

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Water Quality and Water Quantity

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|--------------|---|-----------------|-----------------|----------------|----------------|
| 111 | Conservation and Efficient Use of Water | 30% | 0% | 30% | 0% |
| 112 | Watershed Protection and Management | 20% | 0% | 20% | 0% |
| 131 | Alternative Uses of Land | 20% | 0% | 20% | 0% |
| 133 | Pollution Prevention and Mitigation | 20% | 0% | 20% | 0% |
| 134 | Outdoor Recreation | 10% | 0% | 10% | 0% |
| Total | | 100% | 0% | 100% | 0% |

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

| Year: 2009 | Extension | | Research | |
|------------|-----------|------|----------|------|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 4.0 | 0.0 | 3.5 | 0.0 |
| Actual | 11.5 | 0.0 | 4.3 | 0.0 |

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

| Extension | | Research | |
|---------------------|----------------|----------------|----------------|
| Smith-Lever 3b & 3c | 1890 Extension | Hatch | Evans-Allen |
| 413650 | 0 | 249885 | 0 |
| 1862 Matching | 1890 Matching | 1862 Matching | 1890 Matching |
| 413650 | 0 | 451132 | 0 |
| 1862 All Other | 1890 All Other | 1862 All Other | 1890 All Other |
| 0 | 0 | 0 | 0 |

V(D). Planned Program (Activity)

1. Brief description of the Activity

Environmental researchers have developed new methods to minimize water pollution that are science-based and meet water quality improvements, which are obtained with minimum impact on the American agricultural community and taxpayers. Researchers have science-based answers for questions posed by stakeholders, policy and decision-makers, developers and planners concerning land use alternatives. Success is seen by improved utilization of sound management measures and improved installation and maintenance of these measures.

Workshops to educate municipal officials, designers, developers, building contractors and the public in storm water management and environmentally sound development practices have been attended by approximately 6000 persons.

Many landowners in South Carolina watersheds are unaware of the uniqueness of their property so the Clemson University Cooperative Extension Service staff developed educational programs to inform them about their property and ways to conserve it.

2. Brief description of the target audience

The target audience includes farm and forest landowners, Extension agents, and administrators, natural resource professionals, Land Management agency personnel, and user groups, nature-based tourism operators, South Carolina citizens, tourists, nature base, tourism industry, children in school, after-school, summer and 4-H programs, agents and volunteers, urban, suburban and rural residents, farmers, ranchers, poultry and swine producers, foresters urban agents, agency personnel, urban planners and land owners/managers, municipal officials, and local community groups statewide, managers, government officials, and recreation and tourism operators.

V(E). Planned Program (Outputs)

1. Standard output measures

| 2009 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---------------|------------------------|--------------------------|-----------------------|-------------------------|
| Plan | 7000 | 2500 | 0 | 0 |
| Actual | 12351 | 393517 | 200 | 0 |

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2009

Plan: 1

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

| 2009 | Extension | Research | Total |
|---------------|-----------|----------|-------|
| Plan | 0 | 9 | |
| Actual | 0 | 18 | 0 |

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

| Year | Target | Actual |
|------|--------|--------|
| 2009 | 1 | 2 |

Output #2

Output Measure

- Licenses

| Year | Target | Actual |
|-------------|---------------|---------------|
| 2009 | 0 | 0 |

Output #3

Output Measure

- New Products, processes, procedures and policies
Not reporting on this Output for this Annual Report

Output #4

Output Measure

- National Media Placements

| Year | Target | Actual |
|-------------|---------------|---------------|
| 2009 | 8 | 12 |

Output #5

Output Measure

- Percentage increase in outside funds from grants, contracts and gifts
Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of people completing educational workshops

| Year | Target | Actual |
|-------------|---------------|---------------|
| 2009 | 4300 | 7973 |

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|--------|---|
| 1 | Number of people gaining knowledge |
| 2 | Number of people using practices learned |
| 3 | Policies for economically viable land use preserving water quality |
| 4 | Strategies for TMDL development and implementation at the watershed level |

Outcome #1

1. Outcome Measures

Number of people gaining knowledge

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|-------------|----------------------------|---------------|
| 2009 | 3300 | 7536 |

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

South Carolina has many watersheds that are considered impaired. Watersheds are evaluated based on the EPA standards that are a part of the Clean Water Act of 1972. In the clean water act EPA is given the authority to set the amount of pollutant a water body can contain. The most prevalent of the pollutants in South Carolina is fecal coliform. The presence of fecal coliform is an indication that animal wastes are entering the water body. Fecal coliform is a bacterium associated with the feces of warm blooded animals. Based on EPA's standards for water quality, water bodies which contain more than 200 counts/100ml of fecal coliform are considered impaired. There is a need to improve water quality, wetland, and wetland management.

What has been done

Seventeen water quality and quantity programs were conducted reaching 7,973 people. To reduce the amount of fecal coliform in watersheds, a Section 319 TMDL project was implemented. As a part of this project, homeowners are encouraged to repair failing septic systems which could be contributing fecal coliform to the local streams and creeks. Three (3) Certified Erosion Prevention and Sediment Control Inspector courses were conducted in August by Extension Specialists who are serving as program coordinators for the DHEC Certified Erosion Prevention and Sediment Control Inspector Program. The program seeks to educate field personnel on the proper installation, maintenance, and inspection of erosion prevention and sediment control measures at construction sites. Over 4,500 people have participated in the classes and over 3,900 completed the certification examination. The series of one-day workshops teaches attendees the latest techniques for erosion prevention and sediment control. It also introduces a variety of erosion control practices including the most environmentally effective techniques for different terrain. Instructors demonstrated how to review grading and drainage plans, as well as BMP details. Each participant is provided an opportunity to meet others involved in land disturbing activities and taught how to conduct a field inspection of erosion prevention and sediment control practices. The first South Carolina Water Resources Conference (SCWRC) was held in North Charleston and covered topics such as water policies, research projects, and water management. A natural resources enterprise workshop was conducted and focused on alternative income opportunities from natural resources on private lands.

Agents developed articles for newspapers and newsletters to publicize programs. They are also posting information to inform the public on their county websites.

Results

Of those participating in the water quality and quantity programs, almost 95% reported a gain in knowledge.

Additional information can be found at the SCWRC site:

http://www.clemson.edu/restoration/events/past_events/sc_water_resources/

4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|----------------|---|
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 131 | Alternative Uses of Land |
| 133 | Pollution Prevention and Mitigation |
| 134 | Outdoor Recreation |

Outcome #2

1. Outcome Measures

Number of people using practices learned

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|-------------|----------------------------|---------------|
| 2009 | 2300 | 3677 |

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Clemson Extension Carolina Clear program is currently partnering with Myrtle Beach, North Myrtle Beach, Conway, Georgetown County and Horry County (and small communities in each county) on improved stormwater education and management. These communities and the additional members of the Coastal Waccamaw Stormwater Education Consortium have expressed a need for more technical workshops and training.

In addition, storm water runoff from roofs and driveways threatens water quality and exacerbates flood problems. In addition, impermeable surfaces decrease the amount of rainwater available to recharge groundwater resources. It is important to educate citizens of these water issues.

What has been done

To meet the expressed need of the Stormwater Education Consortium, two bioretention cells were constructed at the new Clemson Baruch Institute. Innovative stormwater management practices have been incorporated into the site design of the new Baruch Institute building as part of its green infrastructure. Bioretention cells, otherwise known as rain gardens, are attractive landscape features that mimic natural hydrologic processes by allowing stormwater to be infiltrated into the ground. This is accomplished by collecting rainfall runoff from the building rooftop into the shallow basins of the bioretention areas, a process which not only delivers water to the landscape plants but also provides water quantity management and water quality improvement. These cells were constructed using local soil materials, including sand from the Hobcaw Barony property, yard waste compost from the Georgetown County landfill, and mulch from a local sod farm. The areas were planted with native tree, shrub, and perennial plant species, including bald cypress, summer sweet, false indigo, coreopsis, lizards tail, blue flag iris, swamp sunflower, joe pye weed, blazing star, and columbine.

The basins were also instrumented and a weather station is housed on site to conduct research and be used in education. Each basin has also been instrumented with the following: 1) one multilevel piezometer; 2) one vented well for water table position, and 3) four soil moisture sensors. Planned research will focus on monitoring weather measurements (rainfall, temperature, potential evapotranspiration, among others), water quantity (water table position, surface water level, infiltration rates, soil moisture content) and various water quality parameters to assess the effectiveness of the bioretention cells. The bioretention areas will serve as a demonstration site for local

stormwater practitioners. All plants used were native and some were particularly chosen to test their viability within bioretention cells and their growth rate due to alternative production methods used.

Some 282 educational programs were conducted in the areas of rain water harvesting, stormwater prevention, pond weed identification and treatment. Participants gained knowledge on the purpose and construction of rain gardens. Extension specialists were part of an academic convened to discuss issues of minimum instream flows in South Carolina's rivers and streams. A white paper was developed and sent to South Carolina legislators. A stormwater pond newsletter series was developed for distribution to local newspapers and community newsletters.

4H20 day camps were conducted on the lake for 4th and 5th grade students. Agents taught sessions for the Girls in Science program at the SC state Museum, Myrtle Beach municipal staff on stormwater and the municipal employees and residents of RV parks on stormwater pond management.

Results

The first workshop for the Stormwater Education Consortium was held in partnership with the North Inlet Winyah Bay National Estuarine Research Reserve Coastal Training Program and the Coastal Waccamaw Stormwater Education Consortium, entitled, Low Impact Case Studies at Hobcaw Barony: Bioretention, Site Design and Pervious Paving. Flyers were distributed via education listservs and within just more than a week of release, the workshop was filled with forty participants, with a wait list of more than 15 people. The workshop was targeted to stormwater professionals, planning board and zoning board members, engineers, landscape architects and plan reviewers. Evaluations were very positive as to the success of this workshop. Based on what was learned at this workshop, some attendees responded that they would be looking into implementing more low impact development within their community and pressuring other staff to become educated on topics presented. The instrumentation and data collection will continue for these basins, which will allow for additional educational opportunities through on site visits, video training and distance education. With all instruments installed and functioning, this demonstration project may also soon become part of the Bannockburn Plantation component of the Intelligent River TM project, which will allow for more widespread distribution of data collected at this site. In addition to the counties listed for this program, Carolina Clear is currently partnering with Lexington, Pickens, Sumter and Richland counties on improved stormwater education and management. This is an indication that the program is well received and is growing.

Other results of the Water Quality Program include the construction of rain gardens at local middle and high schools and a state park. Residents reported that they constructed rain barrels.

Youth learned about soil texture, water infiltration, and soil water repellency. A river sweep event was conducted and volunteers removed 50 tires, 920 pounds of debris and 250 pounds of metal from the river.

4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|----------------|-------------------------------------|
| 112 | Watershed Protection and Management |
| 131 | Alternative Uses of Land |
| 133 | Pollution Prevention and Mitigation |
| 134 | Outdoor Recreation |

Outcome #3

1. Outcome Measures

Policies for economically viable land use preserving water quality

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Strategies for TMDL development and implementation at the watershed level

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

CU Extension Specialists installed a water level logger at a site that is slated for restoration, to provide City of Conway Storm water Department hydrologic relevant information of that site. Hydrologic analyses was carried out using data gathered at this site to calibrate a hydrologic model. Model results were conveyed to the appropriate person in the City of Conway storm water department.

An evaluation of the program on "Low Impact Case Studies at Hobcaw Barony: Bioretention, Site Design and Pervious Paving" was conducted. Based on what was learned at this workshop, some attendees responded that they would be looking into implementing more low impact development within their community and pressuring other staff to become educated on topics presented. The instrumentation and data collection will continue for these basins, which will allow for additional educational opportunities through onsite visits, video training and distance education. With all instruments installed and functioning, this demonstration project may also soon become part of the Bannockburn Plantation component of the Intelligent River&trade project, which will allow for more widespread distribution of data collected at this site.

Key Items of Evaluation