and their offspring.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

Pre and post classroom activities included visits to school classrooms to discuss the events and to ask questions about the Susquehanna River & its watersheds. Follow-up letters were then written by students to describe what they learned at the event (samples include in packet). Wyalusing Area Elementary School teachers used the Field Day to prepare for PSSA testing on the 4th grade level. At least one of the Wyalusing Elementary school's (Camptown Elementary) reported over half of the students were advanced in the testing and the rest proficient, one student scored over 2,000 points.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

Each activity and presenter used the Department of Education's Environment & Ecology Standards to develop their presentation or activity. Additional information was given to teachers as well as classroom presentations on a variety of topics related to the PA portion of the Chesapeake Bay Watershed and its rivers & streams. The activities expanded student's knowledge on aquatic life, watersheds & wetlands, water consumption, and water quality.

2c. How were the classroom activities integrated into the school's curriculum?

Each teacher used information learned from the events to cover subjects related to the field days that they address in daily lesson plans. In addition, teachers used curriculum such as PLT, Project Wild, Project Wet in daily lesson plans to reinforce what students learned at the events.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

The project was led by a variety of knowledgeable teachers who participated in teacher workshops sponsored by the Conservation District. Many of the teachers have been trained in the use of the following curriculum; Project Learning Tree, Project Wild, Project Wet, K.A.R.E., and Healthy Water/Healthy People. Presenters were professionals from the following agencies, BCCD, PA Game Commission, Claverack, PA Fish & Boat Commission, Northern Tier Solid Waste Authority and Penn State Extension.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

Two of the field days were held at the Historic French Azilum site located on the North Branch of the Susquehanna River. Additional partners are listed in question 3.

5. In what ways might it be possible to measure long-term outcomes of the project?

All school districts have requested the same events be held in 2010. PA Department of Education funding was used for 2010 events. Holding these events annually will be a way to measure long-term outcomes of the project.

Project Title: MWEE0902 Trout in the Classroom

Funding: \$2307

Conservation District: Bradford

School District: Troy

School: Troy Area High School

Summary: Trout in the Classroom brings field experiences indoors. Additionally, outdoor field experiences (biological, physical, and chemical water quality analysis, and watershed-related instruction) take place in and along creeks and tributaries within walking distance from the participating classes. Teachers and sponsors facilitated the lessons and activities to 9th through 12th grade students who participated in activities linked to water testing, fisheries and nutrient management (via land use judging, Envirothon, Nutrient Management Planning Competition, Conservation Field Days, and classroom instruction).

Students: Troy Area High School has a graduating class between 125 to 150 students. It is estimated that around 10% of the students, grades 10-12 were involved with the grant activities.

Canton High School bodes a graduating class of approximately 80-90 students. Accounting for the same grades, grant participation is estimated to have reached upward to 15%.

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

Students used the test kits to assess the water quality within the aquarium on a daily basis to assure that it was sufficient to support Brook Trout, comparing it to local environs.

Students cared for the aquaculture equipment, reared and monitored the Brook Trout (from eggs to fingerlings), and kept accurate records. They released the trout into a nearby stream and advertized their success and concern to the general public (see news releases, Appendix E).

Students conducted water quality tests of a nearby section of Sugar Creek, using it for the collection of water for the aquarium and as a release site for the trout. Testing included chemical, biological, and physical parameters.

Students were provided with and formulated and plan and nutrient management proposal for an agricultural operation oriented toward local practices and conditions. They presented their presentation in front of a camera and a judging panel; having to take into account good public speaking practices.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

Pre and post testing consisted of an examination for those participating in the Trout in the Classroom initiative (see exam and results attached, Appendix F). This took into account several aspects of water testing, fisheries and nutrient management, as well as watershed concepts and connections.

Otherwise, success was based upon:

The number of students that participated (approximately 57)

Whether they could successfully rear Brook Trout in the classroom and by the number release (They successfully reared around 60 trout).

The completeness, accuracy, and presentation of the nutrient management plan.

Understanding and using the water quality test kits and knowing what roles the various measures played in assessing water quality.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

Students took part in discussion and testing related to watershed identification, terminology and connective concepts relating to the water cycle (from their back yard to the ocean).

They discovered primary pollutants stemming from activities in Pennsylvania that contribute to concerns surround the Bay.

They particularly focused on agricultural activities (as the leading industry in Pennsylvania) and how management can have a notable effect on the water quality of the streams, rivers, and Bay.

2c. How were the classroom activities integrated into the school's curriculum?

For Troy, the water quality testing, Trout in the Classroom, Nutrient Management Planning Competition, and Nutrient Management Specialist Certification Training were woven into the Agricultural Science curriculum; expanding upon soils science, agronomy, animal husbandry, land use, and forestry among others.

Regarding Canton, the initiatives were dovetailed with the Biological Science curriculum, emphasizing agricultural processes and management; typically including natural cycles, genetics and genetic engineering among others.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

All the initiatives were cooperatively facilitated with Bradford County staff taking the lead role, backed by experienced, helpful, and adventuresome teachers. Both teachers involved are quite knowledgeable about the applicable subject matter and manage agricultural operations of their own.

This represents the third year that the Nutrient Management Planning Competition has occurred due to its practicality, broad subject matter and popularity. Adjustments continue to be made to improve the effort effect above and beyond the previous year.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

Other important participants in the Planning Competition include township officials, local farmers and agriculture support group staff that volunteer as judges for the purpose of observing, critiquing, and providing follow-up questioning for each presentation.

In an attempt to maximize the reach and influence of the student activities, as well as enhance their sense of pride, accomplishment and recognition, news releases describing and publicizing their effort were submitted to media outlets throughout the local area and region. The project was also included in the 2009 Bradford County Conservation District Annual Report which has a wide distribution and audience (see attached, Appendix G, p.6).

5. In what ways might it be possible to measure long-term outcomes of the project?

One long-term measurable is the number of Nutrient Management plans that are developed for the farms on which some of the students live and work.

Surveying the students down the road may likely reveal practices that they have made part of their routine, stemming from their knowledge gained from this initiative, whether applying fertilizers to fields, gardens, and lawns correctly, composting, or taking part in legislative processes related to non-point source pollution.

Project Title: MWEE0903 Contributory Systems of the Bay

Funding: \$1700

Conservation District: Cambria

School District: Cambria Heights

School: Cambria Heights Middle School

Summary: Cambria Heights Middle School students participated in a field trip to Prince Gallitzin State Park to compliment their in class lessons. Activities were planned that would be fun but educational for the students. We focused all of the day's activities around water quality, how to evaluate it and how it affects us, the animals that live in and around it and ultimately the Chesapeake Bay. Students were divided into five groups and rotated through five interactive stations throughout the day. Stations included: Macroinvertebrate identification, Wetlands, Amphibians, Fish Identification and Dissolved Oxygen and Fishing. The district worked closely with the teachers so that students were prepared for the day's activities and had already been introduced to the various topics we covered during our field day.

Students: How many students in which grades were targeted through this project? 98 sixth grade students

What percentage of each grade's total student body do these numbers represent? 100% of 6th graders attended

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic? Students were divided into five groups and rotated through five interactive stations throughout the day.

Station 1: Macroinvertebrate Identification

This workshop was held in a small tributary to the lake. Students were instructed on the proper use of kick nets and macroinvertebrate collection procedures. The students worked with Bryan Rabish, a watershed specialist for the district. He discussed the importance of studying the biology of the stream and explained different species in the stream. Students used identification charts purchased through this grant to characterize the water quality based on the organisms they identified.

Station 2: Wetlands

District staff guided the students through the wetland nature trail located along the lake. Students studied plants in the wetland and examined wetland habitats. They also learned about the functions of a wetland and the importance of having riparian buffers. Students used field guides to identify plants and animals.

Station 3: Amphibians

The district's educator explained the difference between different amphibians, their habitats and specific needs. She explained life cycles and showed students various live specimens. She demonstrated different calls of native Pennsylvania frogs. She discussed vernal pools and how amphibians can be excellent indicator of environmental conditions.

Station 4: Fish Identification and Dissolved Oxygen testing

Students played a fish identification game with conservation district AmeriCorps members and learned about dissolved oxygen and how it affects where the fish live. Students used field kits to conduct their own dissolved oxygen tests at various locations along the edge of the lake and in a small tributary.

Station 5: Fishing

Fish Commission staff assisted district staff with a fishing session. Students had an opportunity to fish in the lake, and learn about the different species living in the lake. Students also learned about pH and its effect on the fish population and diversity of species in the reservoir. They conducted their own tests using lake water. They also made fish prints to take home with them.

The Meaningful Bay Experience/Habitat Restoration provided a valuable enhancement to the Cambria Heights 6th grade science curriculum. Over the past five years, they have reworked the entire middle school curriculum to focus on a three-step approach to each topic. In sixth grade, students are introduced to topics and explore as many facets of the topic as possible, which is later enriched in 7th, and extended in 8th grade.

During the sixth grade year students are introduced to the following topics, which were directly addressed through this program.

- Groundwater
- Watersheds
- Water cycle
- Erosion
- Absorption and Percolation
- Acid Mine Drainage
- Carbon Dioxide Cycle, Nitrogen Cycle, and Oxygen cycle
- Animal Classification

2. 2a. Please describe the project's pre and post classroom activities/evaluations: Science teachers covered basic topics of water quality and habitats in the classroom as part of their current curriculum. Teachers also spent classroom time talking about their local watersheds and how what we do here can ultimately affect the Chesapeake Bay.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams? Students examined watershed maps and discussed sources of pollution occurring on different tributaries in our area. Conservation district watershed specialists instructed the students about on-going projects to restore water quality such as acid mine drainage, agricultural pollution and stream bank rehabilitation.

2c. How were the classroom activities integrated into the school's curriculum? This event was held at the end of the school year. Watershed topics are integrated heavily in 7th grade curriculum at the Cambria Heights Middle School.
3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe: Conservation district educators, watershed specialists, Fish and Boat Commission staff taught the sessions. Teachers accompanied the students through each session, assisting the presenters. AmeriCorps members also assisted station presenters.
4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain. Yes, the Prince Gallitzin State Park provided the facilities for the day's activities. The PA Fish and Boat Commission environmental educators assisted with the fishing station and provided fishing rods for the day. Volunteer from the Clearfield Creek Watershed Association assisted with the project and AmeriCorps members from the Conservation District assisted with the stations.
5. In what ways might it be possible to measure long-term outcomes of the project? We regularly work with the Cambria Heights middle school, providing environmental education programs. We also work with high school through our Envirothon Program.

Project Title: MWEE0905 Pond Habitat Study & Restoration

Funding: \$2568

Conservation District: Centre

School District: Bald Eagle

School: Bald Eagle High, Middle, and Elementary Schools

Summary: The project included the restoration of an existing pond (2/3 acre) that is located on the grounds of the Bald Eagle Area High School on route 220 in Wingate. We also purchased equipment that is being used by multiple grade levels for pond study experiences. In addition, this project involved curriculum development activities for teachers.

Students:

How many students in which grades were targeted through this project? 160

What percentage of each grade's total student body do these numbers represent? 1/7th of the elementary students in the school district. 1/7th of the teachers in the elementary program.

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

At this point, we have created the environmental center curriculum, trained grade 4 teachers and have a plan for training the remaining teaching staff for this summer. The students in grade four have experienced some of the

activities in the curriculum including water environments, insects found in the water, pond plants, the impact of watersheds on the pond and wetlands, water cycle, and the effects of water on animal and plant life.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

The 4th grade teachers used FOSS assessments and scoring rubrics, as well as science notebook entries. Grade 4 will be taking the PSSA Science Test on April 27 and 28, 2010.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

To be honest, this is something that was never addressed previously in our science curriculum at the elementary level. We did an extensive water unit but specific referencing to the watershed was not part of the curriculum. This has been remedied through this project and the fourth grade in particular will have extensive activities on this topic. The 5th and 6th grades will also have activities on this topic next year. Our students will recognize the impact of watersheds and wetlands on animals and plants. This correlates well with our science units of water, environments and plants. The fourth grade students will also integrate these lessons with their PA Unit which encompasses history, geography, and more.

2c. How were the classroom activities integrated into the school's curriculum?

We used Dr. Kathy Blouch as a consultant since she has created some lessons previously that support the FOSS Science Program but cover environmental issues. Our experienced classroom teachers reviewed those lessons and then used state resources from Project WET, WILD and LEARNING TREE to integrate the lessons into the science curriculum. It is our hope to extend this integration into our art and music curriculum next year.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

Ann Donovan, watershed specialist, has been a key player in our Environmental Center process and she helped us to develop our action plan, helped to write the grant and she aided our efforts in creating our materials and equipment list to support the curriculum. She extensively researched wetland plants for us. Members of the school district's elementary science committee have worked with the curriculum and have been involved in the trainings. We will be using a train-the-trainer model for the implementation of the program for grades K,1,2,3,5 and 6. That means that strong instructional leaders at each level (our science committee members) will be training their grade level peers. We will also be using the high school environmental science teacher to provide the teachers with background knowledge and to answer questions that arise during the trainings. We have also used the services of Andy Cole and Bryan Swistock regarding the pond and landscaping plans for the Environmental Center. Dave Jackson is working with us on the forestry part of the Environmental Center and in reviewing the activities planned for the students. All of these people serve on the Environmental Center Committee and attend monthly meetings to keep the project moving.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

The Environmental Center Committee, which oversees the site and curricular projects, includes teachers, administrators, school board members, local agency representatives (Penn State Extension, PSU Pond and Landscaping Specialists, Local Watershed Group, Environmental Center in Julian, Forestry Agencies) and volunteers. Most of the committee members have worked in sub committees to complete the work necessary for the site and curricular plans. We will be asking for volunteers to help finalize the building project.

5. In what ways might it be possible to measure long-term outcomes of the project?

We are in the process of developing evaluation forms for teachers and students to complete at the end of each visit to the Environmental Center. We feel that these forms should provide us with feedback which will help to make each year better for students and staff. The Environmental Center Committee would then review the evaluation report each season and make changes to meet the needs of students and teachers.

Project Title: MWEE0906 Briar Creek Restoration & Festival

Funding: \$2200

Conservation District: Columbia

School District: Berwick

School: Berwick Middle School

Summary: Berwick Middle School students (grade 8) participated in field trips to study and appreciate the Briar Creek Watershed. They accomplished a habitat restoration project at Briar Creek Lake. They also designed and delivered a watershed program to Berwick school students and school board.

Students:

How many students in which grades were targeted through this project? 60 8th grade studnets

What percentage of each grade's total student body do these numbers represent? 25%

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

After initial classroom visits, we visited many places with in the watershed to give the students a firsthand look at all watershed aspects. We visited PPL Riverlands, Nescopeck State Park headwaters, Jeddo Mine Tunnel (AMD impacts), Berwick Sewage treatment Plant, Pennsylvania American Water Co., Briar Creek Lake, stream study sites, did a tree planting at Briar Creek lake, and did a kayak trip on the Susquehanna River.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

We did stream visual assessments at several sites which changed and improved with practice. The final evaluation was their presentation to their peers and the school board.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

They visited many parts of the stream, river, and varying portions of the watershed. They got to see where drinking water was treated and where sewage was treated. They also got to experience many of the local industries and recreational opportunities.

2c. How were the classroom activities integrated into the school's curriculum?

They were given monthly assignments that they worked on both inside and outside of the classroom. They also have an extensive unit on watersheds and the community.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

Yes, conservation district staff, Bloomsburg University professors, PPL Riverland education staff, and teachers

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

Yes, we partnered with the BCAWS (Briar Creek association for Watershed Solutions) for the tree planting, habitat improvement, and field trips.

5. In what ways might it be possible to measure long-term outcomes of the project?

We have done similar projects with other schools in which we informally questioned the former middle school participants when they were in high school. They have counted this as one of their most treasured school experiences. The monthly field trips are very important and the assignments between meetings are essential.

Project Title: MWEE0907 Fishing Creek BMPs for Stream Improvement & Fair

Funding: \$3637

Conservation District: Columbia

School District: Central Columbia

School: Bloomsburg Christian School

Summary: The main goal of our project was to learn to evaluate stream quality using a visual stream assessment method. To accomplish this goal we targeted Hemlock Creek to which we made 4 stream visits plus an additional visit to Fishing Creek. Many of our project goals were achieved through our studies. Students understand more fully the relationship between land use and stream quality. Their vocabularies have broadened considerably. They now look at streams much differently. They can use the visual stream assessment form handily and know what poor, good, & excellent look like in each category. They also made small steps toward improving the water quality of Fishing Creek. Another achievement of the project (and one that we were not planning for) was that students were able to meet skilled and enthusiastic people in the workforce who had water quality and stream quality as part of their jobs.

Students:

How many students in which grades were targeted through this project? 19.

What percentage of each grade's total student body do these numbers represent? 68% of our high school.

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

Our stream visits were vital to the success of this project. Teaching about land use and stream conditions is almost an impossible task without seeing the stream up close. Our project involved being literally in backyards. Seeing that the concepts discussed met the real world in very concrete ways (such as how to landscape one's one backyard) helped to solidify and objectify the concept of our integral connection with our waterways. The nature of our visits combined with our project of re-establishing a riparian buffer helped to incite personal responsibility and stewardship.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

We spent time in class learning the different forms of stream assessment. Stephanie Singer showed the students detailed maps of the Fishing Creek watershed that indicated the 303-d listed streams. The rest of our pre-project work was at the stream itself.

Our post-project activities included questions compiled the Visual Stream Assessment form on the final exam for the school year. Students reviewed the categories in class and on their own to reinforce their learning on the project.

- 2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

Students did significantly expand their knowledge of Pennsylvania's streams and rivers. The students learned from our class activities how Hemlock Creek emptied into Fishing Creek which in a less than another mile emptied into the Susquehanna River. Having chosen a stream this close to the river, my students were able to conceptualize the link between the back yards of the Hemlock Township residents and the Chesapeake Bay. Another part of our class was to view the film Expedition Susquehanna which helped them to connect Pennsylvania's streams with the health of Chesapeake Bay.

- 2c. How were the classroom activities integrated into the school's curriculum?

The classroom activities, stream visits, and project were used as the core of the ecology unit in biology class and also utilized in teaching units in Earth Science class on Erosion and Streams.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

Stephanie Singer who is the watershed specialist at the Columbia County Conservation District led the project. She is a skilled teacher and lent her expertise to the project. In addition to teaching the Visual Stream Assessment form, she also headed up the riparian restoration project.

Joshua Greene also instructed students on several aspects of stream ecology through the project covering topics such as benthic macro-invertebrates, thermal pollution, and riparian buffers. He has participated in the Science in Motion water quality program supported by the Chesapeake Bay Foundation and the Susquehanna River Basin Commission in previous years and has been taking students to Fishing Creek for 6 years.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

Yes. The riparian buffer zone which our class helped to re-establish was on a stretch of Fishing Creek owned by the Columbia County Conservation District and under the management of the Fishing Creek Watershed Association. Prior to our tree-planting, it was generally agreed that getting holes dug for trees was going to be extremely difficult. The class's diligent work showed that it may be possible to re-establish the buffer in less time than was thought. Their efforts have inspired others from the Fishing Creek Watershed Association to join the cause.

5. In what ways might it be possible to measure long-term outcomes of the project?

Seeing riparian zone itself would be a good indicator of the physical part of the project. Students showing stewardship and interest in the local streams would be more significant indicator of positive outcomes. Another measure of success would be to see which of the students join the Envirothon teams, local watershed groups, or become "waterdogs" in their communities.

Project Title: MWEE0908 Mud Run BMPs for Stream Improvement

Funding: \$2200

Conservation District: Columbia

School District: Millville

School: Greenwood Friends School

Summary: Greenwood Friends School students (grades 5-8) became intimately familiar with their schools' watershed- Mud Run (listed by PA DEP on the 303(d) list of impaired waters). They participated in field assessments to identify causes of impairment and they worked as a team to propose solutions that will lead to removal from the 303(d) list. Through community outreach, the students did a tree planting to improve land use and water quality.

Students:

How many students in which grades were targeted through this project? Grade 5-8 – 20 students

What percentage of each grade's total student body do these numbers represent? Everyone in 5-8 grade

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

Initial classroom visits included lessons to learn about nonpoint source pollution (Enviroscape presentations) and impaired streams. We did a stream visual assessments lesson. They visited the Millville water treatment plant and the sewage treatment plant. We also did a kayak trip on the Susquehanna River.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

They did classroom presentations for their final assessment.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

By visiting the watershed locations first hand they gained practical experience about their home watershed and its connection to the Bay

- 2c. How were the classroom activities integrated into the school's curriculum?

They integrated it into their watershed unit

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

Yes, Conservation district staff, river guides, school parents, and classrooms teachers

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

Yes, we partnered with the Fishing Creek Watershed Association for the planting

5. In what ways might it be possible to measure long-term outcomes of the project?

We will still be measuring the success of this program as the project will continue next year with similar lessons and another kayak trip.

Project Title: MWEE0916 Limestone Run Case Study

Funding: \$1750

Conservation District: Northumberland

School District: Milton

School: Milton Area High School

Summary: Project activities for this grant included classroom lessons, time practicing using water test kits in the classroom laboratory, water testing out in the field, collecting and identifying macroinvertebrates, a tour of the Kelly Township Sewer Plant, a tour of a water test laboratory at Lycoming College, and a lecture on watersheds/factors influencing water quality by Dr. Zimmerman.

Students:

How many students in which grades were targeted through this project? There were a total of 64 students that participated in the grant activities. They were from grade 10, 11, and 12.

What percentage of each grade's total student body do these numbers represent?

16% in 10th grade

40% in 11th grade

44% in 12th grade

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

Students performed nitrate, phosphate, dissolved oxygen, coliform, temperature, pH, alkalinity tests on a local stream, Limestone Run. They also collected and identified macroinvertebrates.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

Before going out into the field, students had classroom instruction, power point presentations, and worksheets on the Susquehanna and Chesapeake Bay watersheds. One example of a worksheet was to locate and identify local towns along the Susquehanna River, discuss why those towns were placed there years ago (water, transportation, disposal area), draw present-day pollutions sources (mines, farms, developments, etc.), draw strategies to limit stream water pollution (riparian buffers, porous pavement, wetlands). In addition, students practiced using test kits before going into the field.

Post classroom activities included evaluating test results and ranking the stream sites in order from most polluted to least polluted, quiz, poster board displaying information.

- 2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

Having the students observe a Susquehanna watershed map before going out into the field helps them understand where they are in relation to the Susquehanna River and Chesapeake Bay. They also better understand the cumulative effect that occurs from the head of the river to the bay. Going out into the field allows the kids to see, smell, feel, what is happening in their immediate area and connect those events with concerns of the Susquehanna River and Chesapeake Bay.

- 2c. How were the classroom activities integrated into the school's curriculum?

The classroom activities followed the requirements of the Environment and Ecology Standards and it was not difficult to integrate them into the regular curriculum.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

Yes, Jessica Snyder, Milton HS environmental science teacher, has a background in teaching science classes. Jaci Harner, NCCD Watershed Specialist, has seven years teaching science at the HS level and hands-on experience water testing with local watershed groups.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain. No.

5. In what ways might it be possible to measure long-term outcomes of the project?

Start an environmental science club that tests on an annual basis; compare results. Also, have the group talk to local homeowners and organize tree plantings to increase the amount of riparian buffer along the stream.

Project Title: MWEE0924 Focus on Floodplains

Funding: \$1073

Conservation District: Perry

School District: Newport

School: Newport

Summary: Project activities completed include the selection and purchase of the Floodplain Simulator, organizing and facilitating the use of the simulator at the Newport Middle School, lesson planning, actual Fate of Rain Modeling experiment completion in the classroom, and follow up discussion and evaluation. The goal of the project was to begin to provide students with the information necessary to make wise, environmentally sound decisions on water quality issues.

Students:

How many students in which grades were targeted through this project?

All Newport Middle School Eighth grade, a total of 86 students. A group of 10 seventh grade elective science students.

What percentage of each grade's total student body do these numbers represent?

100% of Newport Middle School eighth grade class, and a small percentage (13 %) of the seventh grade class.

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

The project provided a hands-on experience to students through the carrying out of the scenarios that were included in four Fate of Rain Activities. Students worked in teams to set up the scenarios, make it rain, observe the visual results, record the river readings and summarize the data. They were able to demonstrate the impact of a significant storm on a natural wetland environment, a developed basin, a developed basin with a retention pond, and a developed basin with a levee. They were able to create a flood situation and observe firsthand how it flooded houses and roads under different conditions. The visual nature of this project allows students to easily understand how it could happen in their neighborhood. Comparing the four scenarios allowed students to understand that land use can definitely impact flooding. Therefore thoughtful land use planning is essential to not only reducing flooding, but in preventing the destruction of important floodplain and wetland areas as well. Awareness of the pitfalls of developing certain areas that provide important natural functions, and a general sense that it can be managed to prevent flooding and pollution will hopefully instill a stewardship attitude where the student knows he can make a difference.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

The students were introduced to the prior learning concepts with three watershed units written to help them better understand the Floodplain Simulator Model Laboratory exercise. These units were introduced with a Watershed Activity that helped students visualize what a watershed looks like. The students were asked to crumple a sheet of paper and then slightly uncrumple it. Students indicated ridges in black water-based marker, streams in blue, exposed soil in brown, and pollutants in red. Students then sprayed the "watershed" with water and discussed what they saw. Then each unit was completed: Watersheds – Local, Watersheds – Chesapeake Bay, and Watersheds – Floodplain and Wetlands.

The follow up evaluation consisted of two questions. What did you like or learn? and Any suggestions for improvement? The responses to the questions are included in the mailed material packet.

Students were also evaluated on the unit exercises, a quiz, and on the floodplain simulator lab exercise. Overall, students in the four classes achieved an eighty- three percent average over the five areas of evaluation.

- 2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

These activities expanded student knowledge of the PA portion of the Chesapeake Bay and its waters through a variety of methods that included the following. In the local watershed unit, students were asked to find the watershed in which they live on a small watershed map, and draw that watershed. In the unit on Watersheds- Chesapeake Bay, students learned about the size of the Bay watershed, its position in the landscape, and identification of the Bay's river systems. Students reflected on how our local actions impact the waters of the Bay. They toured the Newport School campus to identify how their school impacts the Bay by identifying eco friendly and non eco friendly practices. Students specifically looked at storm drains and parking lots since Newport School has good examples of each. In addition, they were also asked to locate the school and identify a direct water way to the Chesapeake Bay, along with the distance. Students learned that this whole area, which includes their watershed, drains to the Chesapeake Bay. Water quality issues of the Chesapeake Bay were also discussed and modeled using the Bay in a Beaker experiment demonstration. Information on non point source pollution was presented and NPS pollution in the entire watershed was identified as a major role player in Chesapeake Bay water quality issues.

- 2c. How were the classroom activities integrated into the school's curriculum?

The Science teacher integrated several units of watershed information around the introduction of the Floodplain Simulator. The pertinent concepts were introduced (as described in response 2a), and then demonstrated with the simulator using a Fate of Rain theme. Floodplain simulations were performed as one large group, with subgroups taking turns leading the activities. Students were divided into groups of six students with each group being responsible for a specific activity and task assignments such as rainmaker, river reader timer, recorder, data entry, levee builder, student to measure and runoff output. A series of four experiments were run: undeveloped basin, developed basin, developed basin and levee, and, developed basin and retention pond. Results were quantified and represented visually with a hydrograph (copies enclosed). Students then discussed and analyzed the results.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

Yes. The project was led by the Newport Middle School General Science teacher.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

5. In what ways might it be possible to measure long-term outcomes of the project?

Long term outcome measurement is difficult to quantify. However, if students continue to take classes pertinent to the topic and build their knowledge of land use and storm water concepts it is hoped that they would use that knowledge when they become responsible citizens in their communities. The science teacher will be checking the Science PSSA scores of this group to see if there is improvement.

Project Title: MWEE1001 Trout in the Classroom as a Bay Learning Tool

Funding: \$1788

Conservation District: Adams

School District: Fairfield Area

School: Fairfield Area High School

Summary: The project focused on connecting watersheds, water resources and human interrelationships surrounding our new high school by students in Environmental Science. These areas are becoming part of an out-of-the-classroom integrated learning environment where students apply their knowledge in a real and tangible setting. Environmental Science students at the new high school visited local water resource management facilities in the Codorus Creek Watershed, including Lake Marburg Reservoir (DCNR & Glatfelter), Glatfelter Inc., Indian Rock Dam (U.S. Army Corps of Eng.), The York Water Company, City of York Flood Control Project, and Springettsbury Wastewater Treatment Plant, making it an extension of the classroom.

Students:

How many students in which grades were targeted through this project? Through this project over 100 students participated in hands on watershed education. These students were environmental science students in grades 9-12. Since this is a sustainable project, we expect that there will be 100 students educated each year because of this grant opportunity.

What percentage of each grade's total student body do these numbers represent?

9th – 50%, 10th - 30%, 11th -15%, 12th – 5%

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic? The project provided sustainable hands-on watershed education to high school students at Fairfield Area High School by adding an annual Trout in the Classroom program. By receiving funding through MWEE, the District was able to leverage funding for the Trout in the Classroom Program. Environmental science students in grades 9-12 had and will have an opportunity to learn how local water quality and watersheds affect local aquatic species (Brook Trout). The Trout in the Classroom program is an annual project where students raise Brook Trout from fertilized eggs received by the PA Fish and Boat Commission and raise the fish to small fingerlings. Throughout the project the students will monitor the water quality of the fish tank for criteria such as nitrogen, pH, DO, and temperature. At the end of each school year, the students will take the fish to a local approved trout stream and release the fish. This spring the students had the opportunity to attend a wetland and watershed workshop at Strawberry Hill Nature Preserve. There the students learned through hands-on education about chemical water testing, macroinvertebrate sampling, wetland, vernal pools, and other watershed related subjects like exotic and native plant species. The students had a Meaningful Watershed Education Experience by learning about water quality and by connecting the students with a local watershed within a mile from the school. We believe this helped nurture a sense of community and good stewardship ethic. In future years, the students will release the fish that they have raised and will be able to see the habitat in which the Brook Trout need to survive. The students will also have the chance to analyze the stream through macroinvertebrate and chemical testing.
2. 2a. Please describe the project's pre and post classroom activities/evaluations: The Fairfield High Teacher created a 10 question pre and post tests to evaluate the students' understanding of watersheds, streams, and the Chesapeake Bay. The test was given to the students in February when the funding was awarded and again at the end of the aquatic section (end of April).

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams? The pretest provided a template for the teacher and the student on what subject area they were lacking in knowledge. Through this technique, the teacher was able raise that average test score from nearly 0% on the pretest to 95% on the post test.

2c. How were the classroom activities integrated into the school's curriculum? The teacher was able to incorporate a field trip to a local coldwater fishery to do a stream study. The stream study had and will emphasize on connecting the conditions they mimic in their trout in the classroom aquarium with the Brook Trout's natural habitat (coldwater fishery). Every year, the environmental science classes will study macroinvertebrate, chemical water testing,

wetlands, vernal pools, and local watersheds. Also, through this program, the students will be monitoring the DO, nitrogen, phosphates and water temperature of their Brook Trout aquarium and release stream (Middle Creek).

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe: The project was coordinated by Adams County's Watershed Specialist. The lead teacher was Derek Mckenrick of Fairfield HS teacher who was very interested in providing and learning how to provide hands-on watershed education. He provided multiple hands-on activities in and around the school. He also had multiple guest speakers and field trips.
4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain. The guest speakers were: Strawberry Hill Nature Preserve's – Education Coordinator (vernal pools), Conservation Districts – Watershed Specialist (macroinvertebrates/watersheds) and Conservation Technician (wetlands), Penn State Extensions – Water Resources Educator (chemical water testing).
5. In what ways might it be possible to measure long-term outcomes of the project? It would be easy to monitor the outcomes of this new curriculum. The teacher has planned to incorporate all of the materials covered into his exams. He will also be able to measure outcomes by improved score in the state aquatic and ecology exams.

Project Title: MWEE1002 Turf Grounds Nutrient Management in the Chesapeake Bay

Funding: \$1148

Conservation District: Bradford

School District: Troy

School: Troy Area Elementary School East

Summary: District Nutrient Management Staff worked with each of the Future Farmers of America groups in the participating High Schools to develop mini-nutrient management plans for their school grounds. District Staff provided instruction and hands on guidance to students on how to determine nutrient needs of the turf grasses, take soil samples, compare sample results with crop needs and develop "mini-plans". Students interviewed School Grounds Keepers and included recommendations in their plans to the school. All activities were linked to watershed health.

Students:

How many students in which grades were targeted through this project? 70+/- High School Students engaged with the FFA program.

What percentage of each grade's total student body do these numbers represent? 5% (?)

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

Students actually went to the field and took soil samples and related the results with the crop needs. They interviewed grounds keepers to determine their current management practices. Students were left with an understanding of how to balance crop needs with amounts of nutrients applied thus eliminating excess nutrient runoff and protecting water quality.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

Students were given an overview of nutrient management, soil testing and nutrient values and crop needs. Project involved evaluating those crop needs with actual soil nutrient test results and they were asked to make recommendations that would balance those needs. This was done successfully through the development of mini-nutrient management plans.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

Students worked closely with the District's Chesapeake Bay Technician, who described the activities of that position and how the students' activity they were involved with related to the activities of the Bay Technician. At the end of the project, students could relate soil nutrients, crop nutrient needs and how excess could impact on water quality.

2c. How were the classroom activities integrated into the school's curriculum?

Students were permitted to work on the project as part of their in school programs related to FFA. FFA directors were extremely pleased with the practical, real life application of nutrient management and have verbally committed to continuing the activity utilizing the tools provided by the project.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

The FFA directors have a long relationship with the Bradford District and have integrated other Bay relevant activities with their students. Examples include a nutrient management planning competition and Trout in the Classroom projects that are annual activities.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

The project was primarily limited to the FFA directors, students, school ground maintenance managers. Penn State Extension did provide additional support.

5. In what ways might it be possible to measure long-term outcomes of the project?

Project Title: MWEE1003 Dairy Farms, Watersheds and NPS Pollution

Funding: \$1648

Conservation District: Bradford

School District: Athens, Canton, Troy, Northeast Bradford Schools

School: Athens, Canton, Troy, Northeast Bradford High Schools

Summary: Students and teachers spent a day visiting a working dairy farm that was a previous Chesapeake Clean Water Farm winner. Students received a first-hand tour of the farm and its operations, how agricultural producers manage their resources to maximize returns and protect and enhance natural resources and protect water quality. This was reinforced by the use of an EnviroScape Watershed model. Student then participated in a macro-invertebrate sampling of the stream that runs through the farm in order to assess the effectiveness of the water quality protection practices on the farm. A farm specific booklet was developed to further explain the practices the student observed so that they could continue the discussion in the classroom as well as to provide reference material for the teachers.

Students:

How many students in which grades were targeted through this project? 30

What percentage of each grade's total student body do these numbers represent? 100%

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

Students not only were able to physically tour the farm, see first-hand the practices developed to protect and enhance the farm's natural resources but were also able to participate in macro-invertebrate sampling and evaluation for water quality of a stream that ran through the farm. Use of the EnviroScape model helped reinforce the practices with water quality.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

Students were asked the following questions before and after the field experience:

- How does a farmer stop soil erosion when he plows a field on his farm?
- What does a farmer do with the manure on a farm?
- What kind of food does a cow eat to produce milk?
- Name three (3) types of equipment that a farmer uses on the farm?
- How does a farmer keep the streams clean on his farm?

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

The students were able to see what types of best management practices a farmer utilizes to protect and enhance his soil and water resources. By sampling the stream, students participated in a discussion that directly related the impacts of those practices on protecting water quality of the stream, the Susquehanna River and ultimately the Bay. This was further reinforced through a group participatory use of the EnviroScape Model.

2c. How were the classroom activities integrated into the school's curriculum?

The teachers administered the before and after evaluations. The booklet developed for the farm tour was distributed to the teachers for future reference and use when following up on the field experience.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

The project was led by knowledgeable District staff and a farm family that was exemplary in their knowledge and practices of best management practices.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain. Community farmers.

5. In what ways might it be possible to measure long-term outcomes of the project?

By following up with the teachers and students on the use of the booklet developed and future tours of the project farm by the School, as well as long term use of the Enviroscope model.

Project Title: MWEE1004 Stormwater Conservation Education

Funding: \$2500

Conservation District: Cumberland

School District: West Shore

School: Cedar Cliff High School

Summary: Our project involved in class activities to prepare for the in stream field work. In the stream, the students performed chemical water quality analysis, macro invertebrate assessments and visual habitat and land use assessments. Our goals we achieved by the degree the students realized the impacts of our actions on the local stream and ultimately the Bay.

Students:

How many students in which grades were targeted through this project? 60, grades 10-12

What percentage of each grade's total student body do these numbers represent? 10

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

2 day field trip. Activities included: macroinvertebrate surveys, water quality parameter analysis, habitat & land use assessment, observation of best management practices.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

-discussion and demonstration of human impacts on surface and ground water using model

-practice and drill with macroinvertebrate ID

-practice and drill with chemical and physical water quality tests, lessons on water conservation

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

With every activity, the overall theme was human actions and their effects on water resources. Direct links to personal actions and the impacts on the bay were discussed.

2c. How were the classroom activities integrated into the school's curriculum?

The classes that participated were Environmental Biology and the curriculum for this class has an aquatics section.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

Yes. Mr Weaver is a teacher with 14 years experience and brings realistic issues into his class daily. He is constantly bringing me into his classes to discuss stormwater and NPS pollution and the Bay, which he incorporates into his curriculum. He also is an advisor for the Envirothon and has placed as high as 5th at the PA Envirothon with his County team.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

Yes. We stopped at the PA F&BC fish hatchery in Huntsdale, south of Newville, to get a tour of the facility. We talked about the impacts of the hatchery and related that to the Yellow Breeches and the Bay.

5. In what ways might it be possible to measure long-term outcomes of the project?

Cedar Cliff HS conducts senior surveys that may shed some light to the success of the project. Additionally, students talked about how getting into the streams and experiencing the activities on this field trip really made them think about their activities and how they are impacting streams and the Bay.

Project Title: MWEE1005 Chesapeake Bay Unique Habitats Exploration Project

Funding: \$2500

Conservation District: Dauphin

School District: Central Dauphin

School: Circle School

Summary: This was a multi-part project. Activities included:

- in-class learning activities,
- organizing and supervising a cleanup of Spring Creek in Harrisburg,
- creating a sculpture of some of the trash collected during the Creek Cleanup,
- distributing 475 native trees to our school community, and planting about 20 of them ourselves at school,
- planning a complex five-day overnight field trip with Echo Hill Outdoor School,
- spending 3½ days on Echo Hill's skipjack Elsworth, exploring the geography, flora and fauna of the Chester River and the Bay, then 1½ days at Echo Hill's residential facility, exploring a swamp both on foot and by canoe, and doing a team-building adventure activity called The Giant Swing,
- planning, hosting, and delivering a public presentation to showcase our activities,
- creating this final report on our activities.

Students:

How many students in which grades were targeted through this project?

Students at The Circle School are not grouped into grade levels. The initiating students are a group of five girls ages 11 and 12. A sixth, 18, helped and participated in every other activity but did not go on the trip. Every student at The Circle School (66 total, K-12) was involved in some way in this project, some more substantially than others. The five trippers represent 36% of their age-peers. At our evening presentation, there were 13 students, alums, parents, and grandparents, totaling about 60 people, including one presenter (our other adult chaperone) appearing via projected video-conferencing. At every stage of this project, the science students' learning, preparation, and wrap-up work was experienced by other students, just due to the fertile and free interactivity of the Circle School environment.

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

While we were at the holly and red cedar grove (on the eastern shore of the Bay), there was an unbelievable amount of trash along the shore, and Captain Andy told us most if not all of it was from the Susquehanna River. This made us more aware of how Pennsylvania is one of the main states in the watershed and how we have a very important part in keeping the Chesapeake Bay clean. We were glad we helped clean up Spring Creek, so at least THAT trash won't end up in the Bay. Going fishing and seining (on the trip) helped us be able to identify different types of fish. Going exploring we found all sorts of new things that we had never seen. We also heard a lot of stuff we'd never heard about, and having the time to really experience it helped us understand it a lot more than if we had just heard it.

2. 2a. Please describe the project's pre and post classroom activities/evaluations: Please see our journal (attached).

In brief, we did three kinds of activities during our class times: (1) we explored living and non-living things that came to us naturally (like the family of bats another student brought in), or science topics that simply interested us; (2) JD led us through some activities from Project Wet; (3) We explored the bay, skipjacks, and other trip-related topics on the web.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams? Please see our journal.

2c. How were the classroom activities integrated into the school's curriculum? The Circle School's curriculum is determined by each student, for each student. Essentially that means that everything we did in this project is part of the school's curriculum for the students who participated, and it means that curricular integration is organic and guaranteed. We just live our lives here; applying for this grant and making this project happen are things we do along with reading books, playing outside, helping run the school, keeping the school clean, making things, and exploring our world.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

One of us (staff member JD Stillwater) is certified by the Pennsylvania Department of Education to teach secondary Physics, Chemistry, Biology, General Science, and Math (Pennsylvania does not offer certification in Earth and Space Sciences for private school teachers), and by the College Board to teach AP Physics. Our trip to the Bay was hosted by the Echo Hill Outdoor School in Chestertown MD. EHOS has been doing Environmental Education since 1972. Our principal guide was Captain Andrew McCown, who has been with Echo Hill since 1977.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

In addition to Echo Hill Outdoor School, we partnered with the Pennsylvania State Game Commission to obtain and distribute the native tree seedlings. We also worked with Swatara Township to arrange for disposing of the mountain of trash we hauled out of Spring Creek.

5. In what ways might it be possible to measure long-term outcomes of the project?

Probably the best way will be to see what projects we cook up for next year! We certainly finished this project with a new-found interest in getting out into wilderness and making a positive difference for the environment as part of our school experience. We know that some other students and staff are jazzed about joining us for next year, too.

Project Title: MWEE1006 Farming and Local Streams

Funding: \$2880

Conservation District: Lancaster

School District: Ephrata

School: Clay Elementary

Summary: The watershed experience included lessons introducing the characteristics of water, the importance of water, how water moves, and the importance of clean fresh water created the foundation students to learn how Lancaster County residents can help the Chesapeake Bay. Students then had the opportunity to participate in hands-on field experience on a farm property within the Chesapeake Bay Watershed. Students were involved in a day long hands-on meaningful watershed experience following weeks of preparation in the classroom. Third grade teacher, Suzi Rehm opened her home farm for the students to visit and learn. The property includes a section of Middle Creek, a tributary of the Conestoga River. During the day long experience, students monitored the stream health through macroinvertebrate study and chemical testing. They also planted a riparian buffer along the stream where none existed. This extension to the district science curriculum Water Unit increased the knowledge and understanding of each student to be a better steward of local waterways.

Students:

How many students in which grades were targeted through this project?

98 third grade students participated in this grant project.

What percentage of each grade's total student body do these numbers represent?

20%

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

During the field experience of the project, students completed water testing including both chemical and biological on Middle Creek a tributary to the Conestoga River. They also performed a visual assessment. Issues of non-point source pollution were recognized. Throughout lessons on site, students brainstormed ideas to improve the health of the stream. Ideas included: have someone show farmers to keep their cows out of the stream, plow their farm fields that water run-off would not go into the streams, and plant trees and bushes that would keep soil back and the water flowing into the streams. Students also planted trees along the farm owners section of stream. This was a wonderful positive impact as the owner had previously mowed this area. These extensions of the Water Unit illustrate more practices people can put in place to improve water quality locally which ultimately makes the children more educated about being a better steward of local waterways that lead to the Bay.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

Students completed a watershed booklet produced and provided by the Lancaster County Conservation District entitled, "The Drop You Drink is More Than You Think" prior to the field experience. The Water Unit included classroom lessons about the characteristics of water and the importance of water in every living thing. Pre-field experiences also involved videos that showed the damaging impacts of poor practices by people, factories, or farms. Current event articles were collected from local newspapers reporting on the Chesapeake Bay. Evaluations were

generated from composition books kept by all students. Composition books included data collections, journal entries, and illustrations.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

Suzi Rehm, third grade teacher, believes this project allowed teachers to not only show in the classroom what watersheds are and what we can do to make them better, but it was the field experience where the children actually changed an area along the stream where children could see themselves making a difference to help make a better future for the Chesapeake Bay.

2c. How were the classroom activities integrated into the school's curriculum?

Clay Elementary, Ephrata Area School District science curriculum includes the Water Unit in third grade. Watershed booklets, trade books, videos, hands-on activities, and current issues blended easily into the state standards and school district guidelines.

The project provides a useful preparation for the PSSA science tests in fourth grade.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

Along with school district teachers, instructors included the Lancaster County Conservation District Education Coordinator, an Assistant Principal from a neighboring school district who once taught High School Biology, and two parents with a great deal of experience in chemistry and woodworking.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

Through the generosity of the Octorara Nursery in Lancaster County, all trees were donated to the project. This native plant company was very willing to support youth as they were working to make a difference and build stewardship skills.

The Lancaster County Conservation District Education Coordinator provided resources and support in planning the project along with facilitating different aspects of the field experience.

The local newspaper and local television participated in the field experience to highlight and share the good news story of the students.

5. In what ways might it be possible to measure long-term outcomes of the project?

At the conclusion of the field experience, teachers shared a greater comfort with the entire curriculum emphasizing watersheds. They were ready to continue the project next year and were very grateful for the resources provided through the project which will be used for many years to come.

Project Title: MWEE1007 Human Impacts on the Bay

Funding: \$4800

Conservation District: Lebanon

School District: Annville-Cleona, Cornwall Lebanon, Eastern Lebanon County, Lebanon, Palmyra; Lebanon Catholic

School: Elementary Schools and their Envirothon Advisors

Summary: Took 115 4th – 6th grade students, 10 teachers/advisors, 12 instructors & 20 parent chaperones to the Bay to study watersheds & estuaries and the human impact on the Bay. Study/activity stations included the study of horseshoe crabs at Pickering Beach; Fiddler crabs, benefits of salt marshes, and biological & chemical water testing at Mallard Lodge; recreational activities of fishing & canoeing at Mallard Lodge; and exploring the migratory birds & their relationship to the horseshoe crab at Bombay Hook National Wildlife

Students:

How many students in which grades were targeted through this project? All students in grades 4-6 throughout Lebanon County's public & private schools were targeted.

What percentage of each grade's total student body do these numbers represent?

Best guess is between 7-10%. Some teachers expose the entire classroom to the materials & lessons provided. Gifted teachers teach only the 4-6 grade gifted students. In addition, it's usually one teacher per school who takes on the task as advisor even though two other grades may be involved.

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

After studying the topic of watersheds & estuaries for a few months, the students were able to put all the classroom work/learning into practical experience as they dug in a salt marsh to ID plants and macros; observed the hundreds of thousands of water birds (migrants & local) using the salt marshes for food, shelter, and nesting; weighed, measured, counted, and learned more about the value of horseshoe crabs and their niche in the web of life & bay habitat; recreated among the marshes and ponds canoeing & fishing; and dug in the mud and reeds for Fiddler crabs. Sadly, the Gulf of Mexico oil disaster played right into our hands as we discussed what would happen to the salt marsh habitat & the inhabitants (birds/macros/fish/shellfish/ people) if the spill were here. It made a direct impact on their view of stewardship & protecting the bay. In addition, the Envirothon tests (post assessment) helped make their personal connection to the bay and how they impact it . . . all the way up here in Lebanon.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

A list of resources & learning objectives were provided to the teachers/advisors. Teachers reviewed, had students research, & conducted the material/lessons to their students over the months prior to the field experience. Some advisors took their students on local trips to wetlands/ponds to discuss watersheds or had guest speakers in to discuss watersheds and non-point source pollution. The advisors tested their students in various areas throughout the year with the culminating event being the Bay trip activities and evaluations.

- 2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

Numerous resources & activities, but specifically the 3 tests on the day of the competition assessed their understanding of this. A few examples of test questions related to this include: 1) what 6 states made up the Chesapeake Bay Watershed; 2) which two main rivers in PA run into the Chesapeake Bay; 3) What river provides 50% of the Bay's freshwater; 4) the students traced creeks/rivers from their school yard to the bay the way a kickball from the playground would float downstream to the ocean; 5) knowing the division line in Lebanon County of the Delaware and Chesapeake Bay Watersheds. (See Test #1)

- 2c. How were the classroom activities integrated into the school's curriculum?

Envirothon advisors used the suggested resource list of materials/learning objectives to teach the class or just the 'team' the material. Some incorporate into the existing school curriculum. The advisors select the topic of study each year at the Envirothon. Topics & learning objectives are based on the Pennsylvania's Environment & Ecology Academic Standards. This year the advisors chose PA Endangered & Threatened Species vs. Invasive Species for next year's topic (2011).

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe: Yes. LCCD staff & Quittapahilla Educational Wetland Preserve staff people conducted the stations. In addition, we had a Quittapahilla Audubon Member work with us at Bombay Hook and 2 Federation of Sportsmen Club members conduct the fishing station.
4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain. Yes – see above.
5. In what ways might it be possible to measure long-term outcomes of the project?
 - If advisors are willing to go again in future years and pay the full cost of the trip (without grant assistance).
 - If they choose to participate in future Envirothon events.
 - Career paths these students may take. Some students told their teacher/advisor that they want to become a marine biologist after attending the trip.

Project Title: MWEE1008 Outdoor Education Program

Funding: \$5463

Conservation District: Snyder

School District: Selinsgrove

School: Selinsgrove Area Intermediate School

Summary: The Outdoor Education Program at Selinsgrove area Intermediate School experience is a four day trip for fifth grade students in the Selinsgrove Area Schools District where the students are housed in cabins at Camp Nawakwa and are exposed to a variety of outdoor and environmental activities. In particular consideration to a watershed experience, the students take part in an interactive, hands-on class called Stream Study. Mr. Dick Hackenburger, a

secondary agricultural instructor, is our guest teacher for this class. During this class, students are taught the characteristics of a "healthy" stream and the impact humans have on aquatic environments. The students also learn how the "health" of one stream can affect others in their watershed. The students also collect and identify macroinvertebrates, fish, reptiles, and amphibians from our target stream. They learn how gathering data on the populations of these various species can give scientists indicators about the "health" of a stream.

Students:

How many students in which grades were targeted through this project? One hundred sixty-five fifth grade students and fifty high school students attended the activity.

What percentage of each grade's total student body do these numbers represent? One hundred percent of fifth grade students from Selinsgrove Area Intermediate School were invited to participate in the Outdoor Education Program, and 93% actually attended the activity.

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

While at Camp Nawakwa, the students visit a stream on the camp grounds. They study the characteristics of the stream such as flow rate and temperature. They learn what these characteristics mean for organisms such as trout. They also collect organisms from the stream and learn what scientists can discover about a stream based on the populations that live in it. They also learn how this stream affects the bodies of water that connect with it. The students learn how human activity can affect the "health" of a particular stream and how those changes affect the organisms living in that stream and the bodies of water that connect with it.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

Before leaving for Outdoor Education, students were given a pretest. Their average score was 68.5%. Upon returning, students scored 86% on the same test. A copy of the pre and post test is included.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

Our students have a natural interest in the streams and creeks in the Selinsgrove Area. They are also very fascinated by the Susquehanna River since many students spend time camping, fishing, canoeing, and kayaking this amazing river during the spring and summer months. Students had a deeper appreciation of the river and the way they could impact these creeks, streams, and rivers in the future. They took ownership of what could happen in the future.

2c. How were the classroom activities integrated into the school's curriculum?

In the classroom, 5th grade students in our district complete a unit titled "Interactions of Living Things". In this unit they learn how all organisms live in ecosystems where they depend on each other and the natural resources of the environment. The students learn that ecosystems change constantly, with some experiencing rapid modifications. They learn that some of these modifications are brought about by natural processes and others are brought about by human activities. All of the lessons in this unit link to the academic standards listed for Environment and Ecology.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

At Outdoor Education, students are led by experts including district teachers and Mr. Dick Hackenberger who taught agricultural sciences at East Juniata High School for many years.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

The district staff also teaches classes in Outdoor Survival and Recycling. At Outdoor Survival students learn how to use the natural resources of their environment to survive, how we depend on those resources, and how human activity impacts those resources. At Recycling students learn how we can recycle many used items to limit the negative affects human activity can have on their environment. Students apply lessons they learned from Stream Study during these classes and vice-versa.

5. In what ways might it be possible to measure long-term outcomes of the project?

In the case of our district, teachers from 6th, 7th, and 8th grades met with 5th grade teachers to decide how to best build upon the environmental and ecological lessons and skills learned by our students.

Conservation District: Wyoming**School District:** Tunkhannock**School:** Evans Falls Elementary

Summary: Students and teachers developed a schoolyard habitat that will become an outside classroom for environmental education. Environmental Education Programs relating to the project were provided by the EE Coordinator for all 3 classes of 2nd grade. Journals were provided and the students used them to document their experiences, special speakers and the progression of the project to its completion. The students worked hard preparing the garden areas, weeding and making a border with rocks. On planting day the students worked continually until all the plants (over 100) were planted, watered, and mulched. A special part of the planting day included the planting of Hemlock Trees and Mountain Laurel- our state representatives.

Students:

How many students in which grades were targeted through this project? The Entire 2nd grade. (Approx. 60)

What percentage of each grade's total student body do these numbers represent?

Kindergarten-Fourth grade all have access to the Schoolyard Habitat areas.

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

Everyone near the streams and river witnessed the power of the Susquehanna River. People respect the river and the children have a personal connection to the river and were rerouted when traveling to school due to the reconstruction of a major bridge. Children are growing up learning that living near the Susquehanna River and its streams means that you must be watchful during rain and snow storms. The Susquehanna River also provides many peaceful opportunities for camping, boating, fishing and relaxation. The students were able to strengthen their connection with the Susquehanna River through mapping lessons during which they discovered that the path of the river flows south through Pennsylvania and the Chesapeake Bay Watershed. Mapping confirmed that it eventually enters the Atlantic Ocean.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

The process included many weeks of learning and studying including nature activities, environmental projects, hands on gardening, recycling, threatened and endangered species, mapping skills, native flora and fauna education of Pennsylvania all culminating in a mural representing and depicting the tutoring and edification of the students' experience in the school yard habitat (See attached for detailed explanation).

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

The students were posed a question about how to navigate a way to get to the Atlantic Ocean given the restraints of not being able to use vehicles, hiking and airplanes. The children were able to learn and conclude that the Susquehanna River leading to the Chesapeake Bay watershed was the best and only logical path to follow. They were able to describe how they would travel along the river system and what states they traveled through in the process.

2c. How were the classroom activities integrated into the school's curriculum?

The activities were cross-curricular aligned with the Tunkhannock Area School District standards which connect learning with nature. The Evans Falls Schoolyard project taught the students to work together to create a habitat for native plants and animals on our school grounds (See attached).

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

The project was led by knowledgeable teachers and an Environmental Education Coordinator from the Wyoming Conservation District; Laura Anderson through an "Enviroscape Model".

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain. Nursery professional, Penn State Master Gardener, WCCD-2 Resource Conservation Specialists and EE Coordinator, along with students and their families.

The project did involve other partners that expanded the influence of the project including Judy Shupp from the Penn State Master Gardener Program and a Nursery professional Vito Barzilowski was from Bennies Nursery. WCCD

Conservation Specialists included the Ag. Conservation Programs Coordinator: Paul Hovan, the Resource Conservation Specialist/Dirt & Gravel Roads: David Taylor and the EE Coordinator: Laura Anderson. Also included were certified classroom teachers including Judy Weber, Teresa Cavalier and Larinda Kaufer. This will be an ongoing project well into the future through my initiative and in cooperation with the Wyoming County Conservation District.

5. In what ways might it be possible to measure long-term outcomes of the project? The awareness and interest generated by the students and community increases the likelihood of further participation in conservation programs!

Evans Falls PSSA scores in the science category have been the highest in the region for the past two years demonstrating there is a strong foundation beginning in the primary grades and continuing into fourth grade. Planned future projects in coordination with the WCCD include establishing a rain barrel at the school for the children to utilize and water plants through the dry season and to continue making entrees into their Student Nature Journals.

Project Title: MWEE1011 Wetlands Restoration Project

Funding: \$2500

Conservation District: York

School District: Spring Grove

School: Spring Grove Area High School

Summary: This project was continued restoration of wetland sites surrounding our high school by students in environmental science. These sites have become the focus of the district's outdoor learning environments where students apply their knowledge in real and tangible settings. These wetland ecosystems offer opportunity for authentic outdoor learning experiences beyond what can be simulated indoors. Curriculum-based instruction was applied in these wetland sites throughout the year.

Students:

180 Environmental Science students (11th grade, approximately 60% of the class)

21 Environmental 2 students (12th grade, approximately 8% of the class)

300 6th grade students (100% of the class)

Project Overview:

1. In what ways did the project include hands-on watershed activities that strengthen a student's connection with the PA portion of the Bay, their local rivers and streams, and instill a stewardship ethic?

For the juniors in Environmental Science, lab activities included soil testing and texturing, water chemistry, collection and identification of macro invertebrate indicator species, monitoring succession, studying nutrient loads and the resulting eutrophication, identification and removal of invasive species, and observing food chains and food webs.

2. 2a. Please describe the project's pre and post classroom activities/evaluations:

Pre-classroom activities included connecting content to current events, understanding lab testing procedures, and group readiness. Following a field visit or lab, students would evaluate data and often draw comparisons to what the undisturbed ecosystem would show. Students then identified causes for any changes or discrepancies that were found in the field. ID cards were made for invasive species, food chains were drawn, tables were developed with testing data, and analysis followed. Assessments took the form of brochures, student-made videos, slide presentations, photo documentaries, timelines, electronic posters, billboards, and chapter tests. Students also acted as mentors to the after-school program children who visited the sites several times throughout the year.

2b. In what ways did those activities expand a student's knowledge of the PA portion of the Chesapeake Bay watershed and its rivers and streams?

Beyond teaching content, the focus was on connecting the content to the students' decisions and actions. Students learned about the vectors for invasive species and the damage those species cause outside of their natural habitat. They learned about the negative impact of obsessive fertilization of lawns and pesticides on monoculture crops. They connected their driving habits to the damage done to the watershed they live in and the Bay they visit periodically. They debated the development of land along the Susquehanna River from the viewpoint of the current owners and nameless, countless people in the watershed who are also impacted by their decision. They hopefully developed an understanding of the complexities of the choices we all face in a society which values material wealth above all else.

2c. How were the classroom activities integrated into the school's curriculum?

Activities were dispersed throughout the year's curriculum as standards were addressed. These activities usually meant changing shoes, collecting jackets and supplies/equipment and going outside to the wetland sites for field work. Students were very receptive to the opportunity to go outside even when it became cold. PA State Environment

& Ecology Standards addressed included: 4.1 Watersheds and Wetlands, 4.2 Renewable Resources, 4.3 Environmental health, 4.4 Agriculture and Society, 4.5 Integrated Pest management, 4.6 Ecosystems and their Interactions, 4.7 Threatened, Endangered and Extinct Species, 4.8 Humans and the Environment, 4.9 Environmental Laws and Regulation.

3. Was the project led by knowledgeable teachers, educators, and/or organizations familiar with providing meaningful Chesapeake Bay watershed experiences? Please describe:

Celeste Barnes was the teacher for 5 Environmental Science classes and the Environmental 2 class. Kim Richard was the teacher for 3 Environmental Science classes. Both are certified, professional teachers who are very passionate about connecting students to their environment. Josh Richard, a Technology Education teacher in our building, was instrumental in creating the signage for our wetland sites. He guided several of his students in use of the district's laser engraver to create lasting signs which will be installed over the summer.

4. Did the project involve the community or other partners that expand the influence of the project? If yes, please explain.

Yes; the after-school program at Spring Grove Elementary visited our wetland sites on several occasions, the 6th graders within our district came up to our wetland sites on Earth Day for learning activities and tours, and our local representative to the PA House of Representatives, Seth Grove, came to our sites for Earth Day. In addition, materials were donated for use in our rain garden from business owners of Doug's Lawn care and H&H Contractors.

Two students, who were juniors during the 2009-2010 school year, completed bridges to improve access to our wetland sites as their graduation projects.

5. In what ways might it be possible to measure long-term outcomes of the project?

Students have taken ownership of the wetlands and rain garden, coming by after hours to take pictures and bringing parents and friends by for tours. They have also pledged continued monitoring during the summer months and after graduation. Students who were at first taunted by peers for digging out muck and rock and bailing water were later congratulated (and envied) by those peers for the beautiful ecosystems they restored/created. These students also received countless accolades by staff members who were very impressed by their work ethic.

No student will walk past plumless thistle again without pulling it out or at least identifying it for someone else to remove. Students are working with family members to find environmentally-friendly solutions to human wants and needs.

The positive feedback from the Intermediate School staff and administration about continuing the mentoring that started with the Earth Day activities give us a great sense of accomplishment. We have planted the seeds of interest with these 6th graders, and they seem ready to expand on this foundation.